Working Paper # 162

Impact of Human capital on Economic Growth: Evidence from Pakistan

By

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A publication of the Sustainable Development Policy Institute (SDPI).

Sustainable Development Policy Institute is an independent, non-profit research institute on sustainable development.

First edition: October 2017

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Abstract

Human capital is an intangible source managed mutually by the individuals and groups within the population. Many social indicators such as school enrolments, life expectancy, health, knowledge, and skills are collectively known as human capital. Usually, it refers to formal and informal education. In this study, we have considered formal education as an indicator to assess the impact of human capital on real GDP. The average weighted education level is used as a proxy for the human capital. The results of Johansen co-integration show, that human capital and economic growth are co-integrated, as there is a long run relationship between the two. Further, there is a need to invest in educational sector to maximize the human capital, which not only helps in economic growth but also contributes to economic development of the country.

Keywords:

Human Capital, Economic Growth, Real GDP, Education, Stationarity, Johansen Co-integration, Cobb Douglas Production Function

1. Introduction

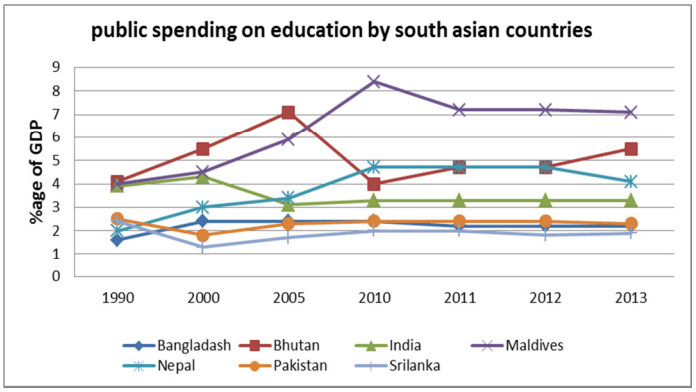
Human capital has a substantial importance in neo-classical growth literature and endogenous growth models. These models are more explicit and wide-ranging in order to explain growth rate within and income disparity between developed and developing countries. Neoclassical growth models incorporate human capital into production function as an additional input. In this regard, Mankiw et al. (1992) say that Solow model augmented with physical and human capital is more capable of describing growth differences among nations, and mostly the countries converge at a rate predicted by Augmented Solow model1.

The endogenous growth models, however, hold investment in human capital and knowledge important contributors in economic growth. According to various researches, the output of a worker at steady state depends positively on the R&D (accumulated human capital) and skilled labour. Similarly, increase in average educational attainment of the labour has a positive permanent effect on the long run growth rate of income per worker. Moreover, these models also assume that human capital has non-diminishing returns; it produces the stock of knowledge that further triggers the economic growth (Romer 1996, Segrestrom 1997, Chen and Hiau 2005, Fleisher and Zhoa 2010, and Pelinescu 2014).

1.1. Expenditure on Education

The graph below shows the expenditures of South Asian countries on education. A comparison of Pakistan's expenditures on education with other South Asian countries shows that there is a high fluctuation in expenditures of other countries. Pakistan, an economy of 180 million people, spends only two per cent of its GDP on education that is like a drop in the ocean.

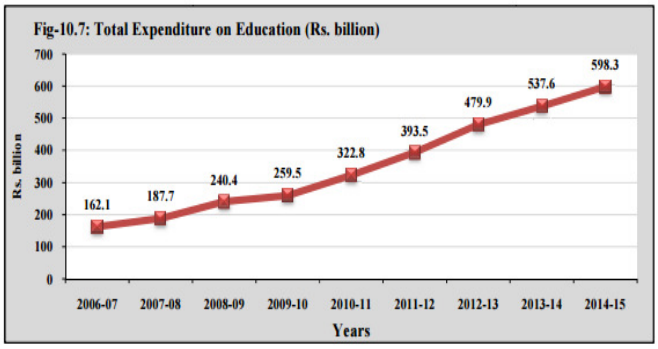
Figure-1: Expenditure on Education by south Asian countries.



Source: Pakistan economic survey 2014-15, UNDP and the World Bank.

Similarly, the amount of expenditure spent on education is increasing with the passage of time. In the figure, given below, we can see that there is sharp increase in expenditure after 2010, as compared to previous years.

