

Human Capital Capacity and Economic Growth: A Worldwide Analysis

*Muhammad Irfan Chani

**Muhammad Sajjad

***Dilshad Ahmad

Abstract

Human capital capacity proved to be an effectual indicator for potential growth of any economy. Current study analyzed the effect of human capital capacity on economic growth around the world. We took the cross-sectional data for the year of 2016 as a sample for 130 countries across the globe. Different techniques like t-test, F-test, ordinary least squares and standardized β coefficients were used to analyze the data. Economic growth was measured by GDP per capita and used as dependent variable while explanatory variables of the study comprised of human capital capacity, initial GDP per capita, gross fixed capital formation, and population size. The study concluded that human capital capacity enhanced the potential of the countries for economic growth around the world. The initial GDP per capita (as in 1960) had negative coefficient which reinforced the theory of growth convergence. The rest of independent variables had positive impacts on economic growth. The study suggested that policy makers should focus on promotion of skills, training and vocational and technical education in order to enhance the human capital capacity of its people. Such undertakings will result in better standard of living and speedy economic growth.

Key Words

Economic growth, Human capital capacity, Initial GDP per capita, population, Physical capital, ordinary least square (OLS)

*COMSATS University Islamabad, Vehari Campus, Pakistan,

**COMSATS University Islamabad, Vehari Campus, Pakistan,

***COMSATS University Islamabad, Vehari Campus, Pakistan,

1. Introduction

Human capital is a main component of economic growth and plays an important role to achieve economic growth targets (Mankiw et al., 1992; Rebelo, 1991; Sianesi & Reenen, 2003). This growth boots by different ways but the role of human capital is very important. Many countries are added in the list of developing countries because of low per capita income as compare to developed countries. Lower level of economic growth has many reasons such as underutilized resources, older methods of production, lack of innovations, outdated technology and the lack of technical education. Due to these reasons, aggregate level of production grows slowly. In fiscal year 2016 Pakistan's gross domestic product is has been 283.7 billion US\$. The GDP worth of Pakistan has represented 0.46% percent of the world GDP. Pakistan GDP has an annual average of 67.19 billion US\$ from 1960 to 2016.

In this study we include human capital capacity as an important variable that effect economic growth directly, or indirectly. An educated population has improved capacity to get advantages of new technologies, innovation and participates in a global level competition. According to the global human capital report (2017), the human capital capacity, that we use as an independent variable in this study, its facial appearance is in the form of general measures of formal educational achievement, disaggregated across age groups in the labor force. These accounts for the proportion of the population that has achieved at least primary, secondary, and university level education, respectively, and the amount of the population that have a basic level of literacy and numeracy. Over the previous decade, the world has jointly made a historical spending in the formal (necessary) education of its now 7.5 billion people. In this study we examined the data of 130 countries about their GDP per capita and other important factors and human capital capacity is one of them. The global ability contains of a large number of people who have formal qualifications of middle, average essential skills as well as advanced qualifications in various fields of specializations. According to global human capital report, most of the countries are close to achieving universal primary education and continuously moving in the direction of worldwide secondary education. But some countries have extended their human talent collection across generations in mostly prominent ways- among them are Singapore, Korea, Malaysia and other countries. This is not showing that those quality features are naturally distributed in each population. Socio-economic indicators have some drawbacks because in this way generally less focus to quality of education. In spite of variation in the consequence for socio-economic demerits,

already rich OECD countries have disadvantage in the form of students' underperformance every time.

There is also difference in the degree to which countries have been successful in structure of human capital capacity through tertiary education and with training their population for work in difficult era of global economy. The upward diversification of degrees as a total returns the increasing demand for particular skill sets in the whole economy over the last eras.

Manpower arrangement indicates planning of human resources for providing the development needs of the economy. According to Schultz (2007) there are five steps to improve human resources i) health; basic needs and services include all expenditure that affects the life expectancy, power and energy, of the population ii) on the jobs training, containing aid to learners/workers; organized by firms iii) preparation of a program for the provision of education on formal primary, secondary, and higher level iv) organization of study program for adults not by firms, including additional programs particularly in agriculture v) Managing the problems of migration of families and individuals for adjustments to changing job opportunities.

The aim of the study is to the role of human capital capacity in economic growth around worldwide senior. The study explores the role of human capital capacity, population in economic growth. It has following objectives:

- i. To examine the role of human capital capacity in economic growth in worldwide scenario.
- ii. To check the role of physical capital formation in economic growth around the world.
- iii. To examine the role of population in economic growth in worldwide scenario.

