

Human Capital Formation and Economic Growth in Pakistan

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Abstract: The study aims to examine the role of human capital formation in economic growth of Pakistan by using annual data from 1979 to 2010. The variables such as fixed capital formation, infant mortality rate, ginicoefficient, education enrollment index and GDP are used for analysis. In order to test the stationarity of variables, study used ADF unit root test. To determine the long run and short-run relationship co-integration and error correction methods are used. Study implies that human capital formation in terms of health and education services is crucial for economic growth in Pakistan. Results show that human capital formation has the significant impact on GDP.

Key words: Pakistan • Economic Growth • Human Capital • Health and Education

INTRODUCTION

In Pakistan, large part of population lies below the poverty line. Most of the policy makers argue that by economic growth, we can reduce the poverty and unemployment but in Pakistan, situation is not like this. The main reason of slow economic growth in Pakistan is poor quality of education, lack of good health facilities, educated unemployment and lack of skilled manpower [1]. In Pakistan for poverty elimination, it is necessary that government allocate maximum budget on human capital formation, because it is an active factor of production. Many researchers used different proxies for measuring the human capital formation. The present literature expressed human capital by education and health components. Education and health are main factors of human capital formation, because in order increase growth rate of productivity and people must be skilled and free from diseases [2]. Despite the significance of health and education sector for economic growth of any economy; these are most ignored sectors in Pakistan. For boosting up these sectors it is required to plan policies and programs that advantage the poor people. Human capital is an important ingredient of economic growth. By increasing investment on human capital and creating more dynamic labor force, will gets higher future growth and income. If Pakistan government spends more on health and education sectors, this will leads to improve the living standard of poor. Theory of human capital implies that

society and individual get benefits from investment on people [18]. Higher level of education affects the labor efficiency and technical advancement which in turn increase the speed of economic growth. Study highlighted a long-run relationship between human capital formation and economic growth [22]. For effective utilization of other resources, it is necessary to improve the skills and capacity of people by education and provision of health facilities. In this way Pakistan is able to reduced unemployment and improves level of economic growth.

The aim of study is to investigate the relationship between economic growth and human capital formation in Pakistan. Give policy recommendation for development and sustainable growth of Pakistan.

Review of Literature: Ali *et al.* (2012) explored that human capital was very important for economic growth. Study concluded that people with higher education and good health take part in economic development and growth. Secondary data from the period of 1972 to 2011 has been utilized. Findings show that provision of education and health services are very important in order to ensure economic growth. Study estimate the relationship between economic growth and human capital by applying ordinary least square techniques and autocorrelation is detected by Durban-Watson test. Result shows positive relationship exists between human capital formation and economic growth [1].

Qadri and Waheed (2011) observe the relationship between human capital and economic growth by using time-series data from the period of 1978 to 2008. Result cobb-douglas production function shows that human capital has positive effect on economic growth of Pakistan [2].

Khan (2005) showed that human capital and economic growth were closely related to each other. Study used time series-data from 1980 to 2002 and used regression technique in order to find the relationship between economic growth and human capital formation. For analysis 73 low- income and middle-income countries are included in analysis sample. Result shows that health and education indicator's of human capital are associated with economic growth, moreover, a positive relationship between economic growth and human capital [3].

Asghar and Asma (2011) investigated the relationship between economic growths of Pakistan and found that human capital encouraged economic growth in Pakistan. Study used Johansen cointegration test in order to check the long- run relationship and short- run relationship among variables. Therefore results show that human capital and economic growth are strongly linked. Pakistan invests more in health and education services in order to ensure economic growth in the country [4].

Appleton and Francis (2008) examined the importance of human capital in economic growth and show that south Asia has better condition of human capital development than other African countries. GDP per capita is high in South Asia. African countries invest a less amount on indicators of human capital like education and health conveniences so the rate of economic growth is smaller in these countries. Study used different indicators of human capital such as life expectancy, school enrollment ratio and GDP and concludes that Africa has the lowest human development then other countries [5].

Murphy and Tamura (2009) examined the relationship between fertility, human capital and economic growth. Study shows that investment in human and physical capital discourage as the fertility increase. Moreover human capital moves up the rate of economic growth. Results show that investing on human capital has large returns in developed countries than less-developed countries [6].