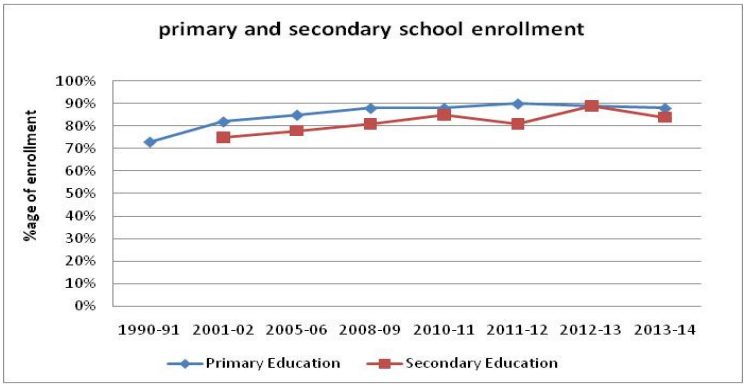
[1] To further see, Growth and Human capital Accumulation - The Augmented Solow Model (1993), by Carl Johan Delgaars, University of Copenhagen.



Source: Pakistan Economic Survey, 2015-2016.

According to the economic survey of 2013-14, the annual secondary level enrolment is 2.9 million as compared to 2.7 million in 2012-2013, which means a 7.4 % increase in the annual secondary enrolment. Figure 2 below shows the different levels of school enrolment in percentage for the years 1990-91 to 2013-14. The figure clearly shows that enrolment at primary and secondary levels is increasing. It further shows that the primary enrolment level is greater than the secondary enrolment, which means more drop out at secondary level. This may be due to financial constraints that do not allow parents to bear expense of further education of their children.

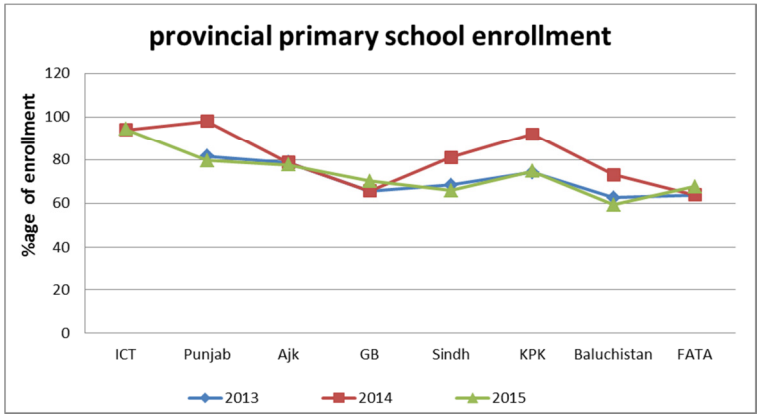
Figure 2: Percentage of primary and secondary enrolment



Source: The economic survey of Pakistan 2014-15.

In the same way, figure 3 shows the percentage of enrolment in primary schools in four provinces as well as FATA, GB, AJK and ICT. It clearly shows increase in primary school enrolment in all provinces in the year 2013-14. But, KP, Balochistan, and FATA had slightly low enrolment in 2015 as compared to previous years. This reduction might be due to the anti-education campaigns especially against girls' education as well as law and order situation in the areas that has negative impact on enrolment.

Figure-3: Percentage of province vise enrolment



Source: The Pakistan Economic Survey 2014-15.

In the figure, given below, the overall assessment of education sector is given. It comprises details of amount of enrolment, institutions and teachers in pre-primary, primary, middle, high, higher sec/inter, degree colleges, technical and vocational institutes, and universities. Interestingly, there is an increasing trend in enrolment amount of pre-primary, primary, middle, high, higher sec/inter, degree colleges, and technical & vocational institutes. However, there are alarming trends in enrolment amount of students in universities. Although, the number of institutions and the number of university teachers are increasing, the enrolment of students is decreasing.