Our study has used new human capital capacity index which has been developed by World Economic Forum in 2017.

2. Literature Review

Wilson and Briscoe (2004) investigated the associations between education and training in EU member countries and their macro level economic development. They used annual time series data from 1970 to 2000. The study found a weak relation between investment in human capital and growth of gross national product, but no apparent causal relationship. Investment increased in the education sector to lead the better efficiency and enlarged their per capita income.

Reddy (2015) examined the human capital contributions to economic growth in India. Their study checked the contribution of human capital and investment in physical capital in the economic development of India by using cross- section data of twenty-six Indian states for the time period from 1995-96 and 1998-99. The study used ordinary least squares method to estimate the model through an aggregate production functions approach. The important finding that built up from their study was that a strong positive correlation existed between human capital and economic development.

Barabas (2016) examined human capital as a determining factor of the economic growth. They used panel annual data of 29 European countries from the year 2000 to 2013 to calculate the result of human capital and technology on economic development. The study used a pooled OLS estimator to estimate that model. Empirical estimates pointed out that there was a positive links of education and growth.

Vinod and Kaushik (2007) explained the role played by human capital in developing countries' economic growth. This study expressed that education was an important element of human capital that was used in the growth of GDP in augmented Solow-models. They used annual panel data for 18 big developing economies beginning from the year 1982 to 2001. They estimated a model using individual country OLS estimator time series regressions. Their results showed that human capital is a significant regressor of developing countries' economic growth. The results of the study were important for policy purpose. The study suggested extended educational opportunities and attention on skills in developing countries.

Qaisar (2001) examined the role of human capital in economic growth and compared the results of Pakistan and India. They used annual panel data of Pakistan and India for a comparative analysis over the period of 1970 to 1994. The major objective of the study was to analyzed the impact of human capital, outcomes of effective labor contribution, physical capital on economic growth. The study regressions were estimated using ordinary least squares (OLS) method. The coefficient of employment was positive and achieved significance in case of Pakistan, but same coefficient for Indian economy was negative and insignificant. Their results pointed out that the achievement of employment in Pakistan contributed positively to the growth of gross domestic product (GDP) but not for Indian economy.

Gould and Ruffin (1995) studied the relationship among human capital, trade, and economic growth. The study tried to derive the effect of human capital and contribution in production, its role in scientific improvement and long run progress. They used Solow growth model as a benchmark. Annual growth rate of real GDP per working-age individual for the period 1960 to 1988 used as a dependent variable and independent variables were the log of real GDP per working age person, the log of the population, growth of knowledge, rate of physical capital growth, the log of the stock of human capital and trade to estimate the model. The results put forward that the role of human capital in open and closed economy was significant but less important in closed economy. Their result showed that correlation among stock of human capital and growth fluctuated with respect to trade management.

Pede et al. (2008) studied the technological leadership, human capital and economic growth in U.S states. The paper used panel data for 48 U.S states from the period 1969 to 2003. The study investigated the role of freedom, technological leadership and human capital by using different techniques as spatial econometrics, OLS, GM, estimator and MRW model and presented estimates for U.S states by using these approaches. Their results showed that the effect of human capital was significant and positive for high income group, but the spatial overflow outcomes of human capital was positive but not significant for the high-income group. When no difference among both spatial groups, as well as for low-income groups, both were negative. The paper found out that a well-built contribution of human capital to growth in a neoclassical framework, although much low contribution in an endogenous growth setting.

Levin and Raut (1997) explained the complementarities between export and human capital in economic growth of semi-industrialized countries. This theoretical research used cross-sectional data of 30 semi-industrialized developing countries for the period 1965 to 84. The method of extreme bounds analysis was used to estimate the model. Their estimates designated that a higher level of complementarity among education spending and trade policies. On the other hand, their analysis created a strong and forceful inference that this understanding an interaction connecting the average education and export was fundamental to be considered which was ignored by preceding studies. These findings were essential for sustainable development policies that encourage investment in human capital and investment in the manufactured export sector.

Wang and Yao (2003) examined the sources of incorporating human capital accumulation in china's economy. In the study, they used time series data from the period 1952 to 1999. They used ordinary least squares to estimate the effect of human capital stock in China. They found that accumulation of human capital was relatively fast, and it subsidized extensively for development and welfare. Second finding stated that after including human capital, the expansion of total factor productivity (TFP) contributed positively in gross domestic product in the sample period, though it was negative in the present period. The analysis of the paper suggested that if china was to sustain economy than a high precedence should be set to human capital accumulation and productivity development.