Mayer (2011) investigates the relationship between technology diffusion, human capital and economic growth in developing countries. Study used data on import of machinery, from both developed and less- developed countries and expenditure on technology in the

developing country for examining the relationship between human capital and economic growth. For examining the role of imports of machinery they apply the growth-accounting framework. Results of growth accounting technique show that human capital stock and import of machinery have the significant impact on economic growth and result findings suggest that import of machinery for improving technology have positive relationship with economic growth [7].

Fafchamps and Quisumbing (2003) analyzed the relationship between human capital, productivity and labor allocation in four districts of Pakistan. Study shows that with higher education individuals earn more non-farm income and shift labor resources from farm work towards non-farm activities. The investigation illustrates that livestock production and crop productivity is affected by education. Moreover, effect of human capital on farm returns is to some extent realized through reallocation of labor from low productivity work to non-farm activities. For analysis study used data of household survey from four districts of Pakistan. Study proceed two steps for testing whether human capital increase productivity. First step involve estimation of labor supply and demand equation and in second step study estimate the production function. Results indicate that higher education persuades household to shift resources on the way to non-farm activities and education arise off-farm output [8].

Abbas and Foreman (2009) examined the relationship between economic growth and human capital and analyzed that human capital played a vital role in economic growth. Study used Johansen Approach for the estimation of long-run and short-run relationship. Results concluded that human capital is very important for economic growth of Pakistan. Study shows that by investing on human capital in the form of education and health services the GDP per capita increase rapidly [9].

Irfan *et al.* (2011) explored the relationship between human capital formation and economic growth. Study is based on endogenous growth theory. Granger causality test is used to test the casual relationship between human capital formation and economic growth. Study used time-series data from the period of 1972 to 2010. Cointegration results show that variables have long run relationship. The findings of causality indicate that human capital formation and economic growth have bidirectional casual relationship [10].

Jesus (2001) analyzed the importance of education in economic process. To investigate the importance of education on economic growth study recognizes two different ways. First, as a productive factor human capital

directly contributes in the production, this is called level effect. Second effect is called the rate effect in which human capital helps in moving up the technical progress. For estimation purpose study used pooled data from the period of 1960 to 1990. Level effect has been investigated by convergence analysis. Study obtains the proof of the existence of the direct effect by running a regression line. For describing the behavior of economy study estimates the dynamic system. Result shows that human capital and economic growth are positively correlated [11].

Gebrehiwot (2014) analyzed the short-run and long-run impact of human capital on economic growth by using the data from the period of 1975-2011. Study applies the error correction model and ARDL approach to cointegration for investigating the relationship between economic growth and human capital formation. Results show that there is long run and stable relationship between gross capital formation, health, GDP per capita, labor force, education and government expenditure. Study demonstrates that human capital in form of health and education services are the main components that raise the GDP per capita. These results are consistent with the endogenous growth theories which states that if any economy increase investment in human capital formation this will increase the productivity [12].

Fernandez and Mauro (2000) examined the role of human capital accumulation in economic growth of Spain. Study creates an index of human capital from the period of 1998 to 2007 for the Spanish employment force and on the basis of demographic improvements plan for next decades. The methodology takes into account both growth in labor productivity because of experience and educational improvements resulting from schooling. A growth accounting exercise is carried out from the period of 1978 to 1997 that helps in estimating the impact of human capital on economic growth of Spain. After that, potential output is estimated for considering the importance of human capital. Moreover, results show that higher education increases the productivity. Finally; results of this study proposed that amount of foregone output are huge because of unemployed youth [13].

Greiner (2007) investigated the relationship between public debt, human capital and economic growth. Study presents the human capital by endogenous growth model which states that human capital formation means the increase in public education and expenditure of the schooling sector are financed by public deficit and tax revenue. Results show that human capital formation and economic growth are positively correlated. Study used 3 sectors in the structure of the growth model,

productive sector, household sector, government sector. Result shows that with unfeasible fiscal policy, it is not possible to ensure economic growth [14].

