

## **THE ROLE OF "HUMAN CAPITAL" AND ECONOMETRIC MODELS ON THE ECONOMIC GROWTH OF UZBEKISTAN**

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### **Abstract**

*This article pays special attention to the role of the human factor in ensuring the economic growth of the Uzbekistan. The study revealed the contents of the human factor has a variety of theories and models of economic growth, in particular, became Romer Whaley Lucas models, as well as the R & the D sector in economic growth models and theoretical aspects are briefly described. The case of the experimental part of the work is conducted in the example of the traditional Kobb-Douglas production function, in addition to the "human factor" has been included in the results interpreted. Important scientific conclusions briefly summarized at the end of the article.*

*Keywords: Economic growth, models of economic growth, human capital, technological development, R & D sector.*

### **INTRODUCTION**

Long – term economic growth evidence is major direction of the macroeconomic research, which is to explain the factors that shape the dynamics of future production, new sources of growth and economic growth, effective solution to the problem of the fundamental tasks. Among the countries that the resolution of these tasks will substantially contribute to the clarification of the causes of the different life standards (Abdukarimov B.A, 2013).

The world's global development process shows that the main long-term sustainable economic growth source of technical progress, ensuring it the "human capital" of particular importance.

Until the beginning of the twentieth century, the production process and the production of physical capital, financial resources, played a key role. During this period, the technology is used as one of the additional resources enough to be a natural effect of the labor force. The objective process - the rapid development of science and technology, knowledge, skills, skills, the ability of the human person directly raised in the first place and become the driving force of economic development.

During this period, the technology is used as one of the additional resources enough to be a natural effect of the labor force. The objective process - the rapid development of science and technology, knowledge, skills, the ability of the human raised in the first place and become the driving force of economic development(Akimov & Dollery, 2009).

Today, the most effective investment in human capital, in particular, according to economists' estimates, every dollar spent on education, bringing great benefits in a relatively short period of 3 to 6 dollars, at the same time be spent on research and scientific developments every 1USD spent on equipment is proved that this quantity eight times more while comparing with previous amount.

At the present time, the share of physical capital in the world of the average national income 16.0% accuracy. At the same time, the share of national wealth, the contribution of human capital is 64.0%, and relatively the share of natural capital is 20.0%.

With the increase in the level of economic development of human capital will increase the share of national wealth. For instance, the share of countries such as , Germany, Switzerland and Japan have contributed 80.0% in this regard. The international community and individual countries' social and economic development, education is considered as an important component of the concept of the development strategy.

Specialists and managers of the business entities in accordance with the determination to improve the efficiency of research has proved the efficiency of investment in human capital. Based on the results of increasing the effectiveness of the specialists and managers of enterprises, especially in their professional and special training, seek to improve the general level of knowledge and professional skills play a crucial role as whole(Calhoun, 2013).

According to the above-mentioned facts, we can say that the center of economic growth lies the idea of "human capital" investment. Therefore, much higher share of human capital on the production, better growth rates in the economy could be reached.

In recent years, great attention has been directed to these factors in the Republic of Uzbekistan too. In particular, the largest share of the state budget expenditures has been directed to social services and social protection at all.

At the same time, assessment over human capital investment could be measured on the basis of continuing education (secondary, secondary and higher education, training and re-training) coverage, moreover rise in the gross domestic product.

In the country, education, science, vocational training system reform, the Law of the Republic of Uzbekistan "On Education", the most important social programs - the national training program, the gradual implementation of the program of development of school education have seen as a result of continuous holistic education system.

According to education rate, Uzbekistan has been listed among the well-developed countries of the world. In Uzbekistan, the index of education is 0,998, which is equal to the world average rate is 0.77. Special attention is paid to the creation of the foundations of the knowledge-based economy. In particular, three of the eight main factors directly related to the principles of knowledge-based economy of the country's economic growth strategy for the period until 2015:

1. Education and training. The national training program and the development of school education program shall be to maintain the level of public literacy 99,3-100,0%. Strategy to expand capacity to meet the needs of scientific and technological development as well as training in various sectors of the economy will be required to increase the level of training of specialists.
2. Science, technology and innovation systems. In this area, primarily in the field of scientific research and experimental development priorities system, it is planned to introduce the principle of commercial innovation. Scientific research institutes, institutions of higher education to strengthen the partnership between the production and innovation, venture funds and investment companies for the purpose of financing of investment projects to assist in the management of the organization and with special attention to the protection of intellectual property is compelling.
3. Information and communication technologies. The development of information and communication technology sector a priority to ensure the formation of knowledge-based economy as the most important sector.

