

Relation between Human Capital and Economic Growth: Evidence from Pakistan

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Abstract

This study investigates the impact of human capital on economic growth of Pakistan. Gross Domestic Product is employed as a dependent variable. Human capital indicators (proxied through public sector spending on health and education, primary education, secondary education and higher education enrollment), physical capital and labor force participation rate are used as independent variables. The time series data is taken from various issues of Economic Survey of Pakistan and Labor Force Surveys for the time period 1971-2013. The long run between the variables is checked through Autoregressive Regressive Distributed Lag Model. Short run relationship is find out through Error correction model. The results explain that there is a significant and long run relationship between the variables.

Key Words: Human capital, Economic Growth, Health, Education, Pakistan.

Introduction Human capital is generally considered as the driving force or an imperative agent of economic development. Human capabilities may be improved by the means of education and health services. Human capital can be defined as the investment in human beings in terms of education, health and other human capabilities which would raise the productivity. Human capital may not be limited to knowledge or comprehension. In many models, contribution of health towards economic growth is positive and

significant. Mankiw, Romer and Weil (1992) examined that there lies a considerable association between the investment in human capital and economic growth.

According to Becker (1962) human capital is a composite theoretical concept. It has been defined as the knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity. This is an extensive definition and is not restricted only to education. It covers all investments in humans that are made to develop their skills.

Education creates understanding and awareness among individuals. The increased education level leads towards improved health which helps in increasing level of output. Moreover, education is an important factor in enhancing labor force participation which in turn increases productivity, Mincer (1996). Another important attribute is experience. In the course of productivity growth, the role of experience cannot be denied. The probability of committing errors declines with experience and hence output level increases.

Health and nutrition are the other important elements of human capital. A healthier worker is more able to take part in the production process as compared to his/ her unhealthy counterpart just because of his higher physical and mental capabilities. Health is considered a vital factor in order to find out the level of returns from education.

Physical investment is also another important factor to determine economic growth. As proper utilization of physical capital depends on human capital, physical capital without human capital is of less importance in an economy. Therefore the co-existence of the two capitals is very much necessary for the economic growth.

The main objective of this study is to empirically investigate the impact of human capital proxied through public spending on health (PSH), public spending on education

(PSE), primary level enrollment (PLE), secondary level enrollment (SLE), higher level enrollment (HLE) on economic growth of a country like Pakistan. Autoregressive Regressive Distributed Lag Model (ARDL model) and Error correction model (ECM) are used for the time series data period(1971-2013).

Objectives of Study

The objectives of the study are:

- To examine the impact of human capital on the economic growth of Pakistan.
- To identify the long run and short run relationship between the human capital and economic growth of Pakistan.

Research Hypotheses

H0: Human capital has no impact on the economic growth of Pakistan.

H1: Human capital has significant impact on the economic growth of Pakistan.

Research Question

What is the impact of human capital on the economic growth of Pakistan?

Literature Review

A view which is widely accepted in development economics is to consider the human capital as an explanatory variable in the production function.

Barro(1991)examined the relationship between human capital and economic growth. The independent variables comprises of the government policies or consumption and the educational attainment while the dependent variable employed is growth rate of real per capita GDP. Results showed that estimated coefficient on the schooling variable have highly significant and positive value.

Abbas (2000) compared the effect of human capital on economic growth in Pakistan and India. In this study output is considered as a dependent variable while labor, physical capital and human capital are used as independent variables. In this study the proxies for human capital are enrollment at primary, secondary and higher secondary levels. The results showed that in both of the countries secondary schooling was positively related and significant while at 1% level of significance, primary education was positively related in case of India and at 10% level of significance higher education was positively related in case of Pakistan.

Abbas (2001) examined that how the economic growth of Pakistan and Sri Lanka is affected by the human capital. The study used a standard human capital augmented production function where output growth is taken as the dependent variable while labor, physical capital and human capital are taken as the independent variables. The study used the enrollment rates at primary, secondary and higher secondary levels to be the proxy for human capital. It was found that there is a positive correlation between economic growth and human capital in Pakistan at 1% level of significance while in case of Sri Lanka at 5% level of significance at secondary and higher secondary level correspondingly.

Khan (2005) analyzed the role of differences in the quality of human capital. The empirical analysis used a model where the growth depends on investment, initial income, macroeconomic policy, institutional quality and labor quality. Different measures i.e. literacy rate, average years of schooling, secondary school enrollment and life expectancy are used to represent the quality of human capital. The study estimated the model for a group of 72 developing countries including Pakistan. Results showed that education and health indicators are highly significant and both influence growth independently of each other.

