Global Journal of Management and Business Research
Volume 12 Issue 2 Version 1.0 February 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

Xinjiang Education Investment and Economic Growth Relationship

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GJMBR - B Classification : *FOR Code: 140204, 160506 JEL Code: I25*

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Based on the Perspective of Human Capital

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I. Introduction

In the 1960s, when he researched on the issue of U.S. economic growth in the past, American economist Theodore Schultz (T.W, Schutz) found that the contribution of U.S. education to economic growth was as much as 33% for several decades, which caused economic academic shock and the production of the concepts of human capital and human capital investment.Using the method of growth factors, by the inverse proportion of education in the labor input, Denison (1962) analyzed that education's contribution to the U.S. national income growth was 37% in the years of 1929-1948.At this stage, as the cornerstone of the traditional western educational economic theory, theory concerning the causes of growth, which is a part of human capital theory and growth economics, played an important role in the research of the promotion of educational economic.According to theoretical and empirical analysis, growth economists have demonstrated that the growth or accumulation of knowledge played an important role in economic growth. Therefore, more countries convinced that the knowledge and technological progress would have a decisive influence in maintaining the sustaining, rapid, steady and healthy growth of economy. A notable feature of the economic development of post-warestern developed countries and burgeoning developing countries is that the growth rate of total output is greater than the sum of the capital accumulation rate and labor growth rate. Economists found it was not material capital but human capital play a great stimulative role in promoting the economy, which was the reason for these countries developing so rapidly. The human capital theory advocated by series of scholars, with Schultz as the representative, made a fully and systematically study of the interaction between education development and economic growth more from dual-perspective of education and economic development.

The new growth theory, emerged in the 1980s, also proposed that human capital and technological advancement are the two big endogenous driving influences promoting the economical sustainable development. Now, people take human capital investment more and more importance to economic growth. And it becomes an upsurge of the economics field to research the relationship between human capital investment and economic growth. Economists, with Romer and Lucas as the representative, emphasizes that human capital investment and knowledge accumulation are the intrinsic element of sustained economic growth, and that the improvement of human capital has strong externalize and plays an active role in the formation and efficiency of production factors such as physical capital. At the same time, economists recognized that we could promote the accumulation of human capital and the realization of the value through the institutional arrangements and organizational arrangements, and that education was the most important way which would be a significant boost for economic growth. Education, the main channel to increase human capital, can raise labor productivity, so increasing investment in education has a role in stimulating economic growth. At this stage, the discuss about education and economic growth entered a new phase, and brought human capital as endogenous factors into model.example, by comparing the relationship between higher education development and economic growth of Japanese, British and American, Zhuang Zhi-jun (2006) pointed out that economic growth is inseparable from the development of higher education and the progress of technology. Wang Ping (2008) used regression analysis to study the data from 1990 to 2005 in Gansu , getting that human capital trained by higher education had high output elasticity and great stimulative function on economic growth. These scholars used different methods elicited the outcome

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from different angles, and analyzed the effect of education to economic growth. After the reform and open-up, China proposed the "science and education strategy ", aiming at promoting a sustainable and healthy development of its economy and society. As a less developed regions, Xinjiang need to continue the economic restructuring, and constantly adjust their development strategies. It also needs to transform from a resource-based strategy to knowledge-development developing strategy. Therefore, we should pay attention to investment in science and education, vigorously strengthen the intensity of investment in education. In this paper, from the investment in higher education point of view, we established an econometric model to analyze the important impact of human capital investment to Xinjiang's economic growth.

II. The Basic Model, Data and Analytical Method

a) Model description

In order to accurately analyze the important role of human capital elements in economic growth, we should establish a corresponding relationship model between economic growth and element variables. Human capital investment is the main source of economic growth, while education investment is a major part of human capital investment, which is the most important way to transform human resources into human capital. To enhance education investment is the core strength to promote sustainable economic development. This paper is ased on human capital theory, drawing from the Cobb - Douglas production model to establish an empirical analytical model, starting on human capital investment and physical capital investment to research the influencing effect of Xinjiang's human capital investment to economic growth by empirical analysis.

$$\textit{Model:}\quad Y_t = F(A, K_t, H_t) = AK_t^{\alpha} H_t^{\beta} e_t^{\mu}$$

Where, A stands for technical parameters. In this paper, we assume that the technological level of each phase remain constant for ease of analysis. K t indicates physical capital investment of each phase; H t indicates human capital investment; et μ is the random error term; Y t expresses the total output;α and β respectively stand for the output elasticity coefficient of physical capital and human capital. This paper was on the basis of the three elements of the production function.

Taking logarithm on both sides to transform it into a linear form, namely:

$$\ln Y_t = \ln A + \alpha \ln K_t + \beta \ln H_t + \mu \ln e_t$$

b) The sources and measurement of data

The data used in this research is from 1990-2009 years of "Xinjiang Statistical Yearbook" to ensure the accuracy and reliability of the information, and to ensure an objective and scientific analysis in a large extent.

