



# An Empirical Study on the Development of Educational Economy in Ethnic Areas Behind Modern Information Technology

Chuanli Wei and Jianghong Zhao<sup>(✉)</sup>

School of Finance and Public Administration, Harbin University of Commerce, Harbin, China  
zhaojianghong0804@163.com

**Abstract.** Based on data from 2005 to 2019, with the five ethnic autonomous regions as an example, using Cobb-Douglas production function, a detailed analysis of five national region education under the condition of economic development, as well as the contribution rate of education to the economic growth. This paper compares the educational economic development of five national areas with the national average level, and reveals the reality and reasons of the backward educational economic development of national areas. At the same time, the paper also puts some countermeasures, including the application of modern information technology, such as computer and cloud computing, is an important means to help the economic development of education in ethnic areas.

**Keywords:** Modern Information Technology · Education · Economic

## 1 Introduction

The foundation of scientific and technological progress and economic revitalization lies in education. Only when education is developed can we better promote scientific and technological progress and realize economic revitalization. This is a unified process that supplements each other and progresses step by step [1].

As an important part of education, ethnic education can promote the prosperity and development of all ethnic groups, and play a vital role in maintaining ethnic unity and realizing the long-term peace and stability of the country [2].

To ensure the formation of human capital is to create conditions for the development of economic society. In today's era, the transformation and upgrading of industrial structure puts forward higher requirements for the quality of the population, and economic and social development needs to adapt to the new trend of transformation from simple labor input to the integration of new forms of business [3]. The key factors for the development of ethnic areas depend more on human resources, the mastery of new technologies, the improvement of the quality of workers and the perfection of the education system. Ethnic education informationization is the internal requirement for the high quality development of ethnic education and an important means to realize the modernization of education [4].

© The Author(s) 2022

V. Balakrishnan et al. (Eds.): ICMEIM 2022, AHSSEH 6, pp. 213–219, 2022.

[https://doi.org/10.2991/978-94-6463-044-2\\_28](https://doi.org/10.2991/978-94-6463-044-2_28)

## 2 Model Construction

In the 1930s, American mathematician Cobb and economist Douglas proposed Cobb-Douglas production function. According to the econometric model, the factors promoting economic ( $Y$ ) growth mainly include technological level ( $A$ ), physical capital stock ( $K$ ) and labor input amount ( $L$ ).  $\alpha$  is the input-output elasticity of physical capital,  $\beta$  is the input-output elasticity of labor,  $\alpha > 0$ ,  $\beta > 0$ ,  $\alpha + \beta = 1$ , and  $t$  is the time variable.

$$Y_t = A_t K_t^\alpha L_t^\beta \quad (1)$$

Denison considered that education could improve the quality of labor force by improving the quality of workers. Therefore, they introduced the educational factor into the Cobb-Douglas production function and decomposed the amount of labor force input ( $L$ ) into the initial labor force ( $L_0$ ) and education input ( $E$ ).

$$Y_t = A_t K_t^\alpha (L_0 E_t)^\beta \quad (2)$$

Take the natural logarithm of both sides of the deformation function, then take the full derivative of time  $t$ , replace the differential equation with the difference equation. Where  $y$  represents the economic growth rate,  $a$  represents the rate of technological progress,  $k$  represents the growth rate of physical capital investment,  $l_0$  represents the change rate of initial labor input, and  $e$  represents the growth rate of education input.

$$y = a + \alpha k + \beta l_0 + \beta e \quad (3)$$

The contribution rate of education to economic growth can be expressed as follows. In actual calculation, the average annual growth rate of education investment is usually replaced by the average annual growth rate of education composite index [5]. Where,  $y$  denotes the average annual growth rate of GDP and denotes the average annual growth rate of education comprehensive index. In actual calculation, the average annual growth rate of education investment is usually replaced by the average annual growth rate of education composite index.