Currently, more than 220 scientific research institutions, development organizations, universities, research and production enterprises, innovation centers operating in the country. Higher education, science and innovation in the production of the country in order to establish cooperation between teachers, research institutions and academic staff, representatives of enterprises and organizations, innovative group of talented students.

## LITERATURE REVIEW

At present, the work force and labor is often seen as an equal terms a sense. The human factor, the concept of human capital as a resource person in the economy, but the production is considered as the main connection. This concept is in many ways the Japanese management leaders K.Matsusita and is linked with the names of the A.Morita.

In the economic field of study, human capital refers to when a person's intellectual, physical, and spiritual potential, that is, knowledge, skills, health and other set of features with it. In particular, according to B.M.Genkin: "Human capital is the sum of human skills, the man, his family, the source of income of the company and society". According to Russian scientists I.A.Kokarev: "Human capital - this is not the people living in their production skills, knowledge and skills". The development of science and technology to strengthen the role of the human production of unusually. "Science is indeed a manufacturer of power, information and knowledge has become the most important resource of the community" stated by an V.L.Inozemtsev. Moreover, personnel training for the community who is able to work the same abstract not "labor", but training and creative research will be valuable as the ability to offer a unique product.

Foreign experts in the world market today, "competitive human resources quality, flexibility and productivity" would be. At the same time the human potential is not the only source of economic opportunities, but at the same time in the country's economic and social potential of the most important indicators.

Human capital is held by a man of knowledge, professional specialization, experience, overall employment potential. Human capital is a concept that emerged in the seventeenth century. It was the first loss of the war in 1676, William Petty weapons used on the basis of comparison with the loss of human life. W. Petty and the structure of the sources of his wealth and those who rent, capital and income (percent) as well as the people's work, depending on qualifications and the health of this or that kind of profitability. According to scientists, the amount of human capital is valued employee to a salary.

Adam Smith and other classical economic theory also recognize the concept of human capital. Adam Smith in 1776's "The essence of the wealth of the nations and the reasons for research" was the basis of the wealth of nations is determined by the number of employees and the quality of their skills. He works as the "human capital", even if you did not use the term capital "held by the public and all members of the community, and useful skills". According to him, the agility and skill of the worker, this person is not a part of the property, as well as the wealth of the society.

According to the theory of human capital to invest in their people, to extend the capabilities of public funding for the enrichment of human capital can be spent to increase the national income. This increase in productivity is the effectiveness of funds spent on investments, expressed by the increase in salaries and bills as whole.

All in all, gathered in the broad sense of the word capital, wealth and income are used in the manufacture of all the elements of technique. According to T Schultz, the capital: human capital, physical capital will allow consistent distribution.

The formation of human capital theory, it is recognized by the scientific community to develop T. Schulz made a great contribution. He was one of the first to develop the concept of human capital as a factor. Scientists and industrial development and industrial development in the next understanding of the role of human capital as the main driving force in the economy, a lot of work.

T. Shultz's "Transformation of the traditional agrarian sector", special attention to the role of technology in agriculture. She believes that these technologies, first of all depends on the knowledge of the farmers. The low level of farmers' knowledge and productivity growth is one of the major obstacles to increasing agricultural productivity.T. Shults considers that a person investing in society, people increase their ability to work effectively implement creative activities, health and so expressed. He is the concentration of human capital and as being able to be formed again. His estimates, three-quarters of the total volume of products produced in the society column of human capital to the collection of funds. However, the theory of the twentieth century, most of the time to make sure it was shown as a part of the fourth.

