



Impact of Human Capital on Economic Growth: A Panel Study

Saba Jameel

COMSATS Institute of Information Technology, Vehari, Pakistan.

Muhammad Zahid Naeem

Department of Economics University of the Punjab, Lahore, Pakistan.

Abstract

Pakistan is in the race of economic development like other developing countries. The government of Pakistan, like that of other developing countries would invest in human capital at the expense of its economic growth. This issue is more sensitive in nature, which is going to be explored through the relationship between human capital and economic growth in case of a panel of eleven (11) countries. This investigation is accomplished by using the panel data during the period 1992-2014. The gross domestic product (GDP) as the economic indicator and the investment, net secondary school enrollment, health expenditures, total labor force and life expectancy at birth as the human capital indicator. The panel econometrics tools like Panel Augmented Dickey Fuller (ADF) unit root test, Pooled OLS test, fixed effect test, redundant variable f-test and Hausman test are applied to investigate such a relationship. The results derived by applying these panel econometrics tools show that there is a long term relationship between the real gross domestic product (GDP) and human capital in fixed effect OLS test.

Keywords: GDP, Human Capital, Life Expectancy, Investment

JEL Codes: J24, J17, P33

I. Introduction

The Pakistan economy has been en-routed on the road towards growth recently. The rate is 5% above, then the low income and middle income countries. General Musharraf government increased the opportunities for public in the macroeconomic sector. Although, Pakistan's economy grew gradually but its growth is less than the high developing countries. Some important and major components in investment level and Human capital describes these factors. Education sector, top most important factor, did not grow as such as it was required. The school system in Pakistan is the cheapest system of providing education. Barrow and Lee (2000) say that the Pakistan schooling system quality is very low in comparison to South Asia and Southeast Asian countries. The overall world population is living in poverty where economist and researcher find the best option to live in and have settlement. In Pakistan 30 percent population live in poverty. Easterly and Levine (2001) have put it, it is the "A" in the standard Cobb-Douglas production function, i.e. $Y_t = A_t f(K_t, L_t)$ that is key to growth, where Y is output, K the capital stock, L the quantity of labor, and "A" is generally taken to be total produced. Productivity has the greatest impact on the growth it determines the efficiency. Productivity is not only showing the technical progress it also left effects on other factors as well. There is also empirical learning that explains the relationship between the education and human capital and economic growth. As the workers' education will be high the productivity will be increasing due to efficiency of workers. Because well-educated worker will be able to use the new technologies. This is the macroeconomic effect that influences the income and education. Early studies, including those of Mankiw, Roomer, and Weil (1992) and Barrow and Sala-I-Martin (1995) found a significant positive relationship between cross-country changes in the initial level of education and later rates of growth.

Easterly and Levine (2001), and Temple (2001), that studied the link between years of schooling and variations in economic Growth failed to find an important relationship. Bosworth and Collins (2003) also fail to find a robust link between educational quality and growth, and particularly cannot distinguish learning quality of more general concepts of the quality of institutions. Some researcher also submit that the association between education and growth is frail. Founding of skills offers no benefits if the infrastructure and institutions do not exist to make use of them. In other words, there is complimentary between human capital development and other growth determinants such as infrastructure and institutions. Growth accelerations tend to be correlated with increases in investment and trade, with real exchange rate depreciations, and with political regime changes. Bosworth and Collins (2003), Abed and Devoid (2004), and Kemal, Musleh-ud Din, and Qadir (2002), find that the only increase in production cannot explain economic growth. There are different procedures to represent the human capital. These include investment, gross secondary school enrollment, health expenditures, total labor force and life expectancy at birth. Single variable inflation is used as a proxy variable which shows the economic plans and complete quality of organizations.

