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, health 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

II. 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; (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>
<thead>
<tr>
<th>Years</th>
<th>Growth rate of health care expenditure(%)</th>
<th>Growthrate of financial expenditure(%)</th>
<th>Proportion of health care expenditure(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>14.30</td>
<td>14.82</td>
<td>4.91</td>
</tr>
<tr>
<td>1996</td>
<td>33.24</td>
<td>25.18</td>
<td>5.23</td>
</tr>
</tbody>
</table>
(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 mediumsized 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].

(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:

\[
H = E^{1/2}M^{1/2}, (0 < \lambda < 1)
\]

Where H, E, M, \(\lambda\) 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:

\[
Y = K^\alpha (H) ^{\beta} (AL) ^{(1-\alpha-\beta)}, 0 < \alpha < 1, 0 < \beta < 1, \alpha + \beta < 1
\]

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-\(\alpha\), 1-\(\alpha\) 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:

\[
K^t = s_K Y - \delta K
\]

\[
E^t = s_E Y - \delta E
\]

\[
M^t = s_M Y - \delta M
\]
Where $S_K$, $S_E$ and $S_M$ represent the investment rate of physical capital, educational expenditure and health.

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

$$
k = s_k k^* e^\beta m^{(1-\beta)\beta} - (n + g + \delta)k
t(6)
$$
$$
e = s_k k^* e^\beta m^{(1-\beta)\beta} - (n + g + \delta)e
t(7)
$$
$$
m = s_m k^* e^\beta m^{(1-\beta)\beta} - (n + g + \delta)m
t(8)
$$

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

$$
\dot{k} = \dot{e} = \dot{m} = 0
nt(9)
$$
$$
e = s_k k^* e^\beta m^{(1-\beta)\beta} - (n + g + \delta)e
nt(10)
$$
$$
m = s_m k^* e^\beta m^{(1-\beta)\beta} - (n + g + \delta)m
nt(11)
$$

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

$$
y^* = \frac{s_y s_{yE} s_{yK} s_{yM} m}{(n + g + \delta)^{2/3}}
t(12)
$$

In order to get the relation between per capita output and human capital level, we assume $\tau = \frac{\tau}{\tau}$, $\tau = \frac{\tau}{\tau}$, $\tau = \frac{\tau}{\tau}$ and $\tau = \frac{\tau}{\tau}$. According to (9), (12) and (1), we get the following expression of per capita output under equilibrium condition:

$$
\tau^* = \frac{\tau}{\tau} = A \left[ \frac{s_y s_{yE} s_{yK} s_{yM} m}{(n + g + \delta)^{2/3}} \right]
$$

(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.

$$
\ln(\tau^*) = \ln(A) + \alpha \ln(n + \delta + g)
$$

(14)

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

$$
\ln(\tau^*) = C_1 \ln(s_{yK}) + C_2 \ln(s_{yE}) + C_3 \ln(s_{yM}) + C_4 \ln(n + \delta + g) + C_0
$$

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

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical value</th>
<th>Prob. **</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.710258</td>
<td>75.77114</td>
<td>47.85613</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1 *</td>
<td>0.585280</td>
<td>41.08764</td>
<td>29.79707</td>
<td>0.0017</td>
</tr>
<tr>
<td>At most 2 *</td>
<td>0.444148</td>
<td>16.44341</td>
<td>15.49471</td>
<td>0.0359</td>
</tr>
<tr>
<td>At most 3</td>
<td>1.06E-05</td>
<td>0.000297</td>
<td>3.841466</td>
<td>0.9883</td>
</tr>
</tbody>
</table>

### TABLE 3: ESTIMATES OF SOLOW MODEL AFTER ADDING HUMAN CAPITAL

<table>
<thead>
<tr>
<th>Dependent variable: $\ln(\tau^*) - \ln(g + \delta)$</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>model sample</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>$\ln(A_0)$</td>
<td>4.79***</td>
<td>2.826*</td>
<td>2.649*</td>
</tr>
<tr>
<td>$\ln(s_{yK}) - \ln(n + \delta + g)$</td>
<td>0.155*</td>
<td>0.334***</td>
<td>0.148*</td>
</tr>
<tr>
<td>$\ln(e^*)$</td>
<td>0.933**</td>
<td>0.697*</td>
<td>0.609*</td>
</tr>
<tr>
<td>$\ln(m^*)$</td>
<td>0.864**</td>
<td>0.609*</td>
<td>0.706*</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.7893</td>
<td>0.7846</td>
<td>0.8098</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.7774</td>
<td>0.7692</td>
<td>0.7887</td>
</tr>
<tr>
<td>$\alpha$ estimate</td>
<td>0.134</td>
<td>0.25</td>
<td>0.129</td>
</tr>
<tr>
<td>$\text{Bestimate}$</td>
<td>0.808</td>
<td>0.648</td>
<td>1.137</td>
</tr>
</tbody>
</table>

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By using the software of E views, we can get the ADF statistic value of \(\ln(y_t) - gt\), \(\ln(s_{t})\) - \(\ln(n + d + g)\), \(\ln(e_t)\) and \(\ln(w_t)\) 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 \(\ln(y_t) - gt\), \(\ln(s_{t}) - \ln(n + d + g)\), \(\ln(e_t)\) and \(\ln(w_t)\) are subject to order 1.

(1) ADF test
(2) Regression analysis

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 \(\ln(y_t) - gt\), \(\ln(s_{t}) - \ln(n + d + g)\), \(\ln(e_t)\) and \(\ln(w_t)\). Therefore, we can get the conclusion that there exists a long stationary relation between the variables.

(2) Empirical results analysis

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 effect of education is \(\lambda\beta = 0.607\), the effects of health is \(\beta = 1.137\) to \(0.808\). The estimates value fell from 0.607 to 0.808. On the contrary, the effect of health is underestimated. The estimates value raised from 0.607 to 0.808. That fully explain that health plays the same important role in Hunan’s Economic Growth.

(3) 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 acountry. 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.

(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.
REFERENCE


