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CONTRIBUTIONAL ROLE OF HIGHER EDUCATION TO THE GROWTH OF ECONOMY: AN EMPIRICAL STUDY FROM PAKISTAN

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ABSTRACT

Following article explores the higher education contribution to Pakistan's economic growth regarding years 1987 to 2016 by investigating the relation between the Pakistan's economic growth and education levels by using Cobb-Douglas Production function. Averaging techniques of Denison and Maddison model are used to calculate the contribution of Pakistan's higher education to the economic growth. The result showed that economic growth (real GDP) had significant relationship with real capital stock ($t=3.93$; $\rho=0.00$) and highly significant relation with educated labor force ($t=14.27$; $\rho=0.00$), which was calculated by using software "EViews 9". From this research, higher education contributes at very low level in Pakistan's economic growth (2.66%) while the composite education contributes (48.06%) of total annual growth rate in Pakistan's total economic development. This means, higher education contributes 0.11 % in total Pakistan's annual growth rate i.e. 4.27 %. This research explored that the basic education i.e. primary level, contributes majorly in growth of economy. The major reasons are, (1) average schooling years per capita received from Pakistan's higher education are fewer, (2) limited human capital possessing higher education is not effectively allocated and utilized due to unemployment. This research advocates that, in order to enhance Pakistan's economic growth and employment rate, Pakistan should focus to accelerate the higher education and try to exert it at work like conditioner in an engine.

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1. INTRODUCTION

In new growth, theories the main thing which considered as the locomotive of economic growth is human capital (Barro, 1991; Barro & Lee, 1993; Echevarría & Iza, 2006). Labor force skills, education level, healthiness, training, experience, and many other elements design the human capital. It comes into a person and enriches the labor efficiency and productivity. It positively effects the economic development (Lucas Jr, 1988). Education is known as the utmost significant factor in human capital stock as real GDP per Capita has a

constructive relationship with school enrollment (human capital) (Barro, 1991). Workers with different education levels, experiences, status of the health influenced significantly on participation of labor force and employment (Farid, Chaudhary, & Mali, 2012).

Pakistan is one of those countries which are enriched in human resource because it is 5th most populated country in the world. To utilize this massive human resource in Pakistan, education is of the supreme importance. It not only creates awareness amongst the people but also enhance the labor productivity and life quality. In 1947 literacy rate of Pakistan is only 16% which now stands at 57 %, according to the economic survey of Pakistan (2014-2015). This describes that the education profile of Pakistan is not very good. Pakistan spends insufficient percentage of GDP on education i.e. only 2.4 % (Economic Survey of Pakistan 2015-16). This research paper is an effort to calculate the higher education contribution in economic growth of Pakistan for the duration 1987-2016. This paper will also deliver suggestions and ideas for improving the higher education of human resource for its optimal utilization in Pakistan.

In a pioneer study, two American economists, T. W. Schultz and E. F. Denison, described the education involvement in the economic growth in 1960 by computing the contribution of education in economic development. Later on many European, Chinese and other scholars did their work in this field with similar and some quit different methods. In this research paper, the labor growth production function was constructed by using Cobb-Douglas Production function and then calculated the higher education contribution in Pakistan's economic growth by using the Denison and Maddison method.

2. LITERATURE REVIEW

Linking educational levels with economic growth and industries are obvious in the developed countries. Although education levels have no direct linkage with economic growth, yet economic development indicators which are known as variables are positively associated to education levels (Thomas, 1993). According to the new growth theories, human source is the key factor in the development of economy. According to the endogenous growth theory by Joseph Cortright, knowledge drives growth, so knowledge is the key variable for increasing return to economic growth along with other variables like physical capital, labor and technology (Cortright, 2001). Person with more knowledge (high level) show impact positively on the economic development than less educated person (Utku-İsmihan, 2012). In all countries, for development of an economy of each country knowledge is considered as vital teamster and, economic performance variation in these countries may be associated to R&D, information technology, and the time of educational investment, along with the economic policies which has influence on foreign direct investment and trade is one more important thing (Driouchi, Azelmad, & Anders, 2006).