Table 10.4: Number of Mainstream Institutions, Enrolment and Teachers by Level **(Thousands)**

Year	Enrolment			Institutions			Teachers		
	2013-14	2014-15 (P)	2015-16 (E)	2013-14	2014-15 (P)	2015-16 (E)	2013-14	2014-15 (P)	2015-16 (E)
Pre-Primary	9267.7	9589.2	9608.3	-	-	-	-	-	-
Primary*	19441.1	19846.8	20157.5	157.9	165.9	168.9	420.1	430.9	431.8
Middle	6460.8	6582.2	6735.8	42.9	44.8	45.6	364.8	380.8	388.7
High	3109.0	3500.7	3738.4	30.6	31.3	32.0	500.5	514.2	529.7
Higher Sec./ Inter	1233.7	1665.5	1785.0	5.2	5.4	5.7	124.3	118.1	124.3
Degree Colleges	674.4	1144.8	1517.7	1.1	1.4	1.4	26.0	36.6	35.8
Technical & Vocational Institutes	308.6	319.9	328.3	3.3	3.6	3.7	16.4	19.4	20.5
Universities	1594.6	1299.2	1294.1	0.161	0.163	0.170	77.6	88.3	94.0
Total	**42089.9**	**43948.3**	**45165.1**	**241.61**	**252.56**	**257.47**	**1529.7**	**1588.3**	**1624.8**

Source: Ministry of Professional & Technical Training, AEPAM, Islamabad
E: Estimated, P: Provisional, *: Including Pre-Primary & Mosque Schools

The main objective of the study is to capture the following questions;

- To assess whether enrolment can play a role in identifying human capital.
- To assess the status of human capital in the real GDP of Pakistan

The study proceeds as follows. After introduction in chapter 1, a brief review of previous studies and expenditures on education have been provided in chapter 2 and 3 respectively. Chapter 4 discusses analytical framework. Information on data and variables has been provided in chapter 5. Chapter 6 presents results and discussion of estimation, and chapter 6 concludes the study.

2. Literature Review

There is a plethora of research on human capital and its contribution towards the economic wellbeing and technological advancement. Human capital accumulation through educational advancement plays a vital role in growth and development. Investment in education has positive effect on economic growth with varying magnitude on developed and developing countries. Aghion et al. (2009) show that investment in higher education in advanced countries have greater impact on growth as compared to developing countries. Investment in higher education in developed nations combined with advancement in technology facilitates these nations to grow faster. Human capital and economic growth have been measured in different studies using different techniques. In previous studies, years of education have been taken as a proxy for human capital by estimating Mincer equation (Nasir and Nazli, 2001, and Behrman et al. 2008). According to these researches, the impact of different level of education has different impact on growth. The results of these study show that the contribution of human capital in economic growth is greater than the physical capital (Romer, 1996, Chen and Hiau, 2005, Fleisher et al, 2010, and Pelinescu, 2014). Mankiw et al. (1992) argue that an augmented Solow model that includes accumulation of human as well as physical capital provides an outstanding narrative of the cross country data. During an in-depth analysis they also observe a significant role of human capital that can also be measured by the secondary school enrolment rates. Another study of Lee and Lee (1995) used secondary school educational achievements for analyzing relationship between economic growth and human capital. The results of this study conform that the students' achievement score is more powerful and prominent factor for economic growth as compared to school enrolment. Because the higher level of education possess more human capital as compared to lower levels of education (Fernandez and Paolo 2000). This concept was empirically tested by Asteriou and Agiomirgianakis (2001) which describes that long run relationship of primary and secondary level with the human capital and economic growth. However, low quality and quantity of schools and health service can be a barrier in contributing to economic growth of the country (Pungo, 1996). The analysis of health status, and human capital on economic growth was further analyzed by Barro (1992) by using which used school enrolment and life expectancy as proxies. The results of study show that human capital and improvement in life expectancy have positive impact on the economic performance. This increase of educational level has effect on living standard as it is improved by wage of workers. The results confirm that the regions that have higher level of education, the workers' wage tend to high and vice versa (López and Motelón, 2012). Another study finds that that find that each year of education, the average earing of individuals increase by 7% on average (Nasir and Nazli 2001).

On the other hand, developing countries have poor infrastructure coupled with lack of sophisticated capitals and low technological advancement hurdles in efficient utilization of highly educated workers. In the context of Pakistan, numerous studies have been conducted to analyze the role of educational level on economic growth. Husain et al. (2015), Ali et al. (2012), and Jaleel & Idrees (2013) studied the long run relationship between the human capital and

economic growth of Pakistan using time series data varying for every study. The result of these studies validates that there is strong role of human capital on economic growth. Similarly, Afzal et al. (2010), Kakar et al. (2011) examine the long run association between educational expenditures and economic growth of Pakistan. The results of these studies find that there is a short run as well as long run relationship between school enrolment and economic growth in Pakistan. However, Afzal et al. (2010) argue that the relationship between school education and economic growth is negative in the short run. Inflation has negatively affects the economic growth both short run and long run. There is also a negative relationship between inflation and school education in the short run. Behrman et al compares the private and social return of low primary schooling with high quality schooling in rural areas of Pakistan. The results show that the rate of return to high quality schooling is 13% greater than the low quality schooling. However, the return of low quality schooling to no schooling is approximately equal to 18.20 and 20.5 respectively.