This G.Bekker makes a significant contribution to the development of the theory. He considers that the formation of the rule of competition in the special training of the personnel firm. G.Bekker revealed that the amount of investment in human capital, profitability and compared with the profitability of many companies in the United States. An increase in the number of private educational institutions, short-term seminars and special courses such as consulting firms, educational level of profitability in the private sector as a result of the expansion of the activity of other types of commercial activity, the level of profitability of 10.0 showed that more than 15.0%. G.Bekker considers that the formation of the rule of competition in the special training of the personnel firm. To be known and popular products in these markets, ultimately the firm's reputation, know-how and trademarks are expressed. Staff to prepare a special, first of all, the firms and the companies they are interested in, so that they can finance themselves.

American economist states that additional income on higher education to be determined in the following manner: finish college and secondary education specialists be deducted from

the income. Educational costs to the direct costs, the corresponding costs - in lost revenue. The estimated annual investment in education, leaving about 12.0 - 14.0% of the benefit.

The importance of this research is to G. Becker determined the amount of investment in human capital, profitability and compared to the profitability of many companies in the United States. An increase in the number of private educational institutions, short-term seminars and special courses such as consulting firms, educational level of profitability in the private sector as a result of the expansion of the activity of other types of commercial activity, the level of profitability showed that more than 10.0 - 15.0%

Economic professors, scientists and professors Qalandar Abdurakhmanov Nodira Zokirova have a great contribution to the formation and development of the theory of human capital. They said, "The importance of human capital, natural resources, wealth, and higher than the means". Therefore, human capital have proved to be the main driver of economic growth and efficiency.

## ECONOMIC GROWTH MODELS

The theory of economic growth models has gone to a new stage in the years of 80-90, while describing in a wide range of different scientific approaches with explanations at all. In particular, according to the models of economic growth modification, the role of the human factor, innovation and the development of innovative economy, focused on the creation of scientific and technical knowledge. Below are some of the theoretical models of economic growth, taking into account human capital aspects are briefly described.

### Economic growth model of Romer Whaley

At present, the human factor is one of the leading role in economic growth models – G. Mankiw, D. Romer, D.Weyl combined econometric model, the idea of a model on the basis of this model, the Solomon's capital has divided into two (physical capital and human capital) categories.

If the theory of G.Mankiw, D.Romer, D.Weyl,  $Y(t) = K(t)^\alpha H(t)^\beta [A(t)L(t)]^{1-\alpha-\beta}$  synergic

econometric model  $y = \frac{Y}{AL}$ ,  $k = \frac{K}{AL}$  and  $h = \frac{H}{AL}$  labeled, then  $y = k^\alpha h^\beta$  could be mentioned.

That the model of the capital reduction adjustment, that is  $\alpha + \beta < 1$  could be measured. Except this  $\dot{k}(t) = s_k y(t) - (n + g + \delta)k(t)$  from  $\dot{k}(t) = 0$  that  $s_k y(t) = (n + g + \delta)k(t)$  equality could be

pointed. This equality  $k^{1-\alpha} = \left(\frac{s_k}{n + g + \delta}\right) h^\beta$  or  $k = \left(\frac{s_k}{n + g + \delta}\right)^{\frac{1}{1-\alpha}} h^{\frac{\beta}{1-\alpha}}$  are considered as equivalent and here  $h$  on  $k$  production from the second derivative negative,  $\beta < 1 - \alpha$  refers to the situation.

If you examine the human capital per unit of labor efficiency, then we get the following equation:

$\dot{h}(t) = s_h y(t) - (n + g + \delta)h(t)$ , from  $\dot{h}(t) = 0$  if  $s_h y(t) = (n + g + \delta)h(t)$  equality could be stated .

This equality  $k = \left(\frac{n + g + \delta}{s_h}\right)^{\frac{1}{\alpha}} h^{\frac{1-\beta}{\alpha}}$  is equivalent if  $h$  this  $k$  production from the second derivative positive,  $1 - \beta > \alpha$  refers to the situation.

In this model  $k$  and  $h$  with  $y = k(h)$  function if we reflect the graph as a function, and where they intersect with each other ( $E$ ) point will be available, the situation in a stable state of equilibrium

$\dot{k}(t) = \dot{h}(t) = 0$  equality and finds its expression in this equilibrium point "global stability"

believed as whole. Therefore, this equation  $k^* = \left(\frac{s_k^{1-\beta} s_h^\beta}{n + g + \delta}\right)^{\frac{1}{1-\alpha-\beta}}$  and  $h^* = \left(\frac{s_k^\alpha s_h^{1-\alpha}}{n + g + \delta}\right)^{\frac{1}{1-\alpha-\beta}}$  equalities could be stated.

