Analysis of the role of higher vocational education in the sustainable development of social economy

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Abstract: With the aim of improving the contribution rate of higher vocational education in social and economic growth, this paper analyses the role of higher vocational education in social and economic sustainable development. Firstly, the relationship between higher vocational education and sustainable development of social economy is analysed. According to the analysis results, the impact of higher vocational education on the input-output structure of sustainable development of social economy is analysed. Secondly, use Denison's educational econometric model to calculate the social economic growth rate. Finally, the contribution rate of higher vocational education to economic growth is analysed according to the calculation results. The experimental results show that the contribution rate of social and economic growth of this method can reach 11.3%, and the prediction accuracy of social and economic growth can reach 99.66%, which verifies the effectiveness of this method.

Keywords: Cobb Douglas production function; educational factors; weight distribution method; higher vocational education; socioeconomic.

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1   Introduction

The sustainable development of social economy is a reasonable form of economic development. Through the implementation of the sustainable economic development strategy, the social economy can form a sustainable economic development model (Zozulia, 2020; Wu and Li, 2022). In essence, this mode is a modern ecological economic development mode. It strives to achieve the coordinated and sustainable development of the three subsystems of economy, society and ecology in different levels of the economic circle, social circle and biosphere, so that production, consumption and circulation meet the requirements of sustainable development of social economy, establish ecological agriculture and ecological industry in industrial development, and establish a rural and urban economic sustainable development mode in regional development. Under this background, it has certain practical significance to train high-quality talents through higher vocational education to provide a source for the sustainable development of social economy (Wu, 2021; Song, 2021; Gao, 2020).

Relevant scholars have studied this issue and made some progress. Feng (2019) applied the grey correlation method to the research on the coordinated development of higher vocational education and social economy, obtained the relationship between higher vocational education and social and economic development through factor analysis, obtained the influence weight of vocational education on social and economic development by using fuzzy theory method, and analysed the influence of vocational education on social and economic coordinated development by using grey correlation method. This method can effectively improve the effect of coordinated social and economic development, but the contribution rate of social and economic growth is low. Yu et al. (2021) introduced the integration method of industry and education to analyse the impact of higher vocational education on the coordinated development of social economy, built an index system of the impact of higher vocational education on the coordinated development of social economy, obtained the impact function of higher vocational education on the coordinated development of social economy through data clustering method, and determined the impact weight of higher vocational education on the coordinated development of social economy through statistical analysis method, research on the impact of higher vocational education on the coordinated development of social economy by using the integration of industry and education. This method can effectively improve the contribution rate of social and economic growth, but the prediction accuracy of social and economic growth is low.

In view of the above problems, this paper further analyses the role of higher vocational education in the sustainable development of social economy. The specific research ideas of this paper are as follows:

First of all, it analyses the correlation between higher vocational education and social and economic sustainable development. On this basis, it analyses the main problems faced by higher vocational education in social and economic development, and gives the development objectives of higher vocational education under the social and economic sustainable development.

Secondly, calculate the social and economic growth rate. According to the calculation results, use the trade complementarity index to analyse the impact of higher vocational education on the input-output structure in the sustainable development of social economy, and obtain the social and economic growth utility under higher vocational education;

Thirdly, the Cobb Douglas production function is constructed to calculate the contribution rate of higher vocational education to social economic growth;

Finally, the contribution rate of social and economic growth and the prediction accuracy of social and economic growth of different methods are verified.