Firstly, the total output indicators. Generally use the gross domestic product (GDP) calculated by the comparable price to measure the total output level of the national economy, which can be obtained directly from the official statistics. 1990-2009 years basis data of Xinjiang's GDP is from "Xinjiang Statistical Yearbook" (2009).

Secondly, physical capital input indicators. In this paper, we use the amount of fixed capital investment to indicate it. Fixed capital investment in Xinjiang Province is divided into urban areas and rural areas, basically including the total capital investment.

Thirdly, human capital indicators. It stands for the investment of human capital that graduated from the junior college and above, which indicates human capital of higher level carried by the higher education system of that year. Higher human capital investment = the number of undergraduates and the students graduated from junior college this year + the number of graduate students graduated from ordinary colleges and universities and various research institutions this year - the number of graduate students enrolled in ordinary colleges and universities and various research institutions this year. For research convenience, we assume that all graduates have achieved the ultimate job.

III. Analysis and Interpretation of the Data

a) Correlative data

In this paper, all data are from "Xinjiang Statistical Yearbook". The correlative data and the chart of analysis are as follows:

Table 1 : The total GDP and human capital of 1990-2009 in Xinjiang

Year	GDPYt (million)	Human capital, Ht (million)	Human capital growth rate%	GDP growth rate%
1990	261.44	0.77	—	—
1991	335.91	0.77	0	28.4845471
1992	402.31	0.84	9.0909091	19.7671995

1993	495.25	0.86	2.3809524	23.1015883
1994	662.32	0.93	8.1395349	33.7344775
1995	814.85	1.04	11.827957	23.0296533
1996	900.93	1.06	1.9230769	10.5639075
1997	1039.85	1.08	1.8867925	15.4196219
1998	1106.95	1.13	4.6296296	6.4528538
1999	1163.17	1.17	3.539823	5.0788202
2000	1363.56	1.28	9.4017094	17.2279203
2001	1491.6	1.56	21.875	9.3901258
2002	1612.65	1.56	0	8.1154465
2003	1886.35	2.46	57.6923077	16.9720646
2004	2209.09	2.95	19.9186992	17.1092321
2005	2604.14	3.61	22.3728814	17.8829292
2006	3045.26	4.43	22.7146814	16.9391815
2007	3523.16	4.71	6.3205418	15.6932413
2008	3764.32	4.83	6.7382902	15.5431567
2009	3886.67	4.92	6.48722081	15.2907514

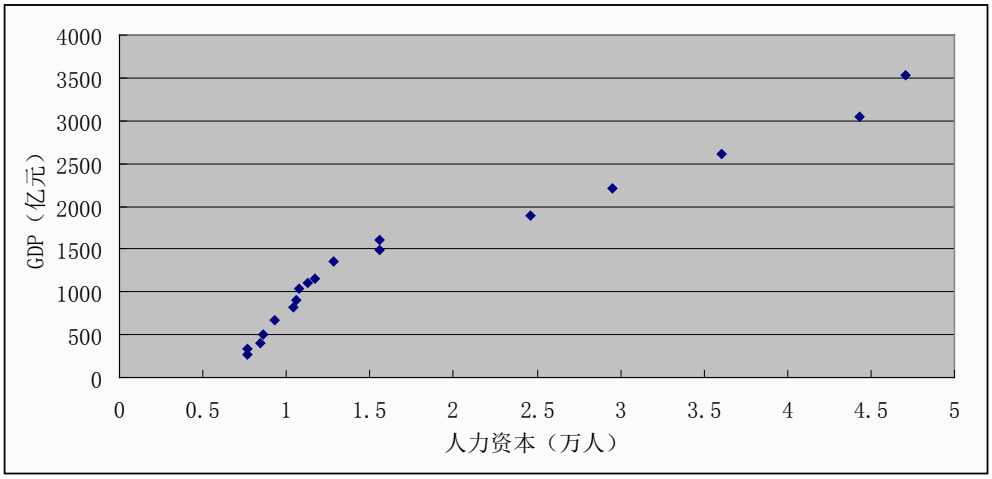

Figure 1: Human capital investment and GDP growth in scatter

b) The interpretation of the contribution rate of factor inputs

By the application of statistical data, we can get the regression results of effective working model (Table II) relating to the economic growth in Xinjiang. From the regression results of EVIEWS, goodness of fit equation has reached 0.99; F = 2001.197; D.W = 2.124964. All parameters are passed the T-test. And P = 0; all the explanatory variables are significant at a given significance level of 1%. It shows that the measurement model from the estimate of the valid labor growth model, which was used in the data analysis of 1990-2009 in Xinjiang's economic growth, has passed the overall test. And the model has a high degree of significance and a good degree of fit (0.99); the test on the estimate coefficient of constant term and self-variables also has a high significant level.