$$C_e = \beta R_e / y \quad (4)$$

## 3 Calculation Process

### 3.1 Years of Education Per Employee

According to the education composition data of the employed personnel in ethnic minority areas, the average years of education of the employed personnel are calculated. The years of education of the employed personnel are divided into 6 years of primary school, 3 years of junior high school, 3 years of senior high school, 3 years of vocational college, 4 years of undergraduate and 3 years of graduate. Where,  $P_i$  is the number of years of education of the employed personnel,  $N_i$  is the number of years of education of all levels, and  $X_i$  is the number of years of education of a certain level of the employed personnel (Tables 1 and 2).

$$P_i = N_i \sum X_i \quad (5)$$

In 2005, for example:

**Table 1.** Composition of Education Level of Employed Personnel in 2005 (Unit: %). Source: China Labor Statistics Yearbook, 2006

Region	Primary school	Junior High school	Senior High school	Higher vocational	Undergraduate	Postgraduate
Inner Mongolia	23.7	42	15.9	7.3	2.9	0.14
Guangxi	34.8	45.2	10.3	3.6	1.4	0.11
Tibet	42.6	7.1	1.4	0.7	0.2	0.01
Ningxia	26.2	35.6	11.6	6.9	2.9	0.08
Xinjiang	29.2	39.8	12.6	8.7	3.4	0.16

**Table 2.** Per capita years of education of employed persons in 2005 [Owner-drawing]

Region	Primary school	Junior High school	Senior High school	Higher vocational	Undergraduate	Postgraduate
Inner Mongolia	5.516	2.047	0.787	0.219	0.122	0.004
Guangxi	5.725	1.818	0.462	0.108	0.060	0.003
Tibet	3.121	0.282	0.069	0.021	0.008	0.000
Ningxia	4.997	1.712	0.644	0.207	0.119	0.002
Xinjiang	5.632	1.940	0.746	0.261	0.142	0.005

### 3.2 Comprehensive Education Index of Ethnic Employed Personnel and Its Annual Average Growth Rate

In the expression of education composite index,  $P_i$  represents the years of education per capita of the employed personnel at all levels of education,  $W_i$  represents the labor simplification index of the labor force at all levels of education.

$$E_t = \sum P_i W_i \quad (6)$$

Based on the existing research results, [6] defines the labor simplification coefficient of the educated labor force at all levels as shown in Table 3.

**Table 3.** Labor simplification coefficient of education labor force at all levels. Source: Citing existing research results

Education level	Coefficient of labor simplification
Primary school	1
Junior high school	1.17
Senior high school	1.4
Higher vocational	1.98
Undergraduate	2.63
Postgraduate	4.33

**Table 4.** Annual Growth Rate of Education Composite Index (Unit: %) [Owner-drawing]

Region	$R_e$	$R_e * 0.6$
Inner Mongolia	1.908	1.145
Guangxi	1.762	1.057
Tibet	6.092	3.655
Ningxia	2.916	1.750
Xinjiang	1.941	1.164

Denison and other Western scholars believe that the improvement of labor quality of employed personnel is not entirely caused by education, so they convert the growth rate of labor quantity promoted by the improvement of education level into 0.6. In the annual growth rate of education composite index,  $E_c$ ,  $E_m$  represent the comprehensive education index of employed personnel in 2005 and 2009 respectively, and  $n$  represents the number of years (Table 4).

$$R_e = (E_m/E_c)^{1/(n-1)} * 100 * 0.6 \tag{7}$$

### 3.3 Annual Growth Rate of Gross Regional Product

In order to eliminate the influencing factors of price, the study adjusted the regional gdp of the five ethnic regions based on the constant price in 2005, so as to calculate the average annual growth rate of regional GDP (Table 5).

In average annual growth rate of GDP formula,  $G_c$ ,  $G_m$  represent the real GDP of 2005 and 2009 respectively at constant prices in 2005.

$$y = \left\{ (G_m/G_c)^{1/(n-1)} - 1 \right\} * 100 \tag{8}$$

The average annual growth rate of GDP of ethnic regions as shown in Table 6.