2 Correlation analysis between higher vocational education and sustainable development of social economy

2.1 Analysis of the relationship between higher vocational education and social and economic sustainable development

Through the induction and analysis of the concept of higher vocational education from the four perspectives of broad sense, narrow sense, external and internal, higher vocational education can be defined as an educational activity that educatees provide vocational ability and vocational knowledge. Vocational education is a service, and vocational education trains high-quality talents instead of ordinary talents. Higher vocational education consists of school vocational education and social vocational training. The former consists of junior colleges, higher vocational colleges and secondary vocational colleges to provide teaching services for educatees, while the latter consists of various types and levels of vocational training held by corresponding social training institutions, governments, enterprises, communities, social groups and formal colleges to provide teaching services for educatees (Jiang and Chen, 2021; Chen, 2020). In the current realistic context of the development of vocational education in China, which is consistent with the semantics of various policy texts, combined with the needs of relevant research, and summarising various definitions of vocational education, this study only limits school vocational education to the scope of vocational education, specifically including secondary and higher vocational education, as well as the academic vocational education implemented by schools in these education systems, such as labour transfer training non-academic vocational education such as job transfer training for reserve servicemen.

The sustainable development of social economy will inevitably affect and restrict the mode, system, scale and product utility of vocational education. The development of higher vocational education will promote social employment and rational allocation of resources, and realise the sustainable development of social economy. Cultivating high-quality workers is the significance of vocational education and the main purpose of its development. Therefore, it is necessary to analyse the relationship between higher vocational education and social and economic sustainable development.

The following is an analysis of the relationship between higher vocational education and sustainable social and economic development through specific data. Taking 2020 as an example, there are 1468 higher education institutions in the country in that year. The number of colleges and universities is relatively small, and the top few colleges and universities are all located in economically developed areas. It can be seen that there is a certain relationship between education and economic development.

2.2   The problems faced by higher vocational education under the sustainable development of society and economy

As mentioned above, since the reform and opening up, the development of vocational education in China has achieved remarkable results, and vocational education has trained a large number of highly skilled technical talents. However, with the sustainable development of social economy, the existing development level of higher vocational education has been unable to meet its development requirements, the effect of vocational education needs to be improved, and the matching degree between vocational education and China's economic and industrial structure needs to be further optimised, a series of problems need to be solved urgently, such as the lack of participation of enterprises, the lack of motivation for running schools, and the uneven quality of running schools and talent training (Veldina and Vagaeva, 2020; Jovanovi and Stojanovi-Jovanovi, 2021).

1   *The development level of higher vocational education does not match the requirements of social and economic sustainable development*

Vocational education is closely related to industry and economic development in essence. On the one hand, the number of high-tech skilled talents is small, and higher vocational education schools do not provide sufficient high-tech skilled talents to the society. According to the analysis of data, the gap in the field of senior technicians in China is about 10million. How to cultivate high skilled technical talents suitable for the needs of economic development and the direction of industrial development will be an important topic for vocational education. On the other hand, the effect of vocational education on the training of workers' skills is poor (Niu, 2021; Huang, 2021). Most of the workers are engaged in low-end jobs, which are highly replaceable, and often face the dilemma of being eliminated under the wide application of artificial intelligence. Another reason for the mismatch between supply and demand is that the technical talents cultivated in vocational colleges do not fully match the demand. The curriculum setting of some higher vocational colleges does not meet the requirements of regional socio-economic sustainable development, and low-level repeated construction is relatively serious. Many vocational education colleges have mismatches between the technical talents cultivated and the technical needs of local industrial development, such as the traditional service industry and other popular skills training tends to be saturated, The skill training of high-end manufacturing industry is obviously insufficient, which finally leads to the mismatch between talent supply and demand.

2   *Unreasonable structure of vocational education*

There are problems of unreasonable structure in the development of vocational education. In the structure of higher vocational education, the development of vocational colleges needs to combine with the local economy, design a reasonable common development

mechanism, and realise resource symbiosis and win-win. Moreover, only by allowing enterprises to effectively participate in vocational education can they truly grasp the law of industrial development. High skilled technical talents support enterprises to carry out technological transformation and upgrading in time, so that enterprises can always stand at the forefront of industrial development, thus forming a benign interactive pattern of vocational education development, industrial optimisation and upgrading, and rapid development of enterprises (Wu, 2021; Li and Islam, 2021).