By attending education and training systems, knowledge, expertise and proficiencies increases the human capital's quality, which significantly contributes to the development of country's growth (Burja & Burja, 2013). In 1986, Romer Endogenous Growth Theory, he explained that people used different endogenous variables like technological progress, research and development (R&D), government expenditure and human capital (having formal education as input), which are different from each other, for enhancing the economic growth (Romer, 1986). This endogenous growth model is different from the neo classical economic growth theory represented by Solow (1956). The endogenous economic growth theory delivers an innovative methodological foundation for reviewing the contribution of education to economic growth. In the production function, educational input can be used as an endogenous variable, though it is worth deliberating. In a country, the development of level of education and its demand and supply are limited by its capital, population, level of economic development and social affordability, but more significantly, by country's public policy and the educational requirements of the community.

According to the Cui yuping, with respect to the historical process of the emergence and development, education is not considered as endogenous variable in an economic system. In the field of economics, it cannot be entirely explained in the economic field, but this one has a key part in promoting the economic system. In reality a vital role is played by the education in the growth of an economy by improving the excellence and output efficiency of labor force. The quality of labor force must be enhanced by improving of workers' education level (Yuping, 2000, 2001). Hanushek and Woessmann explained that, for well-being of economy, education is considered as significant element. On the basis of literature of theoretical frame work, they classify the mechanism (how economic growth is affected by education) into three types. One is same as described in neoclassical growth theories, according to Mankiw et al (1992), the labor force inherent capacity (human capital) is enhanced by the education, due to which productivity of labor force upsurges, therefore provisional

growth of output reaches at its highest stage of equilibrium. Second is same as described in endogenous growth theories, Lucas (1988), Romer (1990), Aghion and Howitt (1998) elaborated their concept that, an economy's innovative capability can be enhanced by improvement in education, and along with this the new knowledge about upcoming processes, products, and technologies promotes economic growth. Third type of mechanism through which education effect on the growth of an economy is same as explained by Nelson and Phelps (1966) and Benhabib and Spiegel (1994), transmission and diffusion of information into existing knowledge can be facilitated by education, which is necessary to recognize and progression of new information, which helps to implement new technologies (newly invented by others) successfully, which also helps to stimulate economic progress (Hanushek & Woessmann, 2010).

For the development or growth of the economy of a country higher education has a lot of importance, so many of developing countries give priority to the labor force with higher education. An employee with high education contributes with quality and effectiveness for the growth of the institute or the country compared to the less educated employee (Barro, 1991; Bashir, Herath, & Gebremedhin, 2012; Becker & Lewis, 1993; Bell, 2011; Bergerhoff, Borghans, Seegers, & Van Veen, 2013; Chaudhary, Iqbal, & Mahmood Gillani, 2009; De Meulemeester & Rochat, 1995; Gardner, 2002; Gherghina & Duca, 2013; Gyimah-Brempong, Paddison, & Mitiku, 2006; Kimenyi, 2011; Kohoutek, Pinheiro, Čábelková, & Šmídová, 2017; Ozsoy, 2008; Pillay, 2011; Pouris & Inglesi-Lotz, 2014; Thomas, 1993; Zhu, Peng & Zhang, 2017; Yuping, 2001). Higher education significantly associated with the economic development of a country (De Meulemeester & Rochat, 1995). For an individual, higher education is a source of extensive rewards in the form of labor force earnings. Along with this, more potential and significant impact held on country's economic development and production capacity of that country (Hanushek, 2016).

Higher education plays imperative role in Pakistan's economic development, which means that there is significant relationship with the economic growth of Pakistan by using different models other than this study (Ali & Jabeen, 2015; Aziz, Khan, & Aziz, 2008; Qazi, Raza, & Jawaid, 2014). With the establishment of the higher education commission in Pakistan, certain steps (improvement of higher education quality and standard, controlling the higher education institutes etc.) were taken by this commission to improve the higher education in Pakistan, which has supported to increase the economic growth of Pakistan (Qazi et al., 2014).