In a nutshell the role of human capital plays a pivotal role for the economic development of both developed and developing countries. Most of the studies separately study the impact of different level of education as a proxy of human capital for economic growth. There is dearth of empirical studies that attribute specific weight to the different level of education. To the best of our knowledge this is the first study that gives specific weight to different level of education in calculating the human capital and its contribution for economic growth of Pakistan.

3. Analytical Framework

This study follows the framework of neoclassical growth theories that consider human capital as an additional input into production function to show the impact of human capital on economic growth.

The Solow Model has been extensively used for growth accounting purposes. The neoclassical as well as endogenous growth theorists claim that human capital causes positive effect on the output. In such a situation omitting human capital may lead to biased results of estimates. That's why Solow Model could not capture the growth experienced in the world. Following Mankiw et al. (1994), and Jalil & Idrees (2013), we incorporate human capital in to the Solow Model. The Solow production function is given as below,

$$Y = A(K, L) \qquad (1)$$

Incorporating the element of human capital (H) in to the production function, which is given by equation 1, the production function takes the form of equation 2.

$$\mathrm{Y} = \mathrm{A}(\mathrm{K}^{\alpha}\mathrm{L}^{\beta}\mathrm{H}^{\gamma}) \qquad (2)$$

Where,

Y= Real GDP

A= Technology used for the production

K= Capital used for the production in economy

H= Human capital used in the production

L= Number of labour used in the production

And $\alpha+\beta+\gamma=1$

Here we assume that our production function depends only on human capital whereas capital (K) and labour (L) are constant. Though these two variables have their effects on real GDP, we incorporate only human capital as the function of real GDP to determine the effect to determine the effect of human capital (H) on real GDP (Y).

$$Y = A(H) \qquad (3)$$

The neo-classical growth theory includes human capital separately into production function. By introducing the factor of human capital separately, we can easily find the results and can show the impact of human capital on output.

We take seven different levels of school enrolment as proxy for human capital. Psacharopolous (1994) estimated the returns to each level of education: primary, secondary, technical, degree college, university enrolment and by retrieving the results of that paper, we gave weight to each level of education to obtain weighted average of aggregate level of human capital. As the human capital is the long run accumulation of knowledge from primary to higher level, therefore, by giving equal weight or separately finding the impact of each level of education as most of the studies have done is misleading (Aghion et al., 1994). In order to clear this bias, we give certain weight according to their contribution and find weighted average of aggregate education as a proxy for human capital.

We use the log-log model for our estimation. Taking the log of the equation 4 yields equation 5

$$\log(Y) = \log(A) + \beta\log(\text{Capital}) + \gamma\log(H) + \epsilon \qquad (5)$$

In equation 5, we can use α in place of log (A) as this is the intercept term in the model, $\log(\text{Capital})$ is denoted by LK and $\log(H)$ is denoted by LH. So the equation takes the form of

$$y = \alpha + \beta LK + \gamma LH + \epsilon \qquad (6)$$

3.1. Data and variables

This study uses time series data of primary, secondary school, higher secondary, technical, Degree College, university enrolment level and GDP of Pakistan for the period between 1992-2014. The data has been taken from Economic Survey of Pakistan 2014-15 and the statistical yearbook of Pakistan. This period shows a drastic increase in number of educational institutions. Particularly, after 2000 there were many new institutions established in Pakistan to promote education.

The real GDP has been taken in domestic currency. We computed it by dividing nominal GDP by GDP deflator with 2005 as base year. We used seven different levels of education in finding the weighted average education as proxy for human capital. These levels include primary, secondary, matriculation, technical, higher secondary, college and university enrolment.

Primary level enrolment involves the total enrolment from grade I to V. Secondary level enrolment involves total enrolment from grade VI to VIII. Matriculation enrolment involves total enrolment from grade IX to X. Technical enrolment consists of total enrolment in technical education. Higher secondary enrolment involves enrolment from grade XI to XII. College enrolment involves total enrolment of college students at bachelor's level. Similarly, university enrolment involves total enrolment of students at university level.