In the current market, most small and medium-sized enterprises implement piecework wages. For workers, the quantity of products is often more important than the quality. In this case, the 'craftsman spirit' is often useless, and these small and medium-sized enterprises will not and are unwilling to pay piecework workers high wages and benefits. Therefore, the failure of the market has reduced the enthusiasm of enterprises to participate in the vocational education system, and most enterprises do not have the internal motivation and willingness of industrial upgrading. Their existing production methods do not have enough demand for high-tech skilled talents, so they are unwilling to participate in vocational education (Wen and Fu, 2021; Zhang, 2021). There is no working platform within the enterprise that is attractive to high-tech skilled talents, and the low interest of workers in enterprise work is also the source of the imbalance between supply and demand in the vocational education market.

2.3 Analysis of the sustainable development of higher vocational education under the sustainable development of society and economy

"Sustainable development of higher vocational education" is an important concept in the intersection research of "geography + education", and it is also a very important concept in interdisciplinary research at home and abroad. From the current situation of research on the sustainable development of regional education, at this stage, domestic research on the sustainable development of regional education is mainly based on pedagogy research. In the relevant studies abroad and in the west, the geographical factors in sustainable development education have been discussed more. At the interdisciplinary research level, the discussion on the relationship between 'EFS' and 'gos' reflects the dynamics and exploration frontier of the research on the sustainable development of regional education.

"Sustainable development of regional higher vocational education" is a concept with obvious comprehensive characteristics, which has three prominent characteristics: 'comprehensive', 'interdisciplinary' and 'interdisciplinary':

First of all, there is a conceptual synthesis of regional education sustainable development, which is constructed on the basis of the combination of geographical concept 'region' + pedagogical concept 'educational development' + comprehensive concept "sustainable development";

Secondly, there are overlapping disciplines and fields, mainly geography and pedagogy, or geographical research and educational research;

In addition, with interdisciplinary vision and multidisciplinary characteristics, 'sustainable development' is defined in geography, economics, management and other disciplines. Sustainable development research is a comprehensive concept with obvious interdisciplinary characteristics and requires the participation of multiple disciplines.

Therefore, the main characteristics of the research on the sustainable development of regional education are comprehensiveness, interdisciplinary and interdisciplinary. Pedagogy defines educational development as a "dynamic process of continuous progress

and expansion of education in terms of scale, structure, quality and efficiency". At the level of regional educational development, the benefits of educational development are specifically reflected in connotative and characteristic educational development, that is, regional education internalisation and regional education characterisation. Sustainable development is a comprehensive research concept, which has a variety of disciplinary definitions, including geographical definitions.

2.4   The development goals of higher vocational education under the sustainable development of society and economy

As for the sustainable development of the regional education system itself, the core of its discussion is the scientific and sustainable development of education. Therefore, the focus and value orientation of the research are mainly based on the concept, connotation and orientation of "educational development". According to the standard terms of education and the definition of education development in pedagogy, education development refers to "the dynamic process of continuous progress and expansion of education in terms of scale, structure, quality and efficiency". Its core lies in the dynamic adjustment and coordinated development of various elements within the education system, so as to achieve the two major goals of scientific development and sustainable development of education.

The scale of educational development mainly points to the increase in the number of educational undertakings. The basic indicators or analysis elements of its observation include the total number of schools, the total number of teachers, the number of students in school, the total amount of educational equipment and facilities, and so on. The structure of education development mainly points to the design and composition of education at the system and system level. Its observation indicators or analysis elements mainly include several major levels, such as education system design, education system composition, education content, curriculum and so on. At present, the research and discussion on educational development in China focus on the quality, connotation and benefit of educational development. For the research on regional educational development, characteristic development is also an important value orientation and research focus. 'Education quality' is a concept with multi-dimensional evaluation system and is difficult to be fully digitised. Improving education quality is the overall goal of the development of China's socialist education, and is undoubtedly one of the main goals and main connotations of regional education development. For the development of education in specific regions, the pursuit of improving education quality is mainly reflected in two levels: first, the pursuit of education quality with the improvement of teaching quality as the main body, mainly the desire and pursuit of a good learning environment and high-quality educational resources. The second is the pursuit of education quality with promoting connotation growth as the main body, which is mainly the desire and pursuit of realising the characteristic development of regional education, that is, the concept of education development quality under the background of cultural diversity.