This study will focus on the impact of human capital on economic growth in case of eleven (11) countries. The variables which are included in this study have direct impact on the economic growth. The basic purpose of the study is:

- To measure the relationship between economic growth and human capital;
- To measure the relationship between economic growth and health expenditure;
- To measure the relationship between economic growth and total labor force;
- To measure the relationship between economic growth and investment;
- To measure the relationship between economic growth and school enrolment;
- To measure the relationship between economic growth and life expectancy at birth;
- To measure the relationship between economic growth and inflation;

II. Literature Review

Sheiner (2014) has measured the perspectives on Health Care Spending Growth for the year 1960 to 2012. The econometric techniques like integration regression growth per capita are used to measure the relationship. They find that economic growth is low then the health expenditure and inflation. Sghari and Hammami (2013) have measured the relationship between health expenditure and GDP in developed countries from year 1975 to 2011. The econometrics techniques like long run causality test granger causality and vector autoregressive are used to measure the relationship. They find that the long run relationship between increase in health care and economic growth is stable and also find that the relationship between health expenditure and economic growth is positive.

Anyanwu and Erhijakpor (2009) have measured the Health Expenditures and Health Outcomes in Africa from year 1994 to 2004. The econometrics techniques like panel data regression equation for under five mortality and infant

mortality is used to measure the relationship. They have found the unambiguously negative relationship between per capita total and government expenditure and also find that the coefficients are significant. Though greater expenditure on health outcomes is being advocated by many, little empirical evidence exists on the beneficial impact of such expenditure on infant and child mortality.

Ramesh and Nishant (2004) have estimated the time series analysis of private healthcare expenditures GDP: co-integration results with structural breaks from year 1960 to 2003. The econometric techniques like ordinary least square method unit root test co-integration are used to measure the relationship. They find that PCI and PHE are not stationary in their level. Null hypothesis unit root are rejected.

Khan and Ssnhadji (2001) have estimated the threshold effects in the relationship between inflation and growth from year 1960 to 1998. The econometric techniques like panel data log likelihood ratio test are used to measure the relationship between inflation and growth. They find that the existence of threshold effects in the relationship between inflation and growth using new econometric techniques that provide appropriate procedures or estimation and inference. The empirical results strongly suggest the existence of a threshold beyond which inflation exerts negative effect on growth.

Attari and Javed (2013) have estimated Inflation, economic growth and government expenditure of Pakistan from year 1980 to 2010. The econometrics techniques like Augmented Dickey Fuller (ADF) unit root test, ARDL, Johansen co-integration and Granger-causality test are used to measure the relationship. They have found the negative relationship between GDP and inflation. The estimated relationship between real income and government expenditure is positive and the same sign had been found in the case of Australia, Canada, Finland, New Zealand, Spain, Sweden and United Kingdom.

Gokal and Hanif (2004) have estimated the Relationship between inflation and economic growth in case of Fiji from year 1970 to 2001. The econometrics techniques non-linear least squares and NLLS methods are used to measure the relationship. They have found that the existence of a threshold beyond which inflation exerts a negative effect on growth. Inflation levels below the threshold levels of inflation have no effect on growth, while inflation rates above the threshold have a significant negative effect on growth.

Asari et al. (2011) have analyzed Multivariate Time Series Analysis on Correlation between Inflation rate and Employment rate with Gross Domestic Product in case Malaya from 1982 to 2006. The econometrics techniques multivariate time series analysis unit root test co-integration test, trace test, maximal eigenvalue test, vector error correlated model granger causality test. They have found that inflation rate and employment rate influence the GDP in short. GDP is unable to affect the inflation. There is a negative relationship between the employment and GDP in the long run.

Ocaya, Ruranga, and Kaberuka (2012) have analyzed the dynamic relationship between gross domestic product (GDP) and domestic investment (DI) in Rwanda for the period 1970 to 2011. The econometrics techniques like unit root test Granger Causality; Co-integration; Vector Auto-regression (VAR) and Vector Error Correction Model (VECM) are used to measure the relationship. They have found that the unidirectional causality suggests that policies initiated towards GDP provide important information for predicting DI in Rwanda. The results of the estimation of the bivariate VAR together with those of Granger causality tests and error correction model underscore the irrelevance of the GDP equation and the appropriateness of DI equation in our adopted model. Our estimated bivariate VAR (1) model was found to be stable in first difference, but not in levels. The forecasted value of DI in 2011 is 22.6303% of GDP while the actual value in 2011 was 22.7% of GDP. The difference shows that GDP can predict DI with small error of 0.0697%. The small difference between the actual and forecasted values in DI may be explained by the commendable policies the Rwandan government and the private sector federation have been pursuing in promoting investment in the country.

