

A Study on the Influences of Human Capital Investment in Health on Economics Growth in Hunan Province

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Abstract – In this paper we constructed a regression model and analyzed the impact of health human capital investment on economic growth in Hunan. We found that the impact of health human capital on output is 0.53. The result shows that health human capital investment not only affects the health level of residents, but also plays a decisive role on the impact of economic growth. Therefore, it was important for the government to increase the health investment, and improve the health level of residents, so as to play a role in promoting the health human capital on economic growth. With the development of the theory of neo-economic growth, human capital stock has attracted increasingly more attention, which plays an important role in economic growth, and it also deepens the role of education. On the other hand, the effect of health human capital has been relatively neglected. Health is an essential condition for human life. As one of human capital factors, it also promotes a country's economy. China is rich in human resources. People's health level not only directly affects the quality of human resources, but also indirectly affects the development of the economy. Hunan as a traditional agricultural province, the resident income is low, and the health status is relatively backward. Therefore, how to promote the economy of Hunan province by improving the health investment is of great significance.

Keywords - regression model; health human capital investment; economic growth; Influences

□. INTRODUCTION

Since 1960s Schultz's Human Capital Theory, education as an important part of human capital is received more attention increasingly. But health has not obtained the proper value and attention.

Most foreign Scholars believe that the investment in health is like the investment in education and material, which can promote economic growth. However, owing to different conditions, in different countries and regions, the investment of health exist a certain degree of different impact on economic growth.

(Barro, 1996) use the neoclassical growth model that the physical capital, Manpower education capital and health capital were taken as variables, the researchers found that the health human capital play a significant role in promoting economic growth for the region in the early stages[1]; (Arora, 2001)found the health capital promote the contribution of economic development, which accounted for 30% -40%[2].

Most Chinese scholars believe that health investment can accelerate economic growth. (Luo, 2006) suggest that extending the resident's life one-year-old, will bring 1.06 to 1.22% increase in GDP[3]. (Wanget. al, 2008) found a positive correlation between health capital and economic growth in short term[4].

Throughout the domestic and foreign literature, most of the study just rest on the primary level. Few quantitative studies on the significance of health and education human capital to economy have been done.

II. ANALYSIS OF THE STATUS QUO OF HEALTH HUMAN CAPITAL INVESTMENT IN HUNAN

Health human capital investment still exist many problems in Hunan.

(1)Health investment covers few of the government expenditure and grows slow

Compared to other financing expenditure, the amount of health care expenditure is descending and its growth rate is the slowest, which is slower than the government expenditure at the same period(except in 1996 and 2003), or even shows negative growth. Since 2005, the proportion that health care expenditure account for financial expenditure is also rising year after year.

From table 1, in Hunan the proportion of health care expenditure is increasing, yet the growth rate is slower than the whole country's average level.

TABLE 1: COMPARISON OF THE GROWTH RATE IN FINANCIAL EXPENDITURE AND HEALTH CARE EXPENDITURE FROM 1995 TO 2008 IN HUNAN

Years	Growth rate of health care expenditure(%)	Growthrate of financial expenditure(%)	Proportion of health care expenditure(%)
1995	14.30	14.82	4.91
1996	33.24	25.18	5.23

1997	-7.53	8.56	4.56
1998	-3.42	18.55	4.85
1999	8.09	14.43	3.96
2000	1.6	11.08	3.73
2001	13.76	24.11	3.41
2002	8.83	23.47	2.76
2003	14.44	7.64	2.93
2004	17.28	25.41	2.74
2005	23.88	21.39	2.8
2006	41.56	21.88	3.41
2007	63.09	27.48	4.36
2008	48.0	30.1	4.96
2009	81.74	25.22	7.20
2010	13.3	22.3	6.68
2011	42.3	30.3	7.29
2012	14.57	16.99	7.14

Data source: Hunan Statistical Year Book

(2) Relative shortage of health care resources and low level of health

There exists large gaps between the support and demand of health care service in Hunan. The health personnel are low in quality, high-level talented people are extremely deficient, personnel structure and layout is still irrational, talents' development mechanism is not perfect, especially the severe shortage of primary health professionals; a shortage of medical institutions and beds[5][6].

(3) Obvious difference of investment between rural and urban residents

Except a few city-state in Hunan Province, most of the regions show great difference in the allocation of health care resources, including medical facilities and medical personnel, About 80 percent of health resources are concentrated in large and medium sized cities like Changsha, where majority of the resources are occupied by the city's big hospitals. However, accounted for 70% of the population in rural areas only has about 20 percent of health resources, and the quality of medical facilities, medical standards, township hospitals and village clinics are generally poor[7].