Azarnert (2010) explored the impact of free public education on private educational investment, fertility and human capital accumulations on different levels of economic development. The paper used a standard growth model to explain that when fertility was considered as endogenous, than parental human capital stages were fundamental for the outcomes of open education system. The results according to new stages of development were totally different because when parental human capital was high, the accessibility of without cost public education crowds out private educational assumption, encourage fertility, and may well hindered growth. Analysis of the study implied, that compulsory high level of human capital is accomplished by increasing human capital accumulation and give attention on excellence in the efficiency of the private educational investments.

Holtz-eakin (2016) examined the capital accumulation, productivity, and economic growth. This study used Solow model on data for U.S. states. In the paper, empirical study provided a qualitative evidence for the Solow model of economic growth. The typical investment rate, the growth rate of labor force, rate of technological development and accumulation of human capital are good estimator of GDP per worker. Finally, the strong confirmation in support of disagreement with simple models of endogenous growth. Still, human capital played a key role in the estimation equation supported a straight-line growth returns of human capital in all state. The study also found a strong relationship between human capital investment and physical capital investment and both played an important in economic development.

Chen et al. (2011) studied the labor market friction, human capital accumulation and economic growth for long run period. They calibrate coefficient value of U.S. quarterly data from the period

1951 to 2003. The study they built up an endogenous growth model which unfolded human capital accumulation and labor market friction as essential elements of economy. Their investigation described the important role of labor market resistance in evaluating macroeconomic activities and policy usefulness. Their results found out that a raise in the effectiveness of human capital accumulation, a fall in the job division rate were raising employment, vacancy creation, learning effort, and outcomes development. Their mathematical results implied that the consequences of communal policy plan developed into the bigger as the austerity of labor market frictions enlarged, which reconfirmed the fundamental role in labor market friction.

Abubakar et al. (2015) studied the financial development, human capital accumulation and economic growth for the economic community of West African states (ECOWAS). They used panel cointegration methodologies as well as the FMOLS and DOLS. Their result exposed that credit of private banks and the credit domestic private subsidies considerably contributed to economic growth in the ECOWAS and encouraged human capital accumulation in these countries. These consequences suggested that as long as access to credit for creativities and specialization was part of suitable financial strategies, would inspire economic growth in the ECOWAS states.

3. Data and Method

The specific form of our model is

$$Y_i = \alpha_0 + \alpha_1 HCAP_i + \alpha_2 IGDPPC_i + \alpha_3 GFCF_i + \alpha_4 POPT_i + \mu_i$$

- Y= Real gross domestic product in billion PPP dollars
- HCAP = Human capital capacity
- GDPPC =Initial Gross domestic product per capita (1960)
- GFCF = Gross fixed capital formation in million USD
- POPT = Total population in millions
- μ = error term/disturbance

3.1 Sources of Data

In this study data on Real GDP_PPP, Gross fixed capital formation, and total population have been composed from the World Bank's World Development Indicators. Data for human

capital capacity has been taken from the global human capital report by World Economic Forum (2017).

4. Result and Interpretation

The estimates of the regression analysis are presented in table 1.

Table 1: Regression Analysis

Dependent Variable: RGDP_PPP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPI	3.062529	1.046014	2.927809	0.0048
GDPPC1960	-0.010011	0.005315	-1.883672	0.0645
GFCFUSD	0.004856	0.000421	11.52206	0.0000
POPT	3.929271	0.241703	16.25662	0.0000
C	-126.9103	51.67511	-2.455928	0.0170
R-squared:0.975601				
Adjusted R-squared:0.973947				
F-statistic:589.7907				
Prob(F-statistic):0.000000				

Estimates presented in table 1 indicate that human capital capacity is used as an explanatory variable in the model. The coefficient of human capital capacity has positive value. Its means that when human capacity increases, on the other side real GDP_PPP also increases. When human capacity level decreases its effects on RGDP_PPP are positive and level of Real GDP_PPP also decreases. We have null hypothesis of human capital capacity index, which states that coefficient of human capacity=0, and alternative hypothesis are coefficient not is equal to 0. The probability of t-test stat against coefficient of human capacity is (0.0048) that is less than 10 percent, so we will reject null hypothesis of coefficient is insignificance and accept alternative which states that coefficient is significant. These results are inline and consistent with Chani et al. (2012); Chani et al. (2014).