3. METHODOLOGY AND ANALYTICAL FRAMEWORK

The study was performed on the data which was collected from the data base of World Bank (different indicators), Penn world tables and labor force survey by Pakistan Bureau of Statistics recorded for the period 1987 to 2016.

Different scholars used different scales in different countries to designate the education's contribution rate to economic development. Among these, it is a part to calculate the contribution of education to the GDP growth rate. To estimate the percentage of the growth rate (y_e) of gross domestic product (y), input of education is brought about as a factor. For calculation of the higher education contribution to economic growth, a well-known method was used which was implemented by American scholars Denison and Maddison. The rudimentary model for the calculation of education's contribution to economic development in Pakistan is as follows:

Assuming that the extent of land remains unaffected, the factors which lead to economic development are represented as capital (K), labor (L) and technological progress rate (A). K and L can be switched to each other and can be pooled in a variable section. It is also presumed that the economic development is in an absolutely competitive market economy, and the production factors are remunerated by their marginal products, while the reward scale remains unchanged. By assuming this, the output growth model of neutral technological progress in the time t array can be constructed as $Y_t = A_t f(K_t, L_t)$. In the meantime, the Cobb-Douglas production function is $Y_t = A_t \cdot K_t^\alpha \cdot L_t^\beta$. By considering the effect of education on the labor force quality, it is assumed that the education boosts the initial labor input. Therefore, the L_t (labor force) can be disintegrated into the product of the initial labor force (Lo_t) and the educational input (E_t). Consequently, the Cobb-Douglas production function can be articulated as $Y_t = A_t \cdot K_t^\alpha \cdot (Lo_t \cdot E_t)^\beta$. The total derivative of time t is obtained by taking the natural logarithm on both sides of the equation, and then the new differential equation is approximated, i.e. $y = a + \alpha K + \beta Lo + \beta e$, where y represents the annual economic growth rate, α is the real capital stock input elasticity of output, K is the annual real capital input growth rate, Lo is the annual growth rate of initial labor input, β is the labor input elasticity of output, and e is the annual growth rate of average educational years input. Then, the contribution of education to economic growth can be articulated as: $R_e = \beta e/y$. Here, y represents the annual growth rate of real GDP and e represents the annual growth rate of the comprehensive index of education which is calculated with respect to the education span per employee. Under the assumption, beta is the

proportion of labor input to total output, and alpha is the proportion of capital input to total output. The coefficient (alpha and beta) values diverse at different times and in different countries. C.W. Cobb and P.H. Douglas, American mathematicians inferred, based on the more than 20 years data in the early 20th century in the United States, that alpha was 0.25 and beta was 0.75. Here $\alpha + \beta = 1$, which shows the constant return to scale. A Chinese scholar, Zhou Tianyong, investigated the China's national income output results from 1953 to 1990, and settled that alpha was 0.8178, beta was 0.1093, here $\alpha + \beta < 1$, which describes the decreasing returns to scale. Another Chinese scholar, Cui Yuping, calculated the national income output results of china from 1990 to 2002, and concluded that alpha was 0.26 while beta was 0.74, which is constant return to scale.

4. ANALYSIS FOR CALCULATION OF PAKISTAN'S HIGHER EDUCATION CONTRIBUTION TO ECONOMIC GROWTH

In this research, on the basis of Cobb-Douglas production function, a regression model was constructed: $\ln Y = \ln A + \alpha \ln K + \beta \ln L_e$, here L_e is equal to the product of L_o and e , and the values of alpha and beta were obtained by using the software "EViews 9" for period 1987 – 2016, which are $\alpha = 0.34$ and $\beta = 0.54$. In this research result $\alpha + \beta < 1$ that describes the decreasing return to scale. The result shows that real GDP of Pakistan had significant relationship with real capital stock ($t=3.93$; $\rho=0.00$) and with educated labor force ($t=14.27$; $\rho=0.00$) during the period 1987 to 2016 at significance level 0.05 (5%).

In current years, the exact data of the span of education per employee at all levels cannot be attained, so we can only analyze the higher education contribution rate to the Pakistan's economic growth rate for the period 1987 to 2016 based on the data of two years 1987 and 2016 provided by Pakistan's labor force survey book.