Mofrad (2012) has analyzed the relationship between GDP and investment in case of Iran from year 1991 to 2008. The econometrics techniques unit root test Johansson co-integration test is used to measure the relationship. They have found the long run relationship between variables. There exist a positive and significant long term relationship between investment and export with gross domestic production at 95% confidence level. But the relationship of investment and export is negative. Analysis of the vector error correction model for GDP indicates an error

correction coefficient is negative which due to the high value of the GDP in the short run than long-term equilibrium value.

Guech, Heang and Moolio (2013) have analyzed the relationship between Gross Domestic Product and Investment: The Case of Cambodia from year 1993 to 2011. The econometrics techniques using simple regression analysis, Augmented Dickey-Fuller test, Durbin-Watson test, Breusch-Godfrey Serial Correlation LM test, Breusch-Pagan-Godfrey test, and Jarque-Bera test. They have found there is a positive relationship between investment and GDP in the long run in Cambodia. Their results concluded that Cambodia tends to benefit less from FDI because of the internal factors of the country. Compared to other countries, particularly listed in their study, Cambodia probably benefits less.

Fatima et al. (2011) has tested the relationship of private investment and economic growth with fiscal deficit in case of Pakistan from year 1980 to 2009. The econometrics techniques like Unit Root Test, Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests are used to check the stationarity of the data and result showed that all series strongly reject the unit root null hypothesis at 5 percent significance level. They have found the consequences of fiscal deficit which affects economic growth directly and indirectly. The fiscal deficit itself showed a negative and significant impact on INV.

Lahoti and Swaminathan (2013) have measured the Economic Growth and Female Labor Force Participation in India from year 1983 to 2010. The econometrics techniques like test robustness is used to measure the relationship. They found that there is significant positive effect of growth in agricultural employment share on female employment, but growth in agricultural value share has no significant effect on female employment. The difference in results across value shares and employment shares might be due to low level of correlation between value added and employment generation in the agricultural sector.

Mujahid and Naeem Uz Zafar (2012) have measured Economic Growth-Female Labor Force Participation Nexus An Empirical Evidence for Pakistan from year 1980 to 2010. The econometric techniques like ADF Unit Root Test Philips and Perron Unit Root Test Zivot-Andrews Unit Root Test the ARDL Bounds Testing Approach to Co-integration. They have found there is a strong link between economic growth and female labor supply so that the policy makers should concentrate on increasing and improving female's education and skills. The adoption of gender specific wage laws may be reduced the earning gap between both the genders. Moreover, measures to improve the employment opportunities along with the expansion of the manufacturing and industrial sector will contribute to increase the female labor supply.

Hossain (2012) has analyzed the labor force and GDP in Bangladesh from year 2000 to 2009. The econometrics techniques like OLS methods are used. He has found strong positive relationship and positive relationship accordingly between Labor Force and GDP. Novignon, Nonvignon, and Arthur (2015) Has analyzed the relationship in Health Status and Labor Force Participation in Sub-Saharan Africa from year 1990 to 2011. The econometric technique like panel analysis is used to test the relationship. The results suggest that population health status (measured by life expectancy at birth) has a positive and significant effect on total and female labor force participation across countries in SSA. That is, the higher the health status of the population the higher the participation in the labor market, other things remaining constant.

