A Primary Exploration of Undergraduate Education's Supportiveness to Regional Economic Development—Taking Inner Mongolia Autonomous Region as an Example

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Keywords: University Undergraduate Education, Contribution Rate, Economic Growth, Spss

Abstract: Higher education has a vital impact on the economic development of a country, and it is the main factor to build an innovative country power. Based on the sample data of undergraduate education from 2016 to 2021, this paper uses Cobb-Douglas production function to estimate the results the contribution rate of undergraduate education to regional economy in Inner Mongolia Autonomous Region is 3.81%. On the correlation test of the output value of the three major industries in Inner Mongolia Autonomous Region, it was found that the number of undergraduate graduates in Inner Mongolia Autonomous Region was significantly positively correlated with the primary industry, and the correlation with the secondary and tertiary industries needed to be improved. To further improve undergraduate education for regional economic development in combination with the strategic positioning and major responsibilities entrusted to Inner Mongolia Autonomous Region by the Party Central Committee, the article puts forward targeted suggestions and countermeasures.

1. Introduction

The report of the twentieth CPC National Congress points out that education, science and technology, and human resources are the basic and strategic support for the comprehensive construction of a modern socialist country, and emphasizes that "we must insist on giving priority to the development of education, scientific and technological self-reliance, and human resources leading and driving". As the main position of talent training and the main body of science and technology development, higher education should play a key role in the strategic pattern of education, science and technology and talent development. Schultz pointed out through the human capital theory, sustained economic growth is the top priority of human capital, and the key to the formation and development of human capital is the investment in education , the domestic education and economic scholars Li Yining that education can realize the accumulation of human capital, science and technology, and cultural level and improve, and social employment, income distribution, financial balance, balance of payments, etc., has a close relationship, and to ensure stable and sustained growth of the economy has an important role to play [1],and to play a good education stage, science and technology, talent "trinity" development strategy pattern. It plays an important role in ensuring stable and sustainable economic growth [2]. Fan Xianzuo has argued the close relationship between education and economic development from a historical perspective [3]. Liu examined the role of education and the role of technological progress in economic growth in Taiwan between 1965 and 2000 in 2003, and found that education has a significant positive impact on economic growth [4]. Foreign scholars Dennison calculated the education situation in the United States from 1922 to 1957, and got the contribution rate to the economic growth of the United States is 20% [5]. Song Huaming and Wang Rong measured the national statistics from 1990 to 1999 by C-D production function and got the result of 0.83% [6].On the premise that education can promote economic growth, scholars continue to deepen and concretize the research on the interrelationship between education and the economy, and further develop in-depth arguments from different research perspectives. Du Yuhong and Zhao Ran's study found that different levels of education have different impacts on the mode of economic growth [7]. Zhang Hongxia found that regional higher education development and regional

  DOI: 10.25236/meeit.2024.006

economic development have a relationship of mutual constraints and mutual promotion, and regional higher education that adapts to the requirements of regional economic development can realize its own sustainable development [8]. Su De believes that in the process of accelerating the construction of a strong educational country, both the supply side of higher education and the demand side of society need high-quality development to provide educational support, implying that the concept of quality has changed from focusing on the expansion of the scale of education in the stage of massification of higher education to focusing on the improvement of the quality and efficiency of higher education in the stage of popularization [9].

The article puts forward more rationalized countermeasures and suggestions for further improving the support of undergraduate education in Inner Mongolia Autonomous Region to the regional economic development through the calculation of contribution rate and correlation analysis.

2. Construction and Estimation of the Model of Contribution Rate of Undergraduate Education to Regional Economic Growth in Inner Mongolia Autonomous Region

2.1. Construction of a model of the contribution rate of undergraduate education to regional economic growth in the Inner Mongolia Autonomous Region

American scholars Cobb and Douglas, famous economists, in the 1930s by selecting the labor and capital of the U.S. manufacturing industry as sample data, argued the relationship between labor and capital and economic development between 1899 and 1922 and put forward the famous production and capital development. Capital as sample data, argued the relationship between labor and capital and economic development during the period of 1899-1922 and put forward the famous production function ---- Cobb-Douglas production function: $Y=AK\alpha L\beta$. Derivation of the above formula gives the model $Y=a+\alpha k+\beta l+\beta e$. This function allows us to calculate the contribution of human capital to economic growth, where y denotes the rate of economic growth, a denotes the rate of technical progress, and α denotes the elasticity coefficient of capital output, k denotes the growth rate of capital investment, β denotes the elasticity coefficient of labor output, l denotes the number of labor force's degree of change, and e denotes the degree of growth of education input. After years of development, the production function was further evolved by introducing the education factor introduced into this function, and finally formed the formula (1). Where CE represents the contribution rate of education to socio-economic development, β represents the labor,labor output elasticity coefficient of 0.7, e represents the growth rate of educational inputs, and Y represents the average annual growth rate of social economy [10].