Romer (1989) analyzed the relationship between human capital and economic growth. Study used theoretical framework and evidence for describing the importance of human capital for economic growth. The theory explains the conceptual structure by using the exploratory data analysis. The natural relationship between growth rate of input and growth rate of output are recommended by growth accounting process. Study runs regression equation for estimating role of human capital and physical investment. Moreover, empirical analysis is drawn for discussing the consequences of measurement error. For investigation sample of different countries are used from Heston and summer data set from the period of 1960 to 1985. The main practical result is that education has no extra explanatory influence in a cross country regression of other variables and growth rate of investment, but consistent with the model, the primary level of education does help predict the successive investment rate and ultimately the rate of growth [15].

Khan (2007) analyzes the role of human capital for attracting the foreign direct investment. Study concluded that one major reason of slow economic growth in the South Asian nations is illiteracy, irrelevant and inadequate skills and the use of outdated technologies. The ignoring skills are increasingly upsetting the abilities of regional countries to participate in the developing world marketplace, achieved sustainable growth and move from exports of primary goods towards export of finished goods. Study suggested that skilled and trained labor force highly attracting the foreign private investment. By analyzing the relationship between FDI and human capital study proposed that if South Asian gets benefit from foreign private investment they must skilled their workers. The key conclusion of the study is that human capital is very important in attracting the FDI and in enhancing the production [16].

Ogunade (2008) examined the role of human capital in economic growth. Study estimates the effectiveness of human capital development carried out in developing countries. Illustration is primarily from classical theory of human capital. Study developed a framework to estimate national skills development practices; it established the worth of HCD practices. By analyzing the general training program in India, South Africa and Singapore, study concluded that developing world must implement human capital development practices in order to increase economic growth. Study subjects to the long run

feasibility of existing practices in few developing countries and gives concentration to the requirement to change present HCD practices. Study shows that if human development practices are implemented in the developing world then these countries are able to produce competitive returns and excess value, which might be utilized to improve technology, expand economic growth and smooth the progress of economic development [17].

Khembo and Tchereni (2013) analyzed the importance of human capital formation on economic development in South African development community (SADC). The study examined that by provision of education and health facilities GDP per capita increase. For analysis, the study used panel data from the period of 1990 to 2005 and data is collected from 13 ASDC countries. The results show that education is positively correlated with economic growth. Study recommends that any economy give particular attention to the provision of health and education facilities for achieving the economic growth [18].

Akram *et al.* (2010) investigated the relationship between economic growth and health and viewed that GDP per capita increase as health of people becomes better. For determining the long-run relationship study applied cointegration test and to check the causality of variables Granger Causality test is used. The results show that human capital is an important factor for economic growth. They found a considerable impact of health on economic growth [19].

Khilji *et al.* (2012) explored the relationship between economic growth and human capital formation and investigated that how labor efficiency and productivity increase by improving the vocational training. For empirical analysis study used time series data from the period of 1980 to 2010. In order to check the long run and short run relationship among variable study applied Johansen cointegration test. Results show that productivity and labor efficiency improved by increasing the amount of vocational training [20].

MATERIALS AND METHODS

Study uses time-series data from the period of 1979 to 2010 collected from World Bank data, economic survey of Pakistan and indicators of world development. Infant mortality rate, Gini coefficient, fixed capital formation, education enrollment index and GDP are the variables that are used for analysis in this study. Specified model is given as follow:

$$GDP = \alpha_0 + \alpha_1 IM + \alpha_2 GC + \alpha_3 FCF + \alpha_4 EEI + \mu$$

IM = Infant mortality rate

GC = Gini coefficient

FCF = Fixed capital formation

EEI = Education enrollment index

GDP = Gross domestic product.

μ = Error term

Econometric Methodology: In time series model before estimation it is necessary to check the long-run and short-run relationship between variables. In literature there are different types of multivariate's and uni-variables techniques for checking the cointegration among variables. Before applying any cointegration approach it is required to identify the order of integration..