All these variables are in time series form and because of this there exists a trend in these variables.

4. Results and Findings

Before going to the rigorous econometric and time series analysis, It is important to check whether all variables are stationary and also they are associated with each other or not. So in order to cope with this problem, we have utilized two types of tests.

4.1. Augmented Dickey Fuller Unit Root Test

For stationarity of variables we have adopted unit root test. Table 1 presents the results of ADF unit root test for variables. As the T statistics shows that we cannot reject the null hypothesis of unit root at 5% level of significance. Therefore lag of output, lag of capital and log of human capital are non-stationary at level. In order to make them stationary, we transformed all the variables in to their first differences. Table 2 shows the results of ADF unit root test at first difference. The t statistics at 1%, 5% and 10% levels respectively, we can reject the null of hypothesis of unit root which means that our variables become stationary at first differences. These results are consistent to many similar studies that show that the economic and finance variables are nonstationary at the level and usually transformed into stationary at the first differences (Christopoulos et al., 2003).

Table 1: ADF Unit Root Tests for Variables

ADF Test for unit Root			
Variables	**ADF Statistics**		**Levels**
	T Statistics	**Probability**	**T Statistics**
LY_t	-1.316	0.6219	-3.648
			-2.958
			-2.612
Lk_t	-1.794	0.3835	-3.641
			-2.955
			-2.611
LH_t	-0.874	0.7963	-3.641
			-2.955
			-2.611

Table 2: ADF Unit Root Tests for Variables

ADF Test for unit Root			
Variables	**ADF Statistics**		**First Differences**
	T Statistics	**Probability**	**T Statistics**
LY_t	-4.807	0.0001	-3.648 *
			-2.958 **
			-2.612***

Lk_t	-5.808	0.0000	-3.648
			-2.958
			-2.612***
LH_t	-5.773	0.0000	-3.648*
			-2.958**
			-2.612***

Note: *,* and *** denote significant at 1%, 5% and 10% respectively.

4.2. Trace Test using Johansen Co-integration Technique

In order to check whether there is any long run association among the variables of interest, we used Johansen Integration techniques. The table 3 shows the results of co-integration between the log of output and log of capital and log of human capital. In case of co-integration, the null hypothesis is that there is no co integration between output and human capital, while the alternative hypothesis is that there is a long run association between the said variables. The rule of thumb for this method is that when the trace statistics and Max-Eigen value are greater than the 5 percent critical value, then we cannot reject the null hypothesis. In our case, the values of the trace statistics and Max-Eigen are greater than critical value so according to rule of thumb we cannot reject the null hypothesis. Therefore we can say that there is no co integration between output and human capital as the table 3 shows.

Table 3: The Trace Test for Johansen Co-integrating

Hypothesized No Of CI(S)	**Trace Statistics**	**5% Critical Values**	**Max-Eigen Values**	**5% Critical values**
Non	22.4471*	29.68	17.5545	20.97
At Most 1	4.8925	15.41	3.1092	14.07

5. Conclusion

Human capital has been considered the significant factor of economic growth and development. This study has made an attempt to analyze the impact of human capital on the real GDP or growth of Pakistan. The neoclassical growth theory suggests that the human capital is the input factor of production but they consider it like physical capital which has diminishing returns. Unless there is no technological innovation, economic growth cannot be achieved. The endogenous growth theory holds that the human capital is the separate strong factor of production and education, however, knowledge based economy has its spillover and multiplier effect, which leads to economic development.

In this study, we have tried to determine the impact of human capital on the real GDP or growth of a recent period of 1992 to 2014 for Pakistan. We have used the log-log model and employed the Johansen co-integration technique in order to find short run and long run association between human capital and economic growth. The results show that there is a long time association between human capital and economic growth, therefore investment in human capital has positive effect on the economic growth.

Recommendations

- Government should increase its spending on education especially in rural areas because majority of the population lives there.
- In the annual budget of Pakistan, a very low percentage is spent on the education sector whereas the sector has a potential and prominent impact on the real GDP of the economy.
- The establishment of Higher Education Commission (HEC) is an effective step in the country but there is a need to develop higher level of technical institutions which will not only help improve the effective and productive labour but also create a multiplier effect on economy in the long run.

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