If above mentioned  $y^* = (k^*)^\alpha (h^*)^\beta$  two side logarithmic, then

$$\ln \frac{Y(t)}{L(t)} = \ln A(0) + gt - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n + g + \delta) + \frac{\alpha}{1 - \alpha - \beta} \ln(s_k) + \frac{\beta}{1 - \alpha - \beta} \ln(s_h)$$

equalities

stated above. Moreover, this  $L(t) = L(0)e^{nt}$  and  $\frac{\dot{L}}{L} = n$  also  $A(t) = A(0)e^{gt}$  and  $\frac{\dot{A}}{A} = g$ ,  $\delta = MP_k, s$  - refers to the accumulation of capital in the balance.

The above equation means that the per capita average income, population growth and the decline in physical and human capital depends on fund. Besides the real high-income countries, the accumulation characteristic, otherwise  $(n + g + \delta)$  will be high relatively.

## Lucas model of economic growth

It was noted that in 80-90 years, a number of academic economists, GDP growth higher than that of the impact of human capital in the process and started to come one after the other on the scientific conclusions of this scientific theory developed slowly.

One of the theories - R.Lukas social- production is functioned:

$$Y(t) = K(t)^{1-\alpha} [uh(t)L(t)]^{1-\alpha} (h_\alpha(t))^\psi$$

Here  $u$  - the share of labor costs in the development of human capital;  $h(t)$  - human capital stocks;  $h_\alpha(t)$  - timing  $t$  moments average level of the whole economy of human capital. In addition, according to R.Lukas, the condition of accumulating capital could be as following:

1. Human Capital:  $\dot{h} = \phi h(1-u)$ , here  $\phi$  - learning efficiency or productivity.

2. Physical capital:  $\dot{k} = sk^\alpha h^{(1-\alpha+\psi)} u^{1-\alpha} - nk$ .

Here  $\dot{k}/k (\equiv \gamma_k)$  and  $\dot{h}/h (\equiv \gamma_h)$ , their  $(\gamma_k)$  physical capital and  $(\gamma_h)$  human capital for sustained growth. In addition, the dynamic equilibrium of capital growth equipment:

$(\alpha-1)\frac{\dot{k}}{k} + (1-\alpha+\psi)\frac{\dot{h}}{h} = 0$  is equal. Dynamic equilibrium conditions  $\alpha \neq 1$ ,  $\gamma_p = \phi(1-u)$ ,

$\gamma_k = \frac{(1-\alpha+\psi)\phi(1-u)}{(1-\alpha)}$  as well as  $\psi = 0$  да  $\gamma_h = \gamma_k = \phi(1-u)$  produced. The production growth

rate was determined by the growth of the whole of human capital and  $\psi > 0$ ,  $\gamma_h < \gamma_k$  has been the growth of human capital, physical capital growth, increase scientific conclusions.

## Economic growth models in R & D sector

There are a group of endogenous growth models of the economy, R & D (Research and Development), which is the name of the model, these models of "Innovation" is characterized as production. According to this approach, the production rate of innovation

( $g_a$ ) R & D sector contributors to funds ( $\psi_\delta$  - scientific and technical base of funds, namely: science, education, budget expenditures in this sector the number of employed and the growth of others, or -  $\mu_\sigma$  technology import, invited foreign researchers, specialists) and scientific potential ( $A$ ) are linked.

This group of models, "Solomon balance" ( $g_a$ ) is equal to  $g_a = \Delta TFP_t / TFP_{t-1} = \Delta A / A = \eta \cdot (\psi_\delta)^\gamma \cdot (\mu_\sigma)^{1-\gamma} \cdot A^\varphi$  and this model of "knowledge production" function is called.