Unit Root Test:

Augmented Dickey Fuller (ADF) Unit Root Test: In order to check the unit root Dickey and Fuller [26] introduced a new test. This test was developed to solve the problem of autocorrelation because lagged terms dependent variable included as an independent variable. The lag lengths are either determined by Akaike Information criterion or by Schwartz, Bayesian Criterion (SBC) criterion such as lag length, which necessarily whiten the residual. To test the unit root ADF gives following three possibilities;

$$\Delta Z_t = \phi Z_{t-1} + \sum \gamma_i \Delta Z_{t-i} + \epsilon_t \quad (1)$$

$$\Delta Z_t = \alpha_0 + \phi Z_{t-1} + \sum \gamma_i \Delta Z_{t-i} + \epsilon_t \quad (2)$$

$$\Delta Z_t = \alpha_0 + \phi Z_{t-1} + a_2 t + \sum \gamma_i \Delta Z_{t-i} + \epsilon_t \quad (3)$$

These equations give the three different possibilities. Equation 1 shows the possibility when data has no intercept and no trend. Equation 2 states the possibility when just intercept found in the data only equation gives the possibilities when trend and intercepts are both found in the data. α_0 and α_0' deterministic components differentiate the above three equations the equations from each other. To check the acceptance or rejection of the null hypothesis McKinnon (1991) table of critical values is used.

Johansen Co-Integration Approach: For checking the cointegration between more than two series Johansen (1988) introduced a new approach. In this approach, ECM is extended into VECM. Now assume that we have three variables, L , M and N . we write this in matrix form as;

$$Y_t = [Y_t, M_t, N_t] \quad (4)$$

$$Y_t = \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_k Y_{t-k} + \mu_t \quad (5)$$

in the VECM framework we can written as;

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \Pi Y_{t-1} + \mu_t \quad (6)$$

While,

$$\Gamma_i = (1 - \beta_1 - \beta_2 - \dots - \beta_k) \quad (i = 1, 2, \dots, k-1) \quad (7)$$

$$\Pi = (1 - \beta_1 - \beta_2 - \dots - \beta_k) \quad (8)$$

Π It demonstrates the 3×3 matrix, which illustrates the long run relationship among $Y_t = [Y_t, M_t, N_t]$. The $\Pi = \phi'$, here ϕ indicates the adjustment speed towards equilibrium and χ' is long-run coefficient matrix. In case of single equation $\chi' Y_{t-1}$ is an error correction term. Assume $k=2$ to come across for the multivariate case. Now model is as below;

$$\begin{bmatrix} \Delta L_t \\ \Delta M_t \\ \Delta N_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta L_{t-1} \\ \Delta M_{t-1} \\ \Delta N_{t-1} \end{bmatrix} + \Pi \begin{bmatrix} \Delta L_{t-1} \\ \Delta M_{t-1} \\ \Delta N_{t-1} \end{bmatrix} + \epsilon_t \quad (9)$$

or in other words;

For ease only examine the error correction part of first equation. The first row of Π thematrix is;

$$\Pi_1 Y_{t-1} = ([\phi_{11} \chi_{11} + \phi_{12} \chi_{12}][\phi_{11} \chi_{21} + \phi_{12} \chi_{22}][\phi_{11} \chi_{31} + \phi_{12} \chi_{32}]) \begin{bmatrix} \Delta L_t \\ \Delta M_t \\ \Delta N_t \end{bmatrix} + \epsilon_t \quad (10)$$

also be written as;

$$\Pi_1 Y_{t-1} = \phi_{11} (\chi_{11} L_{t-1} + \chi_{12} M_{t-1} + \chi_{13} N_{t-1}) + \phi_{12} (\chi_{21} L_{t-1} + \chi_{22} M_{t-1} + \chi_{23} N_{t-1}) \quad (11)$$

Equation obviously states the speed of adjustment of ϕ_{11} , ϕ_{12} and two co-integrating vector.

About the rank of thematrix, there are three cases, which are given below;

- The variables in Y_t are $I(0)$, if Π has a full rank.
- There are $r \leq (n-1)$ cointegration relationships, when Π has a reduced rank

RESULTS

Unit Root Result: Dickey and Fuller, (26) have formulated a Dickey and Fuller unit test to check the non stationarity. The ADF has an additional advantage to abolish the autocorrelation. Because, it comprises additional lagged terms of dependent variable as an independent variable. The results of unit root test are as below.