**Table 5.** Actual Gross Product of ethnic minority Areas (Unit: 100 million Yuan) [Owner-drawing]

Year	Inner Mongolia	Guangxi	Tibet	Ningxia	Xinjiang
2005	3523.7	3742.1	243.1	579.9	2520.5
2006	4158.0	4157.5	275.4	647.7	2797.8
2007	4906.4	4697.9	314.0	723.5	3139.1
2008	5716.0	5181.8	345.7	807.5	3484.4
2009	6630.5	5777.7	388.6	895.5	3766.6
2010	7565.4	6453.7	436.4	1007.4	4165.9
2011	8594.3	7195.9	491.8	1129.3	4678.3
2012	9513.9	7922.7	549.8	1247.9	5192.9
2013	10341.6	8715.0	616.3	1370.2	5764.1
2014	11148.3	9438.3	682.9	1479.8	6340.5
2015	12006.7	10183.9	758.0	1598.2	6898.5
2016	12847.1	10896.8	834.6	1716.4	7415.9
2017	13361.0	11670.5	918.1	1841.7	7979.5
2018	14055.8	12464.1	999.8	1967.0	8466.2
2019	14786.7	13211.9	1080.7	2094.8	8991.1

**Table 6.** Average Annual Growth Rate of GDP (Unit: %) [Owner-drawing]

Region	y
Inner Mongolia	8.740
Guangxi	10.788
Tibet	9.429
Ningxia	11.245
Xinjiang	9.608
Region	9.510

### 3.4 Contribution Rate of Education to Economic Growth

The premise of calculating the contribution rate is to determine the value of labor input-output elasticity  $\beta$ . In this study, the labor output elasticity coefficient 0.7, which is relatively common in the world, will be selected. Therefore, the contribution rate of education in ethnic minority areas to economic growth is as shown in Table 7.

**Table 7.** Contribution rate of education to Economic Growth (Unit: %) [Owner-drawing]

Region	$C_e$
Inner Mongolia	7.427
Guangxi	7.848
Tibet	22.755
Ningxia	12.747
Xinjiang	8.571

## 4 Conclusion

This paper compares the level of educational economic development in ethnic areas with the whole country, finds out the existing problems of educational and economic development in ethnic areas, and puts forward practical solutions.

In the compulsory education stage, the proportion of education level of employed people in Inner Mongolia and Ningxia was significantly different from the national development level in 2015, while only Guangxi had a relatively good development level in 2019. In 2019, compared with 2005, the proportion of employed people with secondary education in the five ethnic autonomous areas decreased, showing a regression. In the stage of higher education, the research and rearing level in the five ethnic minority areas is relatively backward, lower than the national proportion in 2005 and 2019. From 2005 to 2019, the GDP of the five ethnic autonomous areas showed a positive trend, all higher than the national development level. From 2005 to 2019, the contribution rate of education to economic growth in Tibet was 22.755%, much higher than the national level. Ningxia education also has a high contribution to the economy, the contribution rate is 12.747%. It can be seen that the educational development of Tibet and Ningxia is of great importance to regional economic development.

The backward development of education economy in minority areas is largely due to the lack of modern information technology. Therefore, it is necessary to train a large number of modern information technology high-tech personnel. By means of modern information technology, mutual benefit sharing of resources and information can be realized, which is an important channel to bridge the development gap.

## References

1. Xi Jinping. Getting Rid of Poverty [M]. Fuzhou: Fujian People's Publishing House, 1992.
2. Chen Lipeng, Zhang Jue, Li Zhengxin, Xi Jinping's Theoretical Points on the important discourse of Ethnic Education [J]. Guizhou Ethnic Studies, 2022, 43(04): 186–191.
3. Xu Meiyang, Chen Yupeng. The promotion of ethnic education from the perspective of common prosperity [J]. People's Education, 2022(09): 60–62.
4. Gan Jianhou, Yang Chao, Duan Congyu. Ethnic Education Informationization: Times connotation, Value Logic and Construction path [J]. Ethnic Education Research, 2022, 33(03): 82–89.

5. Zhang Jia. Empirical analysis on the contribution of higher vocational education to regional economic development [J]. Vocational and technical education, 2014, 35(10): 45-50.
6. Liu Xiaoming, Wang Jinming. An empirical analysis on the contribution rate of higher vocational education to economic growth in Zhejiang Province [J]. China Vocational and Technical Education, 2011(18): 36-40.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