At the same time, the  $\varphi$  - R & D sector, the scale of the accumulation of knowledge identifiable change rate (increasing or reduction);  $-\eta$  R & D sector investments efficiency (change) parameter;  $\gamma$  - copying technology policy

There exists a class of models of economic growth in the world economy, "Shumpetercha" growth models (Agxion Xovitt Pareto Dinopoulos Thomson), which is the name of one of the following:

$$g_a = \Delta TFP_t / TFP_{t-1} = \Delta A / A = \lambda \cdot (X / Q)^\sigma$$

Here  $\lambda$  - R&D the effectiveness of the sector policy,  $X/Q$  - an indication of the intensity of theoretical research  $X$  - R&D sector due to the growth potential of various products unit  $Q$ , on the rate of accumulation of knowledge,  $\sigma$  - copying technology policy.

In general, the growth of new theories and models of classic Köbbing Douglas and Solomon technological development, including a new factor, which is filled bilimlarbilan. In addition, both the production sector Kobbing valid link-Douglas function: Production and services manufacturing:

$$y_t = [(1 - f_k)K_t]^\alpha [(1 - f_h)H_t]^\beta [A_t(1 - f_l)L_t]^{1-\alpha-\beta}, \text{ while: } 0 < \alpha < 1, 0 < \beta < 1, \alpha + \beta < 1.$$

Knowledge in the manufacturing sector:

$$A_t = [f_k K_t]^a [f_h H_t]^b [f_l L_t]^c A_t^\theta, \text{ while } 0 \leq a \leq 1, 0 \leq b \leq 1, 0 \leq c \leq 1, 0 \leq \theta \leq 1$$

Participates in the production of knowledge as opposed to the human factor, he may not be able to participate in the production of knowledge at the same time.  $A^t$  knowledge of labor used in the production of the commodity. Human capital, labor and knowledge, together with the period  $t$  is used for the production of new knowledge.

## THE EXPERIMENTAL RESULTS AND INTERPRETATIONS

As noted above, the "human capital" in the country's economic growth (GDP) effects, the proof of this idea can be seen in the graph below correlation (Figure 1).

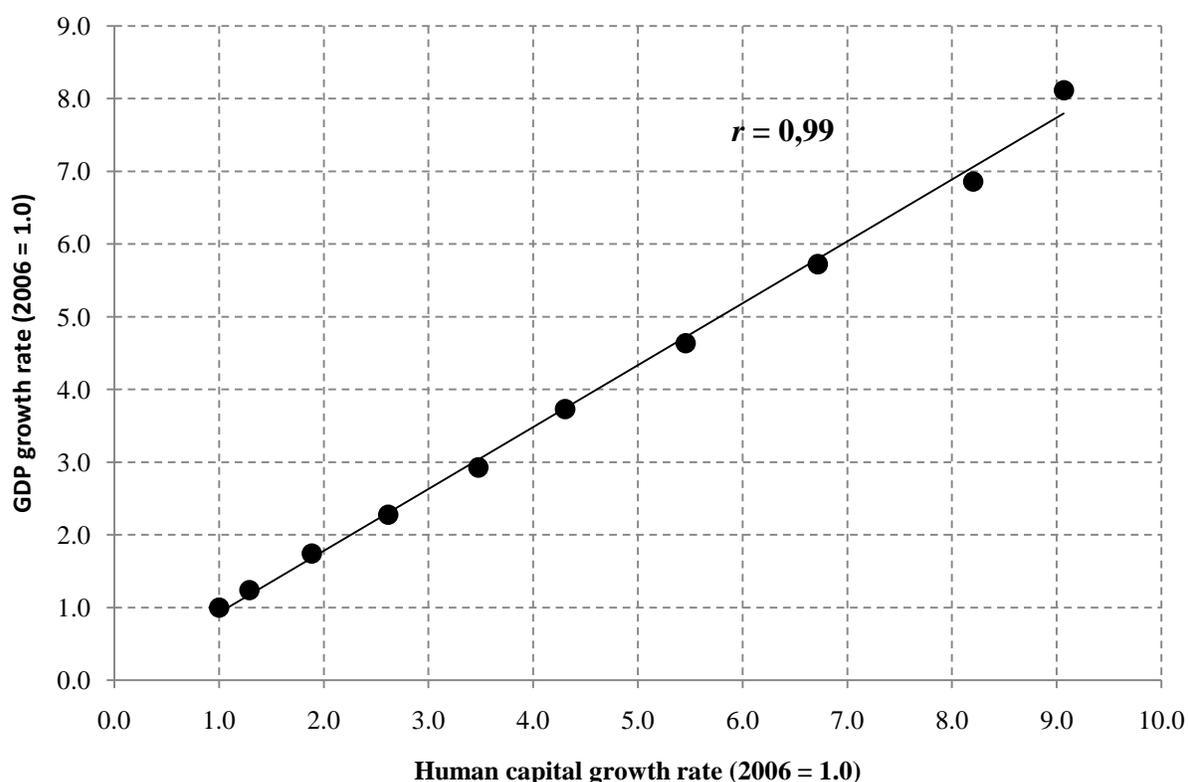
Correlation connections represent a coefficient of correlation and the "human capital" and assess the degree of intensity of the connection between the GDP.