Stationarity of all variables are checked with intercept and trend and intercept. The results shows that after taking the difference all variables are stationary at first difference. Values in the parenthesis are determined by using AIC criteria.

Results of Cointegration Test: Johansen and Juselius (1990) [27] cointegration test has been used to determining the long-run relationship between variables because all variables are stationary at same order of integration. In Johansen cointegration test trace and eigenvalue are used to obtain the co-integrating vectors, if the results of both two test (trace and maximum eigenvalue) are not same, then maximum eigenvalue must be preferred because in the small sample case, it is reliable [28]. There is no long-run relationship if cointegrating vector is zero ($0 = r = n$), on the other hand, if r cointegrating vector is existed; it means that is $(n-r)$ common stochastic trends exist between variables that link them together. Results of Johansen co-integration test has two test statistics trace test and maximum Eigen value that indicate 2 cointegrating equations at 5% level of significance. There does exist the long run relationship among variables in this model. Compare the critical values with the Eigen test and Trace test, there must be exist long run relationship if calculated values are greater than critical values.

Error Correction Modeling: Table 3 shows the ECM result. For determining the short-run relationship among variables, we apply the error correction model. Error correction term is significant and negative in sign but not lies between 0 and 1. Error correction shows the speed of convergence towards equilibrium. Result shows human capital formation and economic growth are positively related. Education enrollment index and GDP are also having positive relationship. GDP and GNI are negatively related.

Table 1: Results of ADF for Unit root test

Variable	Intercept			Trend and Intercept		
	Level	T-statistics	Conclusion	Level	T-statistics	Conclusion
LFCF	-0.089	-5.933	I(1)	-2.764	-5.823	I(1)
LIM	-0.649	-5.500	I(1)	-1.769	-5.441	I(1)
LGC	-0.398	-5.970	I(1)	-3.337	-4.560	I(1)
LEEI	0.273	-5.842	I(1)	-2.497	-5.925	I(1)
Gdp	-3.210	-8.318	I(1)	-4.320	-8.127	I(1)

NOTE: *=1% (level of significance), **=5% (level of significance), ***=10% (level of significance)

*MacKinnon (1996) one-sided p-values.

Table 2: Johansen Maximum Likelihood Test for cointegration

Hypothesis	Trace Statistic	0.05 Critical Value	Hypothesis	Max-Eigen statistic	0.05 critical values
None *	115.912	69.818	None *	52.366	33.876
At most 1 *	63.545	47.856	At most 1 *	30.183	27.584
At most 2 *	33.362	29.797	At most 2 *	22.979	21.131
At most 3	10.383	15.494	At most 3	10.124	14.264
At most 4	0.258	3.8414	At most 4	0.258	3.841

Trace test indicates 2 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 3: ECM regression results

Variables	Coefficients	t-values	R-Squared	0.776
Constant	-3.062	-0.802	Log-likelihood	-40.393
Δ FCF	3.30E+10	1.932	Adjusted R-Squared	0.582
Δ EEI	7630.970	0.320	F-stat	4.008
Δ GNI	1.92E+10	1.023	S.E. equation	1.354
Δ IM	0.647	1.579	Akaike AIC	3.751
Δ ECM(-1)	-2.404	-4.563	Schwarz SC	4.411

Notes: GDP is dependent variable

Conclusion and Suggestions: The purpose of study is to explore the relationship between economic growth and human capital development in Pakistan. For analysis time-series data has been used from the period of 1979 to 2010. The results show that there is long-run relationship between human capital and economic growth. Economic growth is positively related with education enrollment index. The fixed capital formation and infant mortality rate have a considerable impact on economic growth. In Pakistan spending on education and health sectors is remain less as compare to other developing countries, there is significant scope for increasing growth through investing more in human capital. It is exactly stresses that priority must be accorded to basic and secondary education; social spending and essential health care must be increased so as to guarantee that poorer people of country also have sufficient access to health services and basic education. Government should raise the literacy rate among male and females.

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