Qadri and Waheed (2011) evaluated the position of the human capital in economic growth of Pakistan. A standard Cobb-Douglas production function is used with human capital, physical capital and labor as inputs while real GDP per worker is taken as dependent variable. The study used health adjusted education indicator as a proxy for human capital. The results showed a positive correlation between human capital and economic growth in Pakistan in the long-run.

Idris and Rahmah (2012) examined the association between economic growth and human capital in Pakistan. A strong and positive relationship between human capital and economic growth was obtained after the estimation. One of the suggestions of this study was that sustained economic growth may be achieved in Pakistan by spending more on human capital. The estimations are done by using the simple formula used for the human capital index (average of the educational attainment index and health status indices). Results indicated a clear difference in human capital situation between rural and urban areas of Pakistan. With the help of investment in human capital, skills of workforce may be raised or boosted that would further increase the marginal productivity of capital.

Oluwatoyin (2012) analyzed the relationship between foreign direct investment, human capital and economic growth in Malaysia. The study employed a Cobb-Douglas production function where output is dependent upon the domestic capital, unskilled labor, foreign direct investment, human capital and exports respectively. The study showed insignificant effect of FDI on the GDP growth. Moreover a positive relationship between the human capital and economic growth was observed. Significant contribution of lower skilled labor force towards GDP growth was seen. In the long run, a rise of 0.25% in GDP would occur when an increase of 1% would be seen in highly skilled labor force and 0.33% in GDP per capital respectively. At 10% level of significance, a positive effect on growth had been showed from the exports side. One of the results obtained showed that domestic capital accumulation is responsible for the economic growth of the Malaysian economy.

Data and Methodology:

Data are obtained from different issues of *Economic Survey of Pakistan*. Human capital indicators are given in Table 1

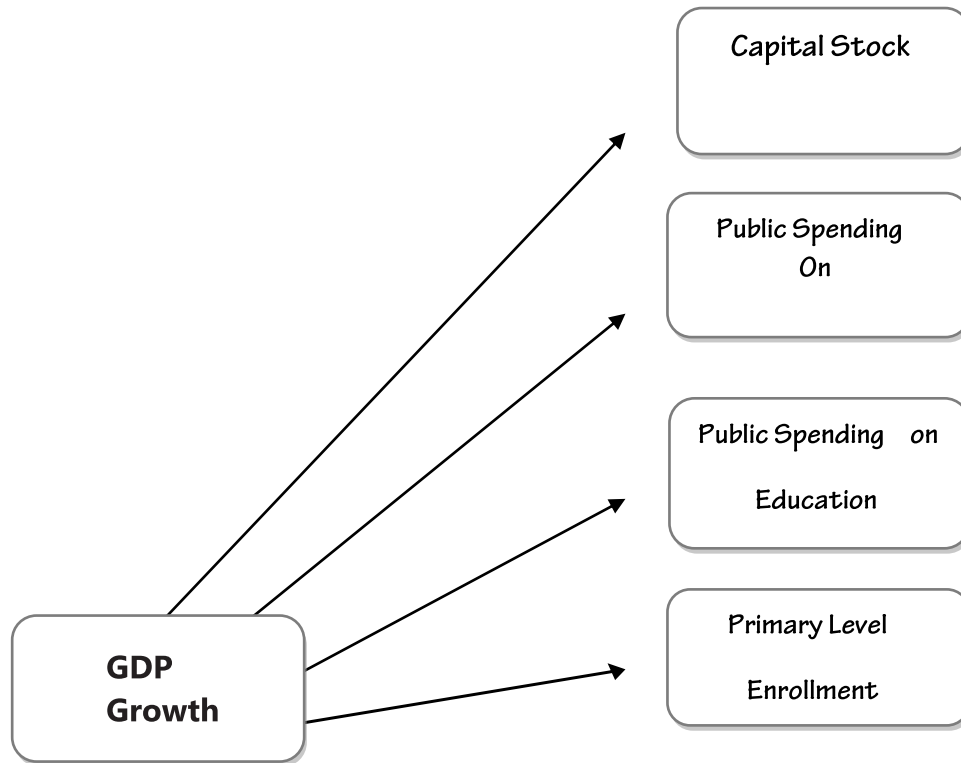
Table 1: Human Capital Indicators in Pakistan (1980-2013)