First step was to calculate the employees' per capita comprehensive education index in 1987 and 2016 respectively. The education comprehensive index of employees characterizes the quantity of labor input carried out by the enhancement of level of education. According to the average annual income difference between primary, middle, secondary, higher secondary and higher educated employees from 1987 to 2016, it was presumed that the income of labor productivity of middle education employee was 1.2 times of the primary educated ones, the labor income of secondary education employees was 1.47 times of that of the ones with primary education. While the labor income of higher secondary education graduates was 1.87 times of that of primary education and that of higher education graduates was 2.67 times of that of primary education. Here 1, 1.2, 1.47, 1.87 and 2.67 can also be regarded as the coefficients of the quantity of labor force after receiving primary, middle, secondary, higher secondary and higher education, respectively, and the number of years of education per capita of labor force can be regarded as weights, and comprehensive index of education per capita of labor force can be calculated accordingly.

Table 1: Proportion of educational level of employed labor force in Pakistan (%) 1987 and 2016

year	Primary level	Middle level	Matric level	Inter level	Graduate level
1987	9.5	5.07	3.87	1.41	1.11
2016	15.08	10.16	9.92	4.89	4.76

Source: Labor force survey of Pakistan 1986-1987 and 2015-2016 from Pakistan bureau of statistics.

With respect to the table 1, the average span years of primary, middle, secondary, higher secondary and higher education for employees in 1987 were 1.048, 0.917, 0.639, 0.302 and 0.178 respectively. The average span years of primary, middle, secondary, higher secondary and higher education for employees in 2016 were 2.241, 2.378, 1.957, 1.158 and 0.762 respectively.¹ The average composite education index of year 1987 was, $E_{87} = 1.048 + 0.917 * 1.2 + 0.639 * 1.47 + 0.302 * 1.87 + 0.178 * 2.67 = 4.127$ and the average composite education index of year 2016 was, $E_{16} = 2.241 + 2.378 * 1.2 + 1.957 * 1.47 + 1.158 * 1.87 + 0.762 * 2.67 = 12.172$.

In the second step, calculate the annual growth rate of the per capita education index of primary, middle, secondary, higher secondary and tertiary levels and the average annual growth rate of the comprehensive education index (e) in the beginning and end years. For this calculation geometric mean method is used, the formula is; $e = (E_{16}/E_{87})^{(1/n)} - 1$, where n is the interval between starting and ending year and its value is 292 in this study. By using this formula the average annual growth rate of Pakistan's primary education index is 2.67 %, middle 3.34 %, secondary 3.94 %, inter 4.74 % and higher education is 5.15 % during the years 1987 to 2016.

¹ Calculation method: $2.241 = (15.08 + 10.16 + 9.92 + 4.89 + 4.76) * 5 / 100$, $2.378 = (10.16 + 9.92 + 4.89 + 4.76) * 8 / 100$, $1.957 = (9.92 + 4.89 + 4.76) * 10 / 100$, $1.158 = (4.89 + 4.76) * 12 / 100$, $0.762 = 4.76 * 16 / 100$

² $29 = 2016 - 1987$

By using the same formula the average annual growth rate of the Pakistan's comprehensive education index was calculated which is, $e = (E87/E16)(1/29) - 1 = (12.172/4.127)(1/29) - 1 = 3.80\%$.

In the third step, calculate the percentage of higher education in the annual growth rate of total education index. This step is further divided into different sub steps. In the first sub step calculate the average education index excluding higher education for year 1987: $1.048 + 0.917 * 1.2 + 0.639 * 1.47 + 0.302 * 1.87 = 3.65\%$ and for year 2016: $2.241 + 2.378 * 1.2 + 1.957 * 1.47 + 1.158 * 1.87 = 10.14\%$. Second sub step is to calculate the annual growth rate of education index excluding higher education: $(10.14/3.65)(1/29) - 1 = 3.59\%$. Third sub step is to calculate the annual growth rate of higher education index: $Eh = [(3.80 - 3.59) / 3.80] * 100 = 5.53\%$.