$$CE = \beta e \div y \tag{1}$$

To calculate the degree of contribution of undergraduate education to industrial development in Inner Mongolia Autonomous Region, the existing formula needs to be adjusted and transformed into formula (2) Cz represents the contribution of education to industrial development in the Inner Mongolia Autonomous Region. y represents the average annual growth rate of GDP in the Inner Mongolia Autonomous Region, and the growth rate of education input represented by e is usually replaced by the annual growth rate of the education composite index E in the actual operation.Y represents the average annual growth rate of GDP of the Inner Mongolia Autonomous Region, and the growth rate of education inputs represented by e is usually replaced by the annual growth rate of the education composite index E in actual operation, and the education composite index is used to represent labor input due to the increase in education, and h represents the proportion of the growth of the index of undergraduate education to the growth of the education composite index [10].

$$CZ = h\beta e \div y \tag{2}$$

Based on the construction of the above model, the following additional steps are required to calculate the contribution of undergraduate education to industrial development:

Composite index of education per capita:

$$\text{Years of schooling per capita} \times \text{Labor Simplicity Factor} \tag{3}$$

Annual growth rate of the education composite index E:

$$E = \left(\frac{\text{Composite index of education for the year}}{\text{Base year education composite index}}\right)^{\frac{1}{n}}(\text{n：Number of years between}) - 1 \quad (4)$$

Annual growth rate of investment in educatione:

$$e = 0.6 \times E(\text{E：Annual growth rate of the education composite index}) \quad (5)$$

Undergraduate education qualifications as a share of the education composite index h:

$$h = \left(\frac{\text{Proportion of undergradu ate education}}{\text{Education Composite Index}}\right) \quad (6)$$

Average annual growth rate of industry or sectoral GDP:

$$Y = \left(\frac{\text{Gross Domestic Product for the year}}{\text{Gross Domestic Product for the base year}}\right)^{\frac{1}{n}}(\text{n：Number of years between}) - 1 \quad (7)$$

2.2. Estimating the Contribution of Undergraduate Education to Regional Economic Growth in Inner Mongolia Autonomous Region

2.2.1. Average years of schooling of employees in Inner Mongolia Autonomous Region, 2016 and 2021

According to the existing school system in China, the education levels and years of education for practitioners in Inner Mongolia Autonomous Region are divided into six stages: six years of elementary school, three years of junior middle school, three years of high school, three years of university Specialized, four years of undergraduate study, and three years of Postgraduates.The distribution of the educational structure of the employed personnel in Inner Mongolia Autonomous Region in 2016 and 2021 is shown in Table 1. According to Table 1, the number of years of education per capita at each stage in 2016 and 2021 can be calculated for Inner Mongolia Autonomous Region, as shown in Table 2.

Table 1 Distribution of educational structure of employed persons in Inner Mongolia Autonomous Region, 2016-2021 (unit: %)

Year	Elementary school	Junior middle school	High school	University Specialized	University undergraduate	Postgraduates
2016	16.0	45.7	11.8	11.5	8.0	0.5
2017	16.0	43.7	12.6	11.9	8.9	0.5
2018	15.9	42.9	12.8	12.1	9.0	0.5
2019	13.5	42.3	18.8	14.1	9.8	0.7
2020	16.4	41.5	15.2	13.6	11.0	0.7
2021	15.9	38.8	15.9	13.3	12.4	1.2

Data source: China Labor Statistics Yearbook 2017-2022

Table 2 Per capita years of education of employed persons in Inner Mongolia Autonomous Region, 2016-2021 (unit: years)

Year	Elementary school	Junior middle school	High school	University Specialized	University undergraduate	Postgraduates
2016	5.610	2.325	0.954	0.345	0.340	0.015
2017	5.616	2.328	1.017	0.357	0.376	0.015
2018	5.592	2.319	1.032	0.363	0.380	0.015
2019	5.952	2.571	1.302	0.423	0.420	0.021
2020	5.904	2.460	1.215	0.408	0.468	0.021
2021	5.850	2.448	1.284	0.399	0.544	0.036