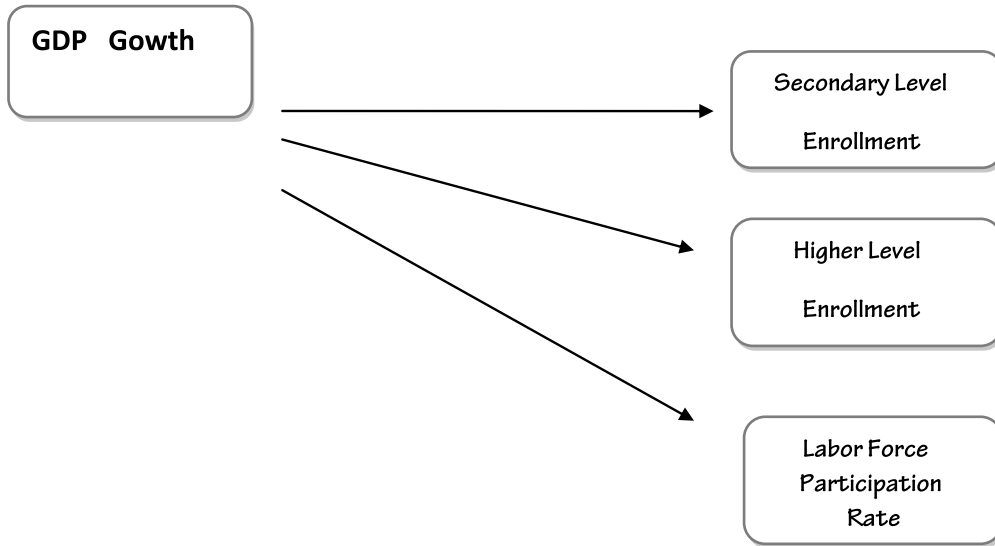
| Years | GDP Growth | Public Spending On Education | Public spending On Health | Primary Education Enrollment | Secondary Education Enrollment | Higher Education Enrollment | Labor Force Participation rate |
|-------|------------|------------------------------|---------------------------|------------------------------|--------------------------------|-----------------------------|--------------------------------|
| | (Annual %) | (% of GDP) | (% of GDP) | (Numbers) | (Numbers) | (Numbers) | |
| 1971 | 0.47 | 1.65 | 0.40 | 4210 | 366 | 17507 | 51.7 |
| 1980 | 6.60 | 2.13 | 0.72 | 5474 | 509 | 42688 | 46.60 |
| 1990 | 4.45 | 2.52 | 0.86 | 10837 | 913 | 61857 | 50.60 |
| 1995 | 4.96 | 2.82 | 0.86 | 14527 | 1525 | 82955 | 49.20 |
| 2000 | 4.26 | 1.84 | 0.58 | 14105 | 1565 | 124944 | 51.00 |
| 2001 | 1.98 | 1.80 | 0.59 | 14560 | 1574 | 276274 | 50.80 |
| 2002 | 3.22 | 1.80 | 0.58 | 15094 | 1589 | 331745 | 50.70 |
| 2003 | 4.84 | 2.00 | 0.57 | 16207 | 1800 | 423236 | 51.10 |
| 2004 | 7.37 | 1.95 | 0.57 | 18190 | 1936 | 471964 | 51.60 |
| 2005 | 7.67 | 2.25 | 0.57 | 17757 | 2188 | 521473 | 52.60 |
| 2006 | 6.18 | 2.63 | 0.57 | 17993 | 2373 | 605885 | 53.60 |
| 2007 | 4.83 | 2.64 | 0.57 | 18360 | 2484 | 741092 | 53.20 |
| 2008 | 1.70 | 2.75 | 0.56 | 18468 | 2556 | 803507 | 53.10 |
| 2009 | 2.83 | 2.59 | 0.54 | 18772 | 2583 | 935599 | 53.60 |
| 2010 | 1.60 | 2.29 | 0.23 | 18063 | 2630 | 1107682 | 54.00 |
| 2011 | 2.79 | 2.22 | 0.27 | 18667 | 2753 | 1319799 | 54.10 |
| 2012 | 4.02 | 2.14 | 0.35 | 18748 | 2824 | 1662477 | 54.20 |
| 2013 | 6.07 | 2.30 | 0.40 | 18756 | 3016 | 1969079 | 53.10 |

Source: *Economic Survey of Pakistan*, World Bank (Various Issues)

The current study focuses on impact of human capital on economic growth where the Gross Domestic Product growth (GDP) is used as a dependent variable. The independent variables are; human capital proxied through public spending on health (PSH) as percent of GDP, public spending on education (PSE) as percent of GDP, primary level enrollment rate (PLE), secondary level enrollment rate (SLE), higher level enrollment rate (HLE), physical capital proxied through capital stock (CS) and labor force participation rate (LFP).