Correlation coefficient values between -1 to +1, according to the power of the link. Direct connection as well as a positive sign, minus sign represents the reverse connection:

$$r_{xy} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\left( n \sum x_i^2 - \left( \sum x_i \right)^2 \right) \left( n \sum y_i^2 - \left( \sum y_i \right)^2 \right)}}$$

According to estimates, the correlation coefficient of 0.99, according to which "human capital" as well as a link between the level of GDP is too high.

Figure 1. Human capital and GDP correlation (2006 = 1.0)



Source: State Statistics Committee of the Republic of Uzbekistan and the author's calculations based on data from the Ministry of Finance.

Correlation the basis of the analysis of the correlation coefficient is not only a link between human capital and GDP measures the norm. However, does not reveal the reason. The method known as regression analysis, the purpose of this service, and it allows you to determine the

effect on the efficiency of human capital to GDP. Below the GDP growth rate and the growth rate of human capital are reflected in the regression equation:

$$g_{GDP} = 0.86g_H$$

This equation  $F = 9190.04$ ,  $R^2 = 0.999$ , the values of  $t = 95.8$  could be measured. The experimental results show that the human capital in addition to the additional 1% of GDP growth leads to a growth of 0.86%.

We have been conducting national Kobbing - Douglas production function, in addition to  $H$  (*Human capital*), including the factor of macroeconomic production function coding. As originally planned production function, we can write the following:

$$GDP = AK^\alpha L^\beta H^\gamma$$

At the same time,  $Y$ ,  $K$ ,  $L$  and  $H$ , respectively the country's GDP, the volume of investments in fixed capital, the average annual number of employed in the economy and state budget expenditure on social services and social support.

Practice, the multiplier form of the econometric model parameters was not possible to directly evaluate both sides of the production function of logarithmic, linear appearance thereof. In this case, the overall appearance will be as follows:

$$\ln GDP = \ln A + \alpha \ln K + \beta \ln L + \gamma \ln H + \mu$$

here,  $\mu$  - the effect of random errors.

Between the years of 2006-2016 economic dependence on the quantitative production on the basis of the material to be installed, then you will have the following regression equations:

$$\ln GDP = -0.06 \ln K + 0.32 \ln L + 0.96 \ln H$$

$$\begin{matrix} (-0.359) & (12.765) & (8.837) \\ [0.171] & [0.025] & [0.165] \end{matrix}$$

At the same time, (...) given in brackets become statistical values and  $t$  [...] the values given in square brackets, the standard errors. As well as,  $R^2 = 0.999$ ,  $F = 29930285$  respectively, but the econometric analysis, the  $K$  parameter is not statistically significant.

## CONCLUSION

The above results of the research and econometric models confirm that the long-term economic growth and the role of human capital is very high. In turn, investment in human capital, the development of professional skills and the quality of the person, the increase in the general level of culture, to stimulate demand and encourage the modernization of production as the same will lead to the development of the economy as a whole. According to the econometric analysis, the GDP growth rate and the growth rate of human capital according to him there is a positive

correlation between the value of these parameters can be a link between the level of 0.998, which is considered very high. The empirical results show that the human capital in addition to the 1.0% GDP growth leads to a growth of 0.86%.

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