2.2.2. 2016-2021 Inner Mongolia Autonomous Region Employee Education Composite Index Average Annual Growth Rate and Average Annual Growth Rate of Education Investment

By analyzing the years of education per capita of employed people at all stages in the Inner Mongolia Autonomous Region in 2016-2021, combined with the labor force simplification coefficient to calculate the education composite index, referring to the existing studies to assume the labor force simplification coefficient of elementary school as 1, which is sequentially set at 1.28 for middle school, high school 1.38, college college 1.81 undergraduate 2.25 and postgraduate 2.83. Accordingly combined with formula (3) to get the 2016-2021 per capita per capita education composite index (see Table 3) and per capita years of education growth rate (see Table 4). Further calculations yielded that the growth rate of education composite index in 2016 was 11.33%. Composite Index growth rate bit is 11.33% and 12.80% in 2021. According to formula (4) to get the education composite index in 2016-2021 The annual growth rate E is 2.47%.The annual growth rate of education investment in 2016-2021 is converted by 60% of the annual growth rate of education composite index, which can be obtained as get the annual growth rate of education input in Inner Mongolia Autonomous Region in 2016-2021 e is 1.48%.

Table 3 Composite Index of Education, 2016-2021 (in %)

Year	Elementary school	Junior middle school	High school	University Specialized	University undergraduate	Postgraduates
2016	5.610	2.976	1.316	0.624	0.765	0.042
2021	5.850	3.130	1.771	0.722	1.224	0.101

Table 4 Average annual growth rate of years of education per employed person in Inner Mongolia Autonomous Region, 2016-2021 (unit: %)

	Elementary school	Junior middle school	High school	University Specialized	University undergraduate	Postgraduates
Annual rate of growth	0.840	0.840	0.840	0.840	0.840	0.840

2.2.3. Contribution of Undergraduate Education to Economic Development in Inner Mongolia Autonomous Region, 2016-2021

Based on the statistical research method, the average annual growth rate of the education composite index for each stage of education other than undergraduate education in the Inner Mongolia Autonomous Region during the period 2016-2021 can be calculated.

$$\sqrt[5]{\frac{12.80-(1.224-0.765)}{11.33}}-1=1.72\%$$

Average annual growth rate of the education composite index for undergraduates:

$$2.47\% - 1.72\% = 0.75\%$$

According to formula (6), the share of education of undergraduate in the growth rate of the comprehensive index of education in Inner Mongolia Autonomous Region in 2016-2021 is calculated as:

$$h = 0.75\% \div 2.47\% = 30.36\%$$

According to formula (7), the average annual growth rate of GDP of Inner Mongolia Autonomous Region in 2016-2021 is calculated to be 8.27%.

According to formula (1) can be calculated that the contribution of education in Inner Mongolia Autonomous Region to the average annual growth rate of GDP in the region from 2016 to 2021 is 12.54%. Bringing the above results of the formula into formula (2) can get the contribution of undergraduate to the regional economy as 3.81%.

3. Correlation analysis between undergraduate education and regional economy in Inner Mongolia Autonomous Region

3.1. Analysis of the correlation between undergraduate education and industry in Inner Mongolia Autonomous Region

Based on the calculation of the contribution rate of undergraduate education to the regional economy in Inner Mongolia Autonomous Region, the correlation between undergraduate education and industrial development is further explored. This paper selects the data in "Industrial Output" of "Inner Mongolia Statistical Yearbook" and the number of University undergraduate in 2016-2021, and uses spss19.0 to carry out Pearson's product-difference correlation analysis, and the results are shown in the table 5 below.

Table 5 Correlation analysis between university undergraduate education and three industries in Inner Mongolia Autonomous Region, 2016-2021

Industry Level	Number of university undergraduate
Primary Sector	0.923**
Secondary Sector	0.750
Tertiary Sector	0.709

**. Significantly correlated at the 0.01 level (two-sided)
*. Significantly correlated at the 0.05 level (two-sided)

The above analysis shows that the number of university graduates and universities of education in Inner Mongolia Autonomous Region in 2016-2021 is positively correlated with the industrial output value of the three industries, and the correlation coefficients are different with the industries. Among them, there is a significant positive correlation with the primary industry, and the correlation coefficient is above 0.9.