With the development of China's education, China has become one of the world's largest countries in education on the whole, and is developing and moving forward towards a world power in education. At this stage, the main contradiction in the development of China's education is the 'efficiency' of education development, not the problem of scale and efficiency. The main goal of education reform and development has

shifted from "scale development and structural adjustment" to "connotation development and quality improvement". At present, China is taking "connotative growth" as the focus of educational development, and quality, connotation and significance are becoming the main axis of educational decision-making, that is, to promote the transformation from 'learning' to "learning". The change of the focus and main tasks of educational development objectively leads to the shift of educational activities and educational development to the pursuit of social benefits and equitable development, which makes educational research more and more focus on the 'qualitative problems' of educational development. The so-called "qualitative problems" focus on the connotation growth, sustainable development and solving the deep-seated contradictions of educational development. The research results are committed to promoting educational investment and educational practice to maximise social benefits, so as to continuously improve the people's sense of fairness and gain in the development of education.

3 Analysis of the role of higher vocational education in the sustainable development of social economy

3.1 Calculation of socioeconomic growth rate

This paper calculates the social and economic growth rate based on Denison's education measurement model. The specific calculation steps are as follows:

The first step is to calculate the labour simplification coefficient based on the wage income level of workers with different levels of education.

The second step is to calculate the simplified index of the total amount of education investment in the reporting period year and the base year.

Simplification coefficient of total education investment in the base year $= \sum$ (income simplification index of education level in the base year $\times$ the proportion of the labour force with this level of education in the total labour force in the base year), and the calculation of the simplified index of the total amount of education investment in the reporting period is the same.

The third step is to calculate the annual average growth rate e of education investment in the reporting period year and the base year.

Through the geometric average method, the simplified index of the total amount of education in the base year is regarded as unit 1, then the year of the reporting period is 1 + the growth range of the total amount index from the base year to the reporting period G, and if the time interval from the base period to the reporting period is t, then the average annual growth rate is $\frac{1+G}{t} - 1$.

The fourth step is to calculate the economic contribution rate of education to the increment of national income.

Economic contribution rate of education to national income increment $=$ labour output elasticity coefficient $\times$ average annual growth rate of total education investment/GDP average annual growth rate $\times$ 100%。

3.2   *Analysis of the impact of higher vocational education on the input-output structure of sustainable social and economic development*

Assuming the panel data of economic growth in *i* provinces are collected, the experimental effect τ_{it} of social and economic growth under higher vocational education is expressed as:

$$\tau_{it} = Y_{it}(1) - Y_{it}(0) \tag{1}$$

Among them, $Y_{it}(1)$ and $Y_{it}(0)$ represent the social and economic growth of provinces.

The method of this study is the utility of social and economic growth under higher vocational education. Therefore, select an appropriate control group to inverse the facts, and further process the above formula, which is expressed as:

$$Y_{it}(0) = \delta_t + \theta_t Z_j + \lambda_t \mu_j + \varepsilon_{jt} \tag{2}$$

Among them, θ_t represents the fixed effect parameter at the same time, Z_j represents the dimensional vector, λ_t represents the unobservable vector, μ_j represents the unobservable regional fixed effect value, ε_{jt} represents the disturbance parameter of province *j* in *t* time, and 8 represents the virtual variable.

On this basis, the trade complementarity index is used to analyse the complementarity of social industries under higher vocational education, and the formula is as follows:

$$RCA_{mj}^a = \frac{M_w^a}{X_w} \tag{3}$$

Among them, M_w^a represents the export volume created by *a* students of *w* schools, and X_w represents the total export volume of a certain year.