The theoretical framework represents the relationship between the dependent and independent variables.





Human capital theory focuses on health and education as inputs to economic production. To understand the role of human capital in economic growth it is necessary to consider the possible links between human capital and growth. Specified non-linear regression model is given as follows.

$$GDP_t = PSH^{\delta_1} PSE^{\delta_2} PLE^{\delta_3} SLE^{\delta_4} HLE^{\delta_5} LFP^{\delta_6} CS^{\delta_7} GDP_{-1}^{\delta_8} e^{u^*} \quad (1)$$

It is clear that the relationship between GDP and explanatory variables are nonlinear. The logarithmic conversion of equation (1) yields the structural form of the production as:

$$\ln GDP_t = C + \delta_1 \ln PSH + \delta_2 \ln PSE + \delta_3 \ln PLE + \delta_4 \ln SLE + \delta_5 \ln HLE + \delta_6 \ln LFP + \delta_7 \ln CS + \delta_8 \ln GDP_{t-1} + ut \quad (2)$$

Equation (2) is linear in parameters. Though, it is nonlinear in variables dependant and independent variables but linear in the log of these variables δ s are elasticities of GDP with respect to various explanatory variables. That is, these parameters measures the percentage change in GDP for 1% change in each of these explanatory variables, holding the other variables constant.

The unit root test is employed to check the stationarity of the data. Long run relationship between the variables is tested through employing Autoregressive Regressive Distributed Lag Model. Wald Test is used to check that whether long run relationship exists between dependent and independent variables. Error correction model (ECM) is employed to study the short run association between variables.

Augmented Dickey Fuller Unit Root Test

In order to check the stationarity of the data, a value known augmented dickey fuller (ADF) unit root test is used. If the ADF value lies to the left of 10% level (test critical value), the variable is stationary otherwise not. All the variables (both dependent and Independent) would be tested to check presence of unit root. Table 2 shows the results of unit root test.

Table 2: Results of Augmented Dickey Fuller Unit Root Test

| Variables | Level/First Difference | ADF statistic | Variables | Level/First Difference | ADF statistic |
|-----------|------------------------|---------------|-----------|------------------------|---------------|
| GDP | Level | -5.20 | lnPLE | First Difference | -6.32 |
| lnCS | First Difference | -6.21 | lnSLE | First Difference | -4.49 |
| lnPSE | First Difference | -8.60 | lnHLE | First Difference | -5.16 |
| lnPSH | First Difference | -5.35 | lnLFP | Level | -3.70 |

Source: *Author's estimation based on specified data.*

The results show that GDP growth and labor force participation rate are found to be stationary at level. The independent variables like public spending on health, public spending on education, primary and secondary school enrollment, higher enrollment and capital stock are found stationary at first difference. Hence it is apparent that ARDL model would be applied as some of the variables are stationary at level and some of the variables are found stationary at first difference

Long Run Analysis

Cointegration is used to determine whether there prevails a long run equilibrium relation among the variables. The study used the bounds testing procedure to find the presence of a long run association between the variables. The order of lags for bound testing approach is obtained from Unrestricted Vector Autoregression (VAR) by means of the minimum value of Akaike Information Criteria (AIC) and Schwarz Bayesian criteria (SBC). Pesaran (2001) suggested two critical bounds to test F statistics. The lower bound assumes that the variables are integrated at level and there is no Cointegration among the variables while the upper bound assumes that the variables are integrated at first difference I(1) and there exist cointegration among the variables. If F- statistics is higher than the upper bound than H_0 of no cointegration among variables is rejected. If F- statistics is lower than the lower critical bound than null hypothesis of no cointegration is accepted which means that cointegration does not exist. If the F-statistic falls between the critical bounds then the test is considered inconclusive.

Table 3: Results Of Wald Test

| Test Statistic | Value | D.f | Probability |
|--|----------|-------------|-------------|
| F-stat | 6.039040 | (8,24) | 0.0003 |
| Chi-square | 48.31232 | 8 | 0.0001 |
| Source: Author's estimation based on specified data. | | | |
| Lower Bound | 3.67 | Upper Bound | 4.10 |

Source: Pesaran *et al.*(2001)

Auto Regressive Distributed Lag Model (ARDL Model)

Auto Regressive Distributed Lag Model is used to check the long run relationship between the variables. Results of ARDL are shown in Table 4.

It is found that the independent variables like primary enrollment rate, secondary enrollment rate and higher enrollment rate, public sector spending on health, public sector spending on education, labor force participation rate and capital stock have large effect on economic growth.