The fourth step is to calculate the average annual growth rate (y) of real GDP during the beginning and ending years. During the period 1987-2016, the average annual growth rate of real GDP was: $y = (y16/y87)(1/29) - 1 = (1175582400000/3492269009400)(1/23) - 1 = 4.27\%$.

Fifth step is to calculate the total education contribution in economic growth of Pakistan (Re). $Re = \beta e/y = 0.54 * 3.80/4.27 * 100\% = 48.06\%$.

In the sixth step, calculate the higher education contribution in economic growth of Pakistan (Rh). $Rh = Eh * Re = 5.53\% * 48.06\% = 2.66\%$.

In the last step, it was calculated that how much contribution involved by the other education level along with the higher education. By using the same methodological techniques, like higher education, contribution of different education levels in Pakistan's economy was calculated as;

Higher Secondary education Contribution:

$$Rhs = Ehs * Re = 7.04\% * 48.06\% = 3.38\%$$

Here Rhs represents the higher secondary education contribution in economic growth, Ehs represents the average annual growth rate of higher secondary education index and Re represents the contribution of composite education.

Secondary education Contribution:

$$Rs = Es * Re = 8.16\% * 48.06\% = 3.92\%$$

Here Rs represents the secondary education contribution in economy, Es represents the average annual growth rate of secondary education index and Re represents the contribution of composite education.

Middle education Contribution:

$$Rm = Em * Re = 9.47\% * 48.0\% = 4.55\%$$

Here Rm represents the secondary education contribution in economy, Em represents the average annual growth rate of secondary education index and Re represents the contribution of composite education.

Primary Education contribution:

$$Rp = Re - (Rh + Rhs + Rs + Rm)$$

$$Rp = 48.06 - (2.66 + 3.38 + 3.92 + 4.55)$$

$$Rp = 48.06 - 14.51$$

$$Rp = 33.55\%$$

Here Rp represents the primary education contribution in economic growth, Eh, Ehs, Es, Em represents the average annual growth rate of higher, higher secondary, secondary, middle education index respectively while Re represents the contribution of composite education.

The above calculation results shows that the average annual growth rate of GDP in Pakistan is 4.27% during the period 1987 to 2016, from which 2.05% are brought about by education, which is the 48.06% of the total average annual growth rate of Pakistan's GDP. This means that the education contributes 48.06% of in the economic development of Pakistan. The contribution of Higher education in economic growth of Pakistan is only 2.66%, which

is 0.114 % of total average growth rate of Pakistan's GDP i.e. 4.27 %. The results explored that the major involvement in the growth of Pakistan's economy was through primary education level of the labor force which was 33.55 % (1.43 % of total annual economic growth rate i.e. 4.27%), while the contribution of other labor force contribution was middle level 4.55 %, secondary level 3.92 %, higher secondary level 3.38 %, which was 0.19 %, 0.17 %, and 0.14 % of the average annual growth rate i.e. 4.27 % respectively.

5. DISCUSSION AND CONCLUSION

Labour productivity differ because of difference in wages and many other factors like, talent quality, hard work skills, working conditions, family background and so on. In this study difference is attributed to the difference in formal education and labor quality improvement, while the improvement of quality and skills cannot be entirely accredited to formal education.

In this paper an analysis was executed to identify the relationship and contribution of higher education with Pakistan's economic growth along with the contribution of other education levels of the labor force in the economic development of Pakistan. It is concluded from this study that education plays a significant role in Pakistan's economic growth for the period 1987 to 2016. 48.06 % of total annual growth rate of Pakistan's GDP is due to education. There is a valid and positive relationship between higher education development and economic growth in short run as well as long run (Qazi et al., 2014). The results show that the growth rate of higher education index was the fastest and its contribution to the annual growth rate of comprehensive education index should be the largest, but Madison's algorithm shows that Pakistan's higher education do not contribute highly to the economic development of Pakistan i.e. 2.66 %, 0.114 % of total annual growth rate of Pakistan's GDP. This may be because of the less number of years of education per capita, unavailability of proper working conditions or may be due to the unfit place of work with respect to education. Due to high unemployment ratio in Pakistan, highly educated people are doing job at low grade with low salaries, due to this their morale status drops down and they do not utilize their full efforts to show maximum output which helps to enhance the Pakistan's economic growth. In the perspectives of Pakistan's scenario primary and secondary education contributes very much in economic growth (Khattak & Khan, 2012). In Pakistan's economic growth higher education rate of return has a constructive impact (Aziz et al., 2008).