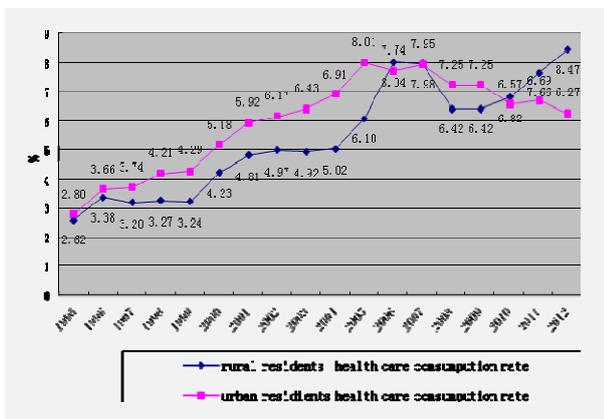


Figure 1: consumption rate of health care in Hunan

(4) Resident individuals has heavy burden of disease

Medical institutions from the financial investment are few. Due to the continuous increases of medical expenses and relative low government medical, most rural residents pay his own medical bills that further burdened their economy. Picture one shows the rural and urban residents health care consumption rate from 1995 to 2012.

III. ANALYSIS OF THE EFFECT OF HEALTH HUMAN CAPITAL INVESTMENT ON ECONOMIC GROWTH IN HUNAN

(1) Introducing the Solow economic growth model

Education and health are two basic factors of human capital, We adopt the Cobb-Douglas production function as the human capital function to analyze the economic effect:

$$H = E^\lambda M^{1-\lambda}, (0 < \lambda < 1) \tag{1}$$

Where H, E, M, λ represent the human capital, physical capital, educational expenditure and elasticity coefficient. Through the Cobb-Douglas production function and the Solow model, we add human capital to construct the economic growth model:

$$Y = K^\alpha (H)^\beta (AL)^{1-\alpha-\beta}, 0 < \alpha < 1, 0 < \beta < 1, \alpha + \beta < 1 \tag{2}$$

Where Y, K, E, H, A and L represent the economic growth, physical capital, educational expenditure, health investment, technological level and labor forces respectively, and $\alpha, \lambda, 1-\lambda, 1-\alpha-\beta$ symbolize the corresponding variable elasticity.

We assume that the growth rate of L and A are exogenous factors and are already given as g and n, respectively. In addition, all the variables are assumed to have the same production function and depreciation. After a set of mathematical deductions, the model can be obtained as follows:

$$\dot{K} = s_K Y - \delta K \tag{3}$$

$$\dot{E} = s_E Y - \delta E \tag{4}$$

$$\dot{M} = s_M Y - \delta M \tag{5}$$

Where s_K , s_E and s_M represent the investment rate of physical capital, educational expenditure and health.

We assume $y = \frac{Y}{AL}$ as efficiency of labour, $k = \frac{K}{AL}$ as physical capital, $e = \frac{E}{AL}$ as educational human capital, $m = \frac{M}{AL}$ as health human capital. Then to get their differential value respectively.

$$\dot{k} = s_K k^\alpha e^{\lambda\beta} m^{(1-\lambda)\beta} - (n + g + \delta)k \quad (6)$$

$$\dot{e} = s_E k^\alpha e^{\lambda\beta} m^{(1-\lambda)\beta} - (n + g + \delta)e \quad (7)$$

$$\dot{m} = s_M k^\alpha e^{\lambda\beta} m^{(1-\lambda)\beta} - (n + g + \delta)m \quad (8)$$

In economic equilibrium condition, $\dot{k} = \dot{e} = \dot{m} = 0$. Combining the formulations above, we can get k, e and h:

$$\dot{k} = \dot{e} = \dot{m} = 0 \quad (9)$$

$$e^* = \left[\frac{s_K^\alpha s_E^{1-\alpha-(1-\lambda)\beta} s_M^{(1-\lambda)\beta}}{n + \delta + g} \right]^{\frac{1}{1-\alpha-\beta}} \quad (10)$$

$$m^* = \left[\frac{s_K^\alpha s_E^{\lambda\beta} s_M^{1-\alpha-\lambda\beta}}{n + \delta + g} \right]^{\frac{1}{1-\alpha-\beta}} \quad (11)$$