The specific formula of complementary index is expressed as:

$$C_{ij} = \sum_a C_{ij}^a \times \frac{X_w^a}{X_v} \tag{4}$$

Among them, C_{ij}^a represents the trade complementarity index, X_w^a represents the import volume created by *a* students of *w* schools, and X_v represents the total import volume of a certain year. Using comparative advantage indicators, the distortion caused by macroeconomic fluctuations is analysed as follows:

$$LFI_i^a = \frac{x_i^a + m_i^a}{\sum_{a=1}^M (x_i^a + m_i^a)} \tag{5}$$

Among them, x_i^a represents the total benefits created by higher vocational colleges, and m_i^a represents the benefits contributed by higher vocational college students to social and economic development.

The analysis of input-output structure based on the above process provides a basic basis for the subsequent analysis of the role of socio-economic sustainable development.

3.3 Calculation of the contribution rate of higher vocational education to social and economic growth

Cobb Douglas production function is widely used to analyse the contribution rate of various factors in economic growth. Its basic form is:

$$Y = AK^{\alpha}L^{\beta} \tag{6}$$

Among them, *Y* represents the output of social and economic sustainable development, *A* represents the comprehensive technological progress coefficient, *K* represents the capital input, *L* represents the labour input, α represents the output elasticity coefficient of capital, and β is the elasticity coefficient of labour output.

Educational factors are incorporated into the production function model. Specifically, first of all, labour input is divided into two categories, one is initial labour L_0, the other is education input *E*. Under perfect competition, the production function satisfies the property of constant return to scale, Namely $\alpha + \beta = 1$. At this time, equation (6) is transformed into:

$$Y = AK^{\alpha}(L_0 E)^{\beta} \tag{7}$$

Take logarithm of equation (7) and introduce educational variables to obtain Cobb Douglas production function:

First, take logarithms on both sides to get:

$$lnY = lnA + \alpha lnK + \beta lnL_0 + \beta lnE \tag{8}$$

The second step is to obtain the full derivative of the time factor, which can be derived:

$$\frac{Y'}{Y} = \frac{A'}{A} + \alpha\frac{K'}{K} + \beta\frac{L'}{L} + \beta\frac{E'}{E} \tag{9}$$

The third step is to replace $\frac{Y'}{Y}$ with y, $\frac{A'}{A}$ with a, $\frac{K'}{K}$ with k, $\frac{L'}{L}$ with l, and $\frac{E'}{E}$ with e. The following is obtained:

$$y = a + \partial k + \beta l_o + \beta e \tag{10}$$

Among them, *y* represents the influence coefficient of higher vocational education on social and economic growth rate, *a* represents the influence coefficient of higher vocational education on social and technological growth rate, *k* represents the growth rate of capital investment, and *e* represents the average annual growth rate of higher vocational education investment.

At this time, the contribution rate of higher vocational education to the sustainable development of social economy is:

$$R_e = y_e / y = \beta \times e / y \tag{11}$$

Among them, R_e refers to the influence coefficient of higher vocational education on the average annual growth rate of social income increment.

This paper quantifies the role of higher vocational education in the sustainable development of social economy according to the growth rate of social economy, and carries out experimental verification.

4   Experiment

### 4.1   Experimental design

In order to analyse the role of higher vocational education in the sustainable development of social economy, search and read the literature on the integration of industry and education, higher vocational education, professional curriculum construction and so on, and compile a "role of higher vocational education in the sustainable development of social economy". After the questionnaire design is completed, the tutor is invited to guide and modify it. In some higher vocational colleges, the directors of the Department of Electronics, the Department of Computer and the Department of Machinery are invited to review and test the questionnaire, and put forward the problems existing in the questionnaire. According to the suggestions put forward by the tutor and directors, the questionnaire will be further modified to improve the operability of this questionnaire.

4.2   Experimental result

4.2.1   Contribution rate of higher vocational education to social and economic growth

In order to verify the contribution rate of higher vocational education to social and economic growth, the contribution rate of social and economic growth of Feng (2019) method, Yu et al. (2021) method and this method are compared, and the results are shown in Figure 1.