As the Pakistan is considered in underdeveloped or developing countries, so here the literacy rate is not so good and the results of this study also explored the involvement of basic education, especially primary and middle, more in growth and development of Pakistan's economy. It was concluded from the literature that the low educational level more contributes in the less developed and developing countries while in developed countries, the higher education involvement was very high in their econometric growth and development. In 2016, Hanif and Arshed emphasized on the contribution and significant impact of tertiary education in a country's growth and development of its economy as compared to other levels of education (Hanif & Arshed, 2016). But in 1982, Colclough examined the greater contribution of primary education level than that of other levels. For confirmation he explained that labor productivity increased through primary school education in both rural and urban areas and the return rate of this education level was very high (Colclough, 1982). Due to having more thinking creativeness, awareness of use of new technologies, having ability to learn new skills and tasks in easy way, higher education involves more and more in the human capital development for further increasing contribution in growth and development of a country. Along with that, it was the fact that as the investment in early education increases then later on the tertiary level education of the labor force increases, which will highly take part in the country's economic growth (Dickens, Sawhill, & Tebbs, 2006). There is a huge gap existed between the developing and developed countries and for reducing that gap considerable efforts were required by the developing countries. For that school attainment and quality of schooling must be increased by the developing countries, due to which they feel a lot of difficulties in enhancing or improving their econometric performance in long run (Hanushek, 2013). In 2010, UNESCO described the importance and investment in primary education level have reported more in developing or less income countries than that of developed or high income countries, and the development of basic education indicates the development in other levels of education in later which enhance the economic growth more and more. It was also concluded that growth and development cannot be boosted with only the basic primary education. By adding the secondary education into it strengthens the developing process. In other words we can say that the primary education along with the secondary education mark the clear boost up in a country's growth and development (Grant, 2017). In 2008, Ozturk explored that without an efficient human capital, any country cannot achieved the sustainable growth and development and that human capital basically depends on the education because of the key and significant importance of it in social, creative, productive, technological, and economic development. It also helps in income distribution improvement (Ozturk, 2008). In 2016, Nowak and Dahal explored the association and contribution of different educational levels in Nepal's economic growth. They founded the significant contribution of secondary and higher education in Nepal's economic growth while elementary education also positively impact on growth and development of Nepal but less significantly (Nowak & Dahal, 2016).

As it was perceived that the primary and secondary education played a significant role in growth and development of economies, but tertiary education impacts more on the country's growth as compared to the these basic education. This effect of education was mostly observed and experienced in developed countries than that of developing countries. Primary and secondary education levels were providing the base line of tertiary education and without this baseline no one can directly interact to the tertiary education. In developing countries, literacy rate represented as low so the improvement and enhancement in basic education can take part more in the economic growth of these countries. On the other hand, in developed countries, literacy rate becomes high so more education involves more in high achievements in economic growths. Although the basic education is important but it highly interacts with the tertiary education in the growth and development of an economy (Chatterji, 1998). A major source of more income, social status, knowledge, intuitiveness, skills and abilities are schooling. More the schooling more will the knowledge and capabilities of labor force and can take part more significantly in growth and development of a country's economy. The countries with low average schooling having low growth rate and their economic growth depends on the basic education levels, while the countries with high average schooling show high level of economic growth and their dependence on more and more higher education for sustaining the growth and development of their economies (Ozsoy, 2008).

This study may serve as support for policy makers and decision makers at countrywide level in formulating economic and educational policies for enhancement of labor education to higher education and its maximum utilization of that educational investment for upgrading the Pakistan's economic development.

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