They* and k* are calculated by substituting (9) and (10) into the production function (1).

$$y^* = \left[\frac{s_K^\alpha s_E^{\lambda\beta} s_M^{(1-\lambda)\beta}}{(n + \delta + g)^{\alpha+\beta}} \right]^{\frac{1}{1-\alpha-\beta}}$$

$$k^* = \left[\frac{s_K^{1-\beta} s_E^{\lambda\beta} s_M^{(1-\lambda)\beta}}{n + \delta + g} \right]^{\frac{1}{1-\alpha-\beta}} \quad (12)$$

In order to get the relation between per capita output and human capital level, we assume $\bar{y} = \frac{Y}{L}$, $\bar{k} = \frac{K}{L}$, $\bar{e} = \frac{E}{L}$ and $\bar{m} = \frac{M}{L}$. According to (9), (12) and (1), we get the following expression of per capita output under equilibrium condition:

$$\bar{y}^* = y^* \cdot A = A \left[\frac{s_K^\alpha s_E^{\lambda\beta} s_M^{(1-\lambda)\beta}}{(n + \delta + g)^{\alpha+\beta}} \right]^{\frac{1}{1-\alpha-\beta}}$$

$$= A(n + \delta + g)^{\frac{\alpha+\beta}{1-\alpha-\beta}} s_K^{\frac{\alpha}{1-\alpha-\beta}} s_E^{\frac{\lambda\beta}{1-\alpha-\beta}} s_M^{\frac{(1-\lambda)\beta}{1-\alpha-\beta}} \quad (13)$$

(2) Construct an econometric model of health human capital investment

Deforming the above formula, we can get an econometric model about economic growth and health investment.

$$\ln(\bar{y}^*) = \ln A_0 + gt - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n + \delta + g)$$

$$+ \frac{\alpha}{1 - \alpha - \beta} \ln(s_K) + \frac{\lambda\beta}{1 - \alpha - \beta} \ln(s_E) + \frac{(1 - \lambda)\beta}{1 - \alpha - \beta} \ln(s_M) \quad (14)$$

Within certain amount of time, t is a constant, the formula can be simplified as follows:

$$\ln(\bar{y}^*) = C_1 \ln(s_K) + C_2 \ln(s_E) + C_3 \ln(s_H) + C_4 \ln(n + \delta + g) + C_0$$

Hence, formula (15) is the econometric model that we construct to analyze the relation between econometric model.

(3) Regression analysis

To avoid spurious regression, we test all the variables through the ADF test and panel cointegration test before regression analysis.

TABLE 2: RESULTS OF JOHANSEN COINTEGRATED TEST

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob. **
None *	0.710238	75.77114	47.85613	0.0000
At most 1 *	0.585280	41.08764	29.79707	0.0017
At most 2 *	0.444148	16.44341	15.49471	0.0359
At most 3	1.06E-05	0.000297	3.841466	0.9883

TABLE 3: ESTIMATES OF SOLOW MODEL AFTER ADDING HUMAN CAPITAL

Dependent variable: $\ln(\bar{y}^*) - gt$			
model	1	2	3
sample	31	31	31
$\ln A_0$	4.79*** (7.58)	2.826* (1.941)	2.649* (1.897)
$\ln(s_K) - \ln(n + \delta + g)$	0.155* (1.692)	0.334*** (8.367)	0.148* (1.774)
$\ln(e^*)$	0.933** (2.648)		0.697* (1.894)
$\ln(m^*)$		0.864** (2.498)	0.609* (1.706)
R2	0.7893	0.7846	0.8098
\bar{R}^2	0.7774	0.7692	0.7887
α estimate	0.134	0.25	0.129
Bestimate	0.808	0.648	1.137

λ estimate	1	0	0.534
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Note: Figures in brackets denote t-statistic. *, **, and *** show that they are greatly related with 0.1, 0.05 and 0.001, respectively.

① ADF test

By using the software of E views, we can get the ADF statistic value of $\ln(\bar{y}^*) - gt$, $\ln(s_k) - \ln(n + \delta + g)$, $\ln(e^*)$ and $\ln(m^*)$ are -2.4896, -3.4162, -0.08 and -1.2818. Under 5% (sig), there exists non-stationary unit root. Then conduct unit root test on the series after the first order difference, we get the ADF statistical value: -3.0824, -6.2088, -7.5637 and -4.3918. The same theory proves that there exists no unit root after the first order difference. The result of the unit root test shows that $\ln(\bar{y}^*) - gt$, $\ln(s_k) - \ln(n + \delta + g)$, $\ln(e^*)$ and $\ln(m^*)$ are subject to order 1.