3.2. Analysis of the correlation between undergraduate education in Inner Mongolia and the development of major industries in the region

On the basis of analyzing the correlation between university undergraduate education and the Major industries in Inner Mongolia Autonomous Region, the correlation between university undergraduate education and the development of major industries in this region is further explored. Due to the lack of relevant data, this paper selects the relevant data and the number of graduates of undergraduate education in the "Value Added of Major Industries" of the "Inner Mongolia Statistical Yearbook" from 2016 to 2021 as the indicators, and carries out the Pearson's product-difference correlation analysis by using spss19.0, and the results are shown in Table 6.

Table 6 Correlation analysis between undergraduate education and value added of major industries in Inner Mongolia Autonomous Region, 2016-2021

Major Industries	Number of university undergraduate
Agriculture	0.879*
Forest Industry	-0.815*
Stock Raising	0.956**
Fisheries Industry	-0.668
Building Industry	0.802
Wholesale and Retail trade	0.622
Transportation, Storage and Postal	0.767
Financial Industry	0.755
Real estate Industry	0.646
Other services Industry	0.856*

**. Significantly correlated at the 0.01 level (two-sided)

Table 6 shows that the number of undergraduate college graduates in Inner Mongolia Autonomous Region has a significant positive correlation with agriculture, animal husbandry and other service

industries and the correlation coefficient is above 0.8, which means that the input of undergraduate labor force has a significant role in promoting the economic growth of the above three industries; it has a positive correlation with the construction industry, transportation, wholesale and retail trade, warehousing and postal service industry, finance and real estate, but the significance of the positive correlation is still to be improved; it has a negative correlation with forestry and fishery, which shows that the development of these two industries is weak in the region. The negative correlation with forestry and fishery shows that the labor input of these two industries is weak in this district.

4. Conclusion

Under the strong support of the government, education in Inner Mongolia Autonomous Region has realized the continuous expansion of the scale of schooling, the continuous improvement of the quality of schooling, the more reasonable professional structure, and the economic function[11] . Through the analysis above, it can be seen that the contribution rate of undergraduate education to the economy in Inner Mongolia Autonomous Region from 2016 to 2021 is 3.81%, accounting for 30.36% of the contribution rate of education to economic growth, and Inner Mongolia Autonomous Region, like the whole country, has seen significant development of undergraduate education in recent years.The population with undergraduate education among the employed population in Inner Mongolia Autonomous Region in 2016 is 8.0%, and the proportion will grow to 12.4% in 2021. grew to 12.4 percent by 2021. The number of years of education per capita for undergraduate education grows from 0.34% in 2016 to0.54% in 2021, a growth rate of 9.8%, but there is still room for further development of undergraduate education relative to the needs of social development. There is a correlation between the number of undergraduate college graduates and the development of industries and industries in Inner Mongolia Autonomous Region, i.e., current undergraduate education can provide corresponding human capital for the development of industries and industries, but the correlation coefficients and significance of the correlation coefficients and significance of the correlation coefficients in different areas of industries and industries are yet to be improved. Combined with the “five major tasks”and the State Council's “Opinions on Promoting the High-Quality Development of Inner Mongolia and Striving to Write a New Chapter of Chinese Modernization”, by 2027, the comprehensive economic strength will enter the middle level of the country, the urban and rural residents' incomes will reach the national average, the industrial structure will be optimized and upgraded, and the installed scale of new energy will exceed that of thermal power, and the grain and food production will be increased. In order to further promote undergraduate education for the high-quality development of the economy of the Inner Mongolia Autonomous Region, we put forward the following suggestions:

4.1. Strengthening the basic and strategic support for the high-quality development of undergraduate education

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An important theoretical innovation of the report of the 20th Party Congress is that education, science and technology, and talent are placed in strategic tasks for integrated deployment. Education, science and technology, talent is an organically linked whole, but also to promote the goal of common wealth is an important hand [12], how to promote the regional economy and talent attraction of the virtuous cycle of development is a top priority. Strengthen the construction of specialties, focusing on the needs of the autonomous region's industries, clear disciplines and specialties reform implementation plan, high-quality undergraduate specialties to add, stop recruiting, withdrawal work, to ensure the construction and development of the autonomous region's urgent need for specialties.

The investment of scientific research funds and the layout of scientific research projects focus on key areas such as energy, dairy, grass, seed industry, rare earths and other key areas with the regional characteristics of the Inner Mongolia Autonomous Region, and focus on improving the quality of education and research and development capabilities, while strengthening the construction of key laboratories and training bases, and strengthening the scientific research of the undergraduate education of the return of the poof. Do a good job of attracting and educating high-level talents, on the one hand, the use of good policies, good environment to retain more talent, such as Alxa's “wild geese nesting” policy, on the other hand, for the introduction of academicians, PhDs and other outstanding young people.