Table 2 : The result of effective model in Xinjiang's economic growth

	Coefficient	Std. Error	t-Statistic	
	4.134476	0.091380	45.24510	
	0.757386	0.026395	28.69434	
	0.996514			7.073150
Adjusted R-squared	0.996016	SD dependent var		0.687505
SE of regression	0.043393	Akaike info criterion		-3.278261

Sum squared resid	0.026361	Schwarz criterion	-3.131223
Log likelihood	30.86521	Hannan-Quinn criter.	-3.263645
		Durbin-Watson stat	2.124964
Prob (F-statistic)			

Therefore, we got the regression equation:

$$LnY_t = 4.134476 + 0.757386LnK_t + 0.125499LnH_t$$

(28.69434) (3.205248)

The figures in brackets and below the coefficient of equation regression are the corresponding T-test value. According to statistical rule of thumb, if the absolute of T-test value is greater than 2, the test of regression coefficient significance passed.

We can get the following conclusions from the model test result:

Through the above analysis, education has a certain positive correlation for economic growth. From the results of the regression, the output elasticity of human capital investment in higher education is 0.125, which shows that human capital cultivated by higher education investment plays a certain role in economic development of Xinjiang. From the quantitative analysis, we can see that on the basis of physical capital investment, Xinjiang's economic development need to add other push factors, while human capital is a strong and forceful endogenous push factor, which will exhibit a momentous power both now and in the future.

From the absolute amount of higher education investment (Table 1), we can see that the total of human capital investment in Xinjiang in 1990-2009 received a large increase, which increased from 0.77 million in 1990 to 4.92 million in 2009; the average annual growth rate of higher education investment was 11.98%, slightly lower than the average annual GDP growth rate of 16.76%.From the GDP growth and human capital growth in scatter showed in Figure 1, there exists significant plus correlation between human capital growth carried by higher education investment and the total GDP growth.

From the output elasticity of various elements, the output elasticity of physical capital investment is 0.76 in Xinjiang, while the output elasticity of human capital investment is 0.13, which shows that the increase of physical capital investment or human capital investment will bring a corresponding increase in output. Currently, the main driver of economic growth in Xinjiang is driven by physical capital investment, and human capital also plays a very important role in it, which shows a great potential space for human capital. So it needs to maintain physical capital investment in Xinjiang, at the same time, continue to increase human capital investment to fully exploit their human capital potential.

From the average contribution rate of various input factor in economic growth, average annual growth rate of GDP in Xinjiang was 14.02% in the period of 1990-2009; average annual growth rate of physical capital was 16.07%; average annual growth rate of human capital stock was 8.38 %. Then, calculate the contribution rate of economic growth through the output elasticity of every element. The contribution rate of physical capital investment to economic growth is about 93.21%, while the contribution rate of human capital investment to economic growth is about 3.16%.Through the analysis, there is a lack of human capital stock development in Xinjiang, which need to enhance the accumulation of human capital stock in order to get a large number of professional and technical talents, who are needed in Xinjiang's development.

IV. Policy Recommendations

Human capital is a key factor in economic development, whose role in economic growth is enormous and irreplaceable. By studding the function of higher education and human capital theory, it indicates that higher education, the key to human capital development, is in close contact with human capital. Education is an important bridge linked human to science, technology, knowledge and skills, which enables people to develop further on the basis of their predecessors' knowledge. Higher education is an important part of education, and the government should devote greater efforts to support its development.

Firstly, physical capital investment remains the main driving force to promote Xinjiang's economic growth now and even a very long period of time in the future, thus it needs to continuously increase investment on the original basis. uman capital has increasingly become a potential factor for economic growth in Xinjiang, whose potential has become increasingly apparent. Therefore, under the premise of ensuring physical capital investment, we should try to solve the shortage of human capital needs, ncrease in human capital investment, so as to solve the problem of inadequate human capital stock from the root. We should establish the income distribution system fully reflecting the knowledge value and education value, form the income gap based on knowledge ownership and level of education, promote the rapid accumulation of human resources, and increase the growth rate of higher education accounted for the average annual overall education index and the contribution rate of higher education to regional economic growth.

Secondly, human capital stock in Xinjiang is mainly from the problem of Xinjiang's education, and

lacks of education investment have seriously restricted the development of human capital in Xinjiang. It should draw attention of the relevant departments to make their efforts to resolve the problem of insufficient capital in education investment. It is not enough to only rely on the government's limited financial education expenditure; we also need to achieve the diversification of investment bodies in education on the basis of improving education funding system, enhance the cooperation of production,tudy, and research, and consummate the transition mechanism of scientific and technological achievements in colleges and universities.

Thirdly, with the acceleration of the integration process of education, scientific research, and production, higher education, treat science and technology as a link, makes a direct and necessary contact with the development of social productive forces. And it becomes the impetus for promoting technological progress, improving labor productivity, and supporting economic growth and industrial development. Colleges and universities should improve the mechanism of technological achievements and consummate the research evaluation system to improve the quality of technological innovations. At the same time, we should establish and improve the venture capital system of technological achievements and intermediary service organizations in colleges and universities, which provide the market organizational conditions for the achievement transformation.

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Global Journal of Management and Business Research Volume XII Issue II Version I February 2012

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