②. Cointegration test

We collect the related data by using the Johansen model and software of E views. The values as Table 2.

According to the chart, we found that under 5% (sig), there exists at least one co-integration relation between $\ln(\bar{y}^*) - gt$, $\ln(s_k) - \ln(n + \delta + g)$, $\ln(e^*)$ and $\ln(m^*)$. Therefore, we can get the conclusion that there exists a long stationary relation between the variables.

③. Regression analysis

Based on the econometric model (15), we can get the chart three through Eviews.

(4) Empirical results analysis

① From the econometric model 3, we found that: Considering both the impact of education and health, the influence of human capital investment on Hunan's economic growth is $\beta = 1.137$, which the effect of education is $\lambda\beta = 0.607$, the effects of health is $(1-\lambda)\beta = 0.53$. That is, a healthy investment in human capital of Hunan every one percentage point increase can spur economic growth 0.53%, while the contribution value of investment in education is 0.607, only 0.077 shy. That fully explain that health plays the same important role in Hunan's Economic Growth.

② According to the estimates of β and λ in econometric model 1 and 2, we found that: if we focused narrowly on education, its economic contribution is 0.808. However, the contribution of health is 0.648, only 0.16 shy.

③ Through a comprehensive analysis of model 1, 2, 3, we found that: if we focused narrowly on education neglecting the effect of health, its economic benefits are overrated. The estimates value raised from 0.607 to 0.808. On the contrary, the effect of human capital is under estimated. The estimates value fell from 1.137 to 0.808.

By comparison, although the effects of health and education human capital on economic growth are different, they play the same important role in economy.

IV CONCLUSION AND SUGGESTION

Based on the new-classic economic growth theory, we add health investment into the Cobb-Douglas production function. The following conclusions are drawn from the regression analysis of the time series data from 1978 to 2008 of Hunan.

(1) To build a correct understanding of the contribution of health investment on economy and to improve the health investment awareness

Relative to physical capital, the human capital to better promote economic growth, human capital two elements - health and human capital, also has a role in promoting economic growth, but the economic investment in health promotion in practice has been seriously underestimated, should be both theoretical and practical importance to the great significance of health and hygiene

point of view of investment, on the one hand promote, encourage scholars to deepen theoretical research in the field, on the other hand the Government to formulate policies to increase investment in health efforts, attention to the health of human capital accumulation give full play its due role. Health and education capital are both part of human capital, which can also boost the economy, We should pay great attention to the significance of health investment both in theory and practice.

(2) To increase the investment in public health and to improve public health service system

The improvement of residents' health level depends on the Economic growth of its investment. In a region, health investment is directly determined by the investment of health care, where the number of health care investment and its effective management play critical role in improving people's health, and all the more so of government's financial investment in public health which may determine and influence the health care system of a country. Practices show that: the more complete of the social medical care service system, the higher of the residents' health level will be. Health services belong to national public utilities. The system is so large and complex that should be support by the government. Thus, the government can support from the following aspects: Firstly, to meet the increasing need of health care services, government should keep further investment on health. Secondly, to change the uneven allocation situation of health resources and to increase health investment in community and rural area. Thirdly, to enhance cultivating talented people of health care. Fourth, to promote the health services industry continues to develop, and to provide more and better healthcare products and services.

(3) To strengthen health care consciousness and the ability to resist disease

Health investments include at least two aspects: one is medical investment, the second is health care investment. Both of them complete each other and improve people's health. Therefore, to enhance residents' health-conscious is part of health investment which can not be neglected.

With the enhancement of conscious, the ability to prevent and resist diseases can also be improved. It can not only enhance the health level of themselves and society, but also can save medical expenses. It is an another form of health investment. Therefore, the government and the community should adopt various ways to popularize health education. Besides, to increase investment in sports facilities is also important, which can provide more fitness sites and facilities to the communities and rural residents. These will fully improve the health level.

(4) To enhance the quantity and quality of health care resources and to enlarge the scale of investment by ushering in private capital into this field.

Health care service is useful for our country and people. We should maintain the dominant position of government's fiscal support. But in the initial stage of China's economic development, under the correct guidance and effective monitoring of the government, ushering private capital into this field can not only give a profitable return to business, but also can make up the relative deficiency of health investment in Hunan. Then to improve residents' health level, so as to boost faster economic growth.

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