Figure 1   Comparison of contribution rates of social and economic growth by different methods
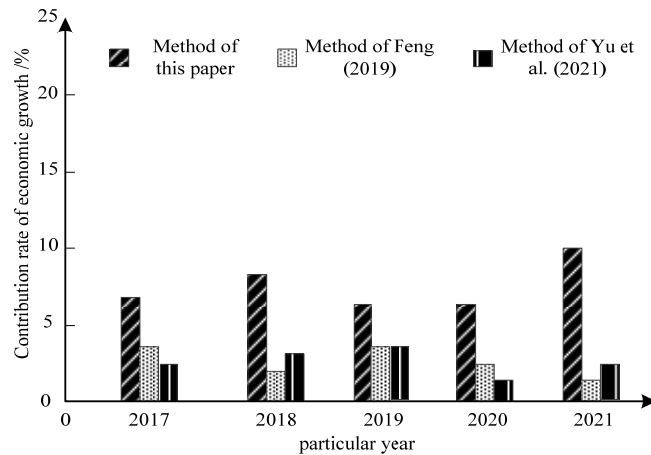
According to the analysis of Figure 1, when the year is 2017, the contribution rate of socio-economic growth of Feng (2019) method can reach 3.8%, the contribution rate of socio-economic growth of Yu et al. (2021) method can reach 2.2%, and the contribution rate of socio-economic growth of this method can reach 7.8%. When the year is 2021, the contribution rate of socio-economic growth of Feng (2019) method can reach 1.6%, the contribution rate of socio-economic growth of Yu et al. (2021) method can reach 2.4%, and the contribution rate of socio-economic growth of this method can reach 11.3%. The

contribution rate of higher vocational education to social and economic growth under this method is significantly higher than that of other methods, indicating that this method has certain advantages in the contribution rate of social and economic growth.

4.2.2 Prediction accuracy of higher vocational education on social and economic growth

In order to verify the prediction accuracy of higher vocational education on social and economic growth, the prediction accuracy of social and economic growth of Feng (2019) method, Yu et al. (2021) method and this method are compared, and the results are shown in Table 1.

Table 1 Prediction accuracy of social and economic growth by different methods (%)

Particular year	Method in this paper	Feng (2019) method	Yu et al. (2021) method
2017	98.88	85.32	86.90
2018	96.92	88.19	89.28
2019	99.62	85.96	83.53
2020	98.23	89.92	89.16
2021	99.66	90.02	80.83

According to the analysis of Table 1, when the year is 2017, the prediction accuracy of socio-economic growth of Feng (2019) method is 85.32%, the prediction accuracy of socio-economic growth of Yu et al. (2021) method is 86.90%, and the prediction accuracy of socio-economic growth of this method is 98.88%. When the year is 2021, the prediction accuracy of socio-economic growth of Feng (2019) method is 90.02%, the prediction accuracy of socio-economic growth of Yu et al. (2021) method is 80.83%, and the prediction accuracy of socio-economic growth of this method is 99.66%. The prediction accuracy of higher vocational education on social and economic growth under this method is much higher than that of other methods, which shows that this method can accurately predict the social and economic growth of higher vocational education. This is because the method in this paper uses the Dennison education econometric model to calculate the social economic growth rate. According to the calculation results, the Cobb Douglas production function is used to calculate the contribution rate of higher vocational education to economic growth, which improves the accuracy of the prediction results.

5 Conclusion

This paper analyses the role of higher vocational education in the sustainable development of society and economy, uses the Denison education econometric model to calculate the social and economic growth rate, and analyses the contribution rate of higher vocational education to economic growth according to the calculation results, which effectively improves the accuracy of the analysis results. The experimental results show that, compared with the traditional methods, the contribution rate of social economic growth of this method can reach 11.3%, and the prediction accuracy of social economic growth can reach 99.66%, which is significantly higher than the repayment

method. Through the above analysis, it can be seen that in the sustainable development of social economy, higher vocational education plays a role in promoting and inducing the growth of economic scale.

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