Lechman (2014) has analyzed the Female Labor Force Participation and Economic Growth. Re-Examination of U-Shaped Curve from year 1990 to 2012. The econometrics techniques like GMM and panel data used to test the relationship. He has found that the hypothesis on U-shaped relationship between female labor force participation and economic growth, however high cross-country variability on the field is evident. Lechman and Kaur (2015) have analyzed the Economic Growth and Female Labor Force Participation-Verifying the U-Feminization Hypothesis. From year 1990 to 2012. The econometric techniques like pooled OLS method used to determine the relationship between GDP and female labor force. They have found support for the U-hypothesis, which implicates that in early stages of economic growth female labor force participation tends to fall, as a country advances in economic development and its economy is gradually more service-based, it grows systematically. Although they empirically confirmed the U-shaped relationship, high cross-country variability on the field remains. In contrast, disaggregation of the evidence, and examination of analogous relationships between female labor force and GDP per capita, however in four distinct income-groups; unveils variations across analyzed country groups with this regard. Notably,

in high-income and upper-middle-income economies, the existence of the U-shaped relationship is positively verified, although it vanished when introducing the dynamic effects.

Qadri and Waheed (2011) have estimated the human capital and economic growth in Pakistan. Human capital is generally used like a positive contributor in the economic growth. They estimated the relationship with the time series facts regarding Pakistan because of its period 1978 to be able to 2000. A health adjusted education indicator of human capital is usually consumed on the recognized Cobb-Douglas production performs confirms the long operate positive relationship between human capital with economic growth throughout Pakistan. The result coming from this study is broadly in accordance with the result of various and employment and labor force has significant effect in economic growth. Kakar, Khilji, and Jawad (2011) have analyzed Relationship between Education and Economic Growth in Pakistan: A time series analysis from year 1980 to 2009. the econometrics techniques like co-integration and error correction models are used to determine the long and short run relationship of education and economic growth. The results confirm that education has a long run relationship of economic growth. Better standards of education improve the efficiency and productivity of labour force and effect the economic development in the long -run. However, in the short-run education do not have any significant relationship with economic growth.

Nawaz (2014) has analyzed Which Factors Influence the Economic Growth of the Country? Evidence with Reference to Pakistan from year 1998-2012. The econometrics techniques like co-integration VCM and granger causality tests are used. The study results cannot be generalized for non-banking industries either in Pakistan or any other developing countries due to many other reasons. The results of this study can be generalized only for the banking sector in Pakistan and in those developing countries which have same banking culture and environment. Afzal, Farooq, Ahmad, Begum, and Quddus (2010) have measured relationship between school education and economic growth in Pakistan from year 1970 to 2009. The econometrics techniques like ARDL approach to co-integration ADF, PP, and Ng-Perron unit root tests are used. They have found the positive and significant effect of physical capital on economic growth is supported by both long-run and short-run dynamic models. The significant direct effect of net school enrollment ratio on economic growth is found in short-run as well as in long-run. Inflation, one of the measures of macroeconomic instability, retards economic growth both in short-run and long run. It affects school education negatively and significantly only in the long-run.

Wilson and Briscoe (2004) have estimated the impact of human capital on economic growth: a review. Impact of Education and Training, Third Report on Vocational Training Research in Europe. They provide a comprehensive and critical overview of the impact of education and training on economic performance, and, by implication, employment opportunities, at the macro level. They used the panel root and integration methods. They find that increase in the health expenditures/investments causes an increase in the economic growths.

Ranis, Stewart, and Ramirez (2000) they analyzed Economic growth and human development economic growth and human development, identifying two chains, one from economic growth to human development, and the other ,conversely, from human development to economic growth. The various links in each chain are explored, together with a review of some existing empirical material on their importance. They examined the significance of the relationships, for the chains as a whole and for particular links in them, with the help of cross-country statistics for the period 1970-92. The finds that there exists a strong positive relationship in both directions and that public expenditure on social services and female education are especially important links determining the strength of the relationship between economic growth and human development, while the investment rate and income distribution are significant links in determining the strength of the relationship between human development and economic growth.