Initial gross domestic product per capita in 1960 as an independent variable is negatively connected with dependent variable Real GDP_PPP. In 1960 the poor countries, had GDP per capita very low, covered by Solow growth theory, that poor countries in present have high GDP per capita growth rate compared with those richer countries having their initial high GDP per capita in 1960. So, it is negatively related and fulfilled the Neo-classical theory and convergence hypothesis. In

this case we also reject null hypothesis (for coefficient of initial GDP per capita) due to less p-value (0.0645) than 10 percent level of significance, and we will accept alternative hypothesis that the coefficient is significant.

The impact of gross fixed capital formation is positive on the dependent variable Real GDP_PPP. The coefficient of the independent variable is 0.004856. It indicates that when gross fixed capital formation level has increased then Real GDP_PPP also will increase and vice versa. The null hypothesis is coefficient is equal to zero and the alternative is that is not equal to zero. But in this case the probability of coefficient for t-test is 0.0000 that is less than our significance level 0.10. So, we reject the hypothesis stating coefficient is insignificant and accept the hypothesis that coefficient of physical capital significantly appears in our model.

Now we see the impact of total population on Real GDP_PPP. The coefficient of total population is 3.929271 that shows the positivity of the relationship between total population and Real GDP_PPP. With the increase in total population, Real GDP_PPP also increases but if total population level decreases its mean Real GDP_PPP also decreases. Null hypothesis is rejected at our significance level. We conclude that the relationship is significant.

R^2 describes explanatory power of regression model. The value 0.975601 means that 97 percent variation in Real Gross Domestic Product in Purchasing power of parity dollar is explained by human capital capacity, initial gross domestic product per capita in 1960, gross fixed capital formation and total population. The remaining 3 percent variation in Real GDP_PPP is due to other variables which are not included in our regression model.

F-Statistic illustrated the overall significance of regression model. The null hypothesis is H_0 : overall model is insignificant, and the alternative hypothesis is H_1 : overall model is significant. In our analysis the F-Statistic (589.7909) and its P-value (0.000000) is less than 10 percent significance level, so we will reject H_0 overall model insignificant and accept H_1 the overall model is significant and conclude that the regression model and its results are reliable and significant.

Table 2: Standardized Coefficient

Dependent Variable: RGDP_PPP			
Variable	Coefficient	Standardized Coefficient	Elasticity at Means
CAPI	3.062529	0.036827	0.276138
GDPPC1960	-0.010011	-0.054487	-0.074561

GFCFUSD	0.004856	0.566074	0.656691
POPT	3.929271	0.547723	0.320408
C	-126.9103	-	-

In this study we used scaled coefficients method to calculate the standardized regression coefficient. The magnitude of these standardized coefficient is used to explain order of importance of independent variables for our dependent variable. The estimates of standardized coefficients are reported in table 2. We see that the value of standardized coefficient of gross fixed capital formation coefficient is the highest so, it is most important for economic growth. The second important factor is population (labor force) for the process of economic growth. The coefficient of initial GDP per capita is on third rank of importance among our explanatory variables for economic growth because its standardized coefficient value lower as compare to GFCF and labor force. Similarly, the human capital capacity takes last but not least rank among our determinates of economic growth due to small value (0.036827) of standardized coefficient.

5. Conclusion and Recommendations

This section concludes the important outcomes of the study. This study checks the impact of human capital capacity on economic growth around the world. The study uses the cross-sectional data for the 130 countries around the world. Data for human capital capacity is taken from Human Capital Report 2017 by World Economic Forum (WEF). Data for rest of the variables like initial GDP per capita, total population, gross fixed capital formation and Real GDP in purchasing power parity dollar has been taken from world development indicators database by World Bank. In this study we used the different techniques to find results. We used cross sectional regression analysis, t-test, F-test and standardized regression coefficients.

The results show that human capital capacity pose positive impacts on the economic growth around the world. Furthermore initial GDP per capita of 1960 has negative coefficient in regression of real GDP_PPP. This confirm the validity of absolute convergence hypothesis around the world as proposed by classical economist. The gross fixed capital formation shows a positive impact on economic development and the effect of total labour force proxied by population is also positive. Overall results of this study are significant based on F-test. Additionally the model has very good

explanatory power and is good fit because R^2 is high. Generally this study concludes that human capital capacity plays a positive role in the way of economic development around the world. This study suggest that investment in skills and traing aswell as in human capital infrastructure must be stimulated around the world.