On the other hand, for the introduced academicians, doctors and other outstanding young national talents, we should find ways to make their talents combined with regional characteristics, and play a greater role in the cultivation of undergraduate talents. We will take multiple measures to promote the integrated development of education, science and technology, and talents, to comprehensively enhance the ability of undergraduate education to serve the regional economic and social development, and to explore a comprehensive, coodinated and sustainable development path.

4.2. Explore the new road of industry-education integration and improve the adaptability of talent cultivation

Increasing the contribution of education to economic development also requires further deepening the integration between education and the economy. On the one hand, it is necessary to build on the existing foundation to further increase the depth and intensity of integration between industry and education, and on the other hand, it is also necessary to explore new paths of integration between industry and education, to improve the adaptability of talent training, and to promote interdependence and mutual support between schools and government and business entities.

As a region inhabited by ethnic minorities, the Inner Mongolia Autonomous Region is situated in the western part of China and faces challenges such as relatively underdeveloped education, ideology, and economy. In response to the rapid advancement of information technology and digitalization, it is imperative for Inner Mongolia Autonomous Region to proactively overcome marginalization barriers, actively integrate into the wave of economic restructuring and industrial transformation and upgrading, and align with the development trend of digital economy and industrial iteration speed. It is necessary to fully utilize information technology to promote the rich natural resources and other regional characteristics of our region, further driving the development of education and promoting economic growth. By strengthening cooperation with leading enterprises, promoting "order based" training, reducing the asymmetry between education and economic development, and improving the conversion rate of talents guided by market demand, we vigorously cultivate talents in agriculture, animal husbandry, rare earths, new energy, grassland, and dairy industries, implement the "Craftsman Class" plan, improve the standards for cultivating applied talents, innovate the entire chain of "school basic research enterprise quantitative production market industrialization marketing" to provide strong impetus for regional characteristic development, encourage and support teachers to go deep into enterprises and science and technology special missions to carry out social service work, and deepen the integration of industry and education, form a virtuous cycle of interaction between educational resources and regional economy, and achieve a "win-win" path of enhancing students' employability and serving the local community.

4.3. Goal-oriented, local schooling characteristics

Regional economic development urgently requires higher education to provide talent and intellectual support, different regional economies in the formation of their own characteristics, all need a compatible higher education to protect and promote its development [13].

Based on the analysis above, in order to strengthen the protection of grassland forests and wetlands and scientifically promote the comprehensive management and restoration of desertification, we need to increase efforts in grassland ecological protection, wetland protection and restoration, soil and water conservation, and fully support the restoration of degraded forests and grasslands.For example, we should take the grassland science of Inner Mongolia Agricultural University as a guide, actively

promote the construction of grassland ecological protection bases, establish national ecological civilization experimental zones, and also rely on disciplines such as animal husbandry to provide support. For example, we can take the biology of Inner Mongolia University as a guide, establish a biology discipline group, focus on key technology research such as cattle and sheep breeding, improve the meat and sheep industry chain, enhance resource integration and development concentration, and promote the all-round development of the entire chain.In promoting the goal of green, low-carbon and circular development and innovating the institutional mechanisms for the transformation and development of resource-based regions, we should actively respond to the national "dual carbon plan" for 2030 and 2060.For example, we should take the power engineering and engineering thermophysics of Inner Mongolia University of Technology as the leading force, establish a new energy discipline group, focus on key technology research such as source network load hydrogen storage, and expand and strengthen the new energy development and equipment manufacturing industry chain.In order to accelerate the construction of a modern energy economic system, we need to focus on fields such as rare earth new materials and coal based new materials. For example, with Inner Mongolia University of Science and Technology's metallurgical engineering as the leader, we will establish a discipline group for metallurgical new materials and focus on conducting research on the application of rare earth new materials, expand and strengthen the rare earth new material industry chain, build the largest rare earth new material base and leading rare earth application base in China, and under the comprehensive guidance of various universities in our region, construct a "northern bridgehead" road with local characteristics.

Acknowledgements

Funded by: Inner Mongolia Autonomous Region Undergraduate Education Teaching Reform Research Project (Key Project) “Research on the Reform of Classification and Evaluation of Colleges and Universities in Inner Mongolia Autonomous Region” (Project No.: JGZD2022016)

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