Name of author	Research Paper	Sample	Dependent variable	Independent Variable	Test	Result
Sghari, M. B. A., & Hammami, S	The relationship between health expenditure and GDP in developed countries	1975-2011	GDP	Health expenditure income elasticity of health expenditures	Causality test Granger causality test Vector autoregressive test	They find positive relationship between GDP and health expenditure.
Sheiner, L	The Perspectives on Health Care Spending Growth year 1960 to 2012	1960 - 2012	GDP growth	Health care income	Regression growth model Integration	They find that economic growth is low then the health expenditure and Inflation.
Anyanwu, J. C., & Erhijakpor, A. E.	The Health Expenditures and Health Outcomes in Africa	1994-2014	Health outcome (under-five mortality or infant mortality rate)	Per capita health expenditure (total or government/public) Female literacy rate Urban population	Panel data regression equation	They find the Unambiguously negative relationship between per capita total and government expenditure and also find that the coefficients are significant.
ramesh, B., & Nishant, J.	Time series analysis of private healthcare expenditures GDP: co-integration results with structural breaks	1960 to 2003	GDP	Per capita income Private health expenditure	ordinary least square method unit root test co-integration	They find that PCI and PHE are not stationary in their Level. Null hypothesis unit root are rejected
Khan, M. S., & Ssnhadji, A. S.	Threshold effects in the relationship between inflation and growth	1960 to 1989	GDP	Inflation CPI Income	panel data log likelihood ratio test	They find that the existence of threshold effects in the relationship between inflation and growth using New econometric techniques that provide appropriate procedures or estimation and inference. The empirical results strongly suggest the existence of a threshold beyond which inflation exerts negative effect on growth

Attari, M. I. J., & Javed, A. Y.	Estimated Inflation, economic growth and government expenditure of Pakistan	1980 to 2010	The natural log of real GDP	The rate of inflation, by taking the first difference of natural log CPI the natural log of real government expenditure	Augmented Dickey Fuller (ADF) unit root test, ARDL, Johansen co-integration and Granger-causality test	They have found the negative relationship between gdp and inflation. The estimated relationship between real income and government expenditure is positive and the same sign had been found in the case of Australia, Canada, Finland, New Zealand, Spain, Sweden and United Kingdom.
Gokal, V., & Hanif, S. (2004).	Relationship between inflation and economic growth:	1970 to 2001	gdp	Inflation	non-linear least squares and NLLS methods	They have found that the existence of a threshold beyond which inflation exerts a negative effect on growth. Inflation levels below the threshold levels of inflation have no effect on growth, while inflation rates above the threshold have a significant negative effect on growth.
Asari, F., Mohammad, Z., Alias, T., Shamsudin, N., Baharuddin, N., & Kamaruzaman, J.	Analyzed Multivariate Time Series Analysis on Correlation between Inflation rate and Employment rate with Gross Domestic Product	1982 to 2006	GDP	Private consumption Gross investment Government spending	multivariate time series analysis unit root test co-integration test, trace test, maximal eigenvalue test, vector error correlated model granger causality test	They have found that inflation rate and employment rate influence the GDP in short. GDP is unable to affect the Inflation. There is a negative relationship between the employment and gdp in the long run.
Mofrad, M. A	Analysed the relationship between gdp and investment in case of Iran	1991 to 2008	GDP	Export and investment	unit root test Johansson co-integration test	They have found the long Run relationship between variables. There exist a positive and significant long term relationship between investment and export with gross domestic production at 95% confidence level. But the relationship of investment and

						export is negative. Analysis of the vector error correction model for GDP indicates an error correction coefficient is negative which due to the high value of the GDP in the short run than long-term equilibrium value.
Lim GuechHeang and Pahlaj Moolio		1993 to 2011	Gdp	Investment	simple regression analysis, Augmented Dickey-Fuller test, Durbin-Watson test, Breusch-Godfrey Serial Correlation LM test, Breusch-Pagan-Godfrey test, and Jarque-Bera test	They have found there is a positive relationship between investment and GDP in the long run in Cambodia. Their results concluded that Cambodia tends to benefit less from FDI because of the internal factors of the country. Compared to other countries, particularly listed in their study, Cambodia probably benefits less.
Goher, Fatima	TESTING RELATIONSHIP OF PRIVATE INVESTMENT