References

- Abubakar, A., Kassim, S. H. J., & Yusoff, M. B. (2015). Financial Development, Human Capital Accumulation and Economic Growth: Empirical Evidence from the Economic Community of West African States (ECOWAS). *Procedia - Social and Behavioral Sciences*, 172, 96-103. doi:10.1016/j.sbspro.2015.01.341
- Azarnert, L. V. (2010). Free education, fertility and human capital accumulation. *Journal of Population Economics*, 23(2), 449-468. doi:10.1007/s00148-008-0205-8
- Barabas, C. S. (2016). Human Capital As a Determinant of the Economic Growth - a Panel Data Approach. *IV*(5), 28-45.
- Chani, M. I., Hassan, M. U., & Shahid, M. (2012). Human capital formation and economic development in Pakistan: an empirical analysis. *ACTUAL PROBLEMS OF ECONOMICICS*(6), 486-495.
- Chani, M. I., Jan, S. A., Pervaiz, Z., & Chaudhary, A. R. (2014). Human capital inequality and income inequality: testing for causality. *Quality & Quantity*, 48(1), 149-156. doi:10.1007/s11135-012-9755-7
- Chen, B. L., Chen, H. J., & Wang, P. (2011). Labor-Market Frictions, Human Capital Accumulation, And Long-Run Growth: Positive Analysis And Policy Evaluation*. *International Economic Review*, 52(1), 131-160. doi:10.1111/j.1468-2354.2010.00622.x
- Gould, D. M., & Ruffin, R. J. (1995). Human capital, trade, and economic growth. *Weltwirtschaftliches Archiv*, 131(3), 425-445. doi:10.1007/BF02707911
- Holtz-eakin, D. (2016). National Tax Association SOLOW AND THE STATES : CAPITAL ACCUMULATION , PRODUCTIVITY , AND ECONOMIC GROWTH Author (s): DOUGLAS HOLTZ-EAKIN Published by : National Tax Association Stable URL : <http://www.jstor.org/stable/41789037> STATES : CAPITAL ACCUMULA. 46(4), 425-439.
- Levin, A., & Raut, L. K. (1997). Complementarities between exporters and human capital in economic growth: Evidence from the semi-industrialized countries. *Economic Development and Cultural Change*, 46(1), 155-174.
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437.
- Pede, V. O., Florax, R. J. G. M., & Groot, H. L. F. D. (2008). Technological Leadership, Human Capital, and Economic Growth:A spatial Econometric Analysis for U.S. Counties 1969-2003. *Annals of Economics and Statistics*, 87-88(May 2006), 103-124.
- Qaisar, A. (2001). Endogenous Growth and Human Capital : A Comparative Study of Pakistan and Sri Lanka. *The Pakistan Development Review*, 40(4), 987-1007.
- Rebelo, S. (1991). Long-run policy analysis and long-run growth. *Journal of political Economy*, 99(3), 500-521.
- Reddy, K. L. N. (2015). Human Capital Contributions to Economic Growth in Production. 44(3), 473-486.
- Schultz, T. P. (2007). Chapter 52 Population Policies, Fertility, Women's Human Capital, and Child Quality. In T. P. Schultz & J. A. Strauss (Eds.), *Handbook of Development Economics* (Vol. 4, pp. 3249-3303): Elsevier.

- Sianesi, B., & Reenen, J. V. (2003). The returns to education: Macroeconomics. *Journal of economic surveys*, 17(2), 157-200.
- Vinod, H. D., & Kaushik, S. K. (2007). HUMAN CAPITAL AND ECONOMIC GROWTH: EVIDENCE FROM DEVELOPING COUNTRIES. *The American Economist*, 51(1), 29-39.
- Wang, Y., & Yao, Y. (2003). Sources of China's economic growth 1952-1999: Incorporating human capital accumulation. *China Economic Review*, 14(1), 32-52. doi:10.1016/S1043-951X(02)00084-6
- Wilson, R. a., & Briscoe, G. (2004). The Impact Of Human Capital On Economic Growth : A Review Review. *Impact of education and training*(54), 1-64. doi:10.1016/S2212-5671(15)00258-0
- World Economic Forum. (2017). *The global human capital report 2017*.