The empirical results indicate that school enrollment rate is found to have strong monotonic impact on economic growth of Pakistan. It is examined that 1 percent increase in primary enrollment rate tends to increase economic growth by 24 percent. Similarly secondary school enrollment has strong positive impact on economic growth. That is one percent increase in secondary education is likely to increase economic growth by 33 percent. It is found that higher enrollment rate education enrollment has significant positive effect on economic growth of the country.

Table 4: Results of ARDL Model

| Variables | Coefficients | t-Statistic | Probability |
|--------------------|--------------|---------------|-------------|
| Constant | -16.356 | -1.273 | 0.215 |
| lnPSH | .5085 | 2.369 | 0.043 |
| lnPSE | .4957 | 2.168 | 0.040 |
| lnPLE | 0.244 | 2.072 | 0.049 |
| lnSLE | 0.3139 | 2.2825 | 0.031 |
| lnHLE | 0.535 | 2.844 | 0.009 |
| lnLFP | 0.379 | 2.704 | 0.001 |
| lnCS | 0.478 | 2.736 | 0.005 |
| R-Square | 0.746 | Durbin Watson | 2.051 |
| Adjusted R- Square | 0.577 | F-Statistic | 4.416 |

Source: Author's estimation based on specified data.

If higher education enrollment rate increases by 1 percent, it tends to increase the economic growth of Pakistan by 53 percent. These results are confirmed by general findings of Abbas (2001), Abbas and Foreman-Peek(2008), and Hanushek and Woessmann (2012). All these studies found a positive relationship between human capital variables and economic growth.

Public sector spending on education and health is found to have positive impact on economic growth. It shows that one percent increase in public sector spending on education and health is likely to increase economic growth by about 50 percent. The result implies that government spending on education and health play a vital role in enhancing economic growth of the country.

Labor force participation is important to speed up economic growth. The estimation results indicate that labor force participation rate has significant positive impact on economic growth of Pakistan. That is 1 percent increase in labor force participation rate tends to increase economic growth by 38 percent. Likewise, capital Stock is found to have strong positive impact on the economic growth. We find that economic growth is likely to increase by about 48 percent as a result of 1 percent increase in capital stock in the country.

R-Square shows that about 75% variation in dependent variable is explained by variation in independent variables.

Error Correction Model (ECM)

Error Correction Model is used to examine the short run relationship between the variables. If there is any disturbance found in short run model, coefficient of error correction term indicates that how much adjustment would be required to adjust the economy back to the equilibrium. The respective results are provided in Table 5.

| Variables | Coefficient | t-Statistic | Probability |
|-----------|-------------|-------------|-------------|
| DlnCS | 5.02E-17 | 3.173921 | 0.0035 |
| DlnPSH | 7.67E-15 | 4.110247 | 0.0003 |
| DlnPSE | 1.10E-15 | 2.874474 | 0.0006 |
| DlnPLE | 6.64E-19 | 3.389779 | 0.0020 |
| DlnSLE | 6.67E-18 | 2.551224 | 0.0161 |
| DlnHLE | 3.68E-21 | 2.780823 | 0.0551 |
| DlnLFP | 7.15E-17 | 2.696001 | 0.0018 |
| DlnGDP_1 | 1.000000 | 1.45E+16 | 0.0001 |
| ECM_1 | 1.73E-16 | 1.283190 | 0.2093 |

Source: Author's estimation based on specified data. If the value of the error correction term is significant and negative and lies between zero and one, there exists a short run relationship between the variables. Our error correction term is not significant as shown in Table 5, there does not exist short run relationship between the variables.

Conclusion

The study confirms that human capital accumulation is a key determinant of labour market productivity. Education and health are two important indicators of human development and hence economic growth of the country. If the country does not maintain minimum levels of education and health of workers, it cannot maintain economic growth. So there is need to advance both the quality and quantity of education at each level.

Human capital indicators like public sector spending on health and education, primary education enrollment, secondary education enrollment and higher education enrollment show significant impact on the economic growth of Pakistan. Capital Stock also has strong positive impact on the economic growth of Pakistan. Efficiency of labor is increased by investment in human and physical capital that will in turn improve the productivity level. Hence economic growth is increased. The estimation results indicate

the existence of long run relationship between human capital and economic growth of Pakistan.

Policy Recommendations

- Annual budget allocation for education and health is very stumpy, so there is a need to allocate handsome amount for these sectors.
- Improved technology and efficiency are the important factors to economic growth so there is a need to give more attention to advanced technology, trainings and skill improvement or development of human capital.
- More emphasis should be on development of educational infrastructure by the government so as to increase the proportion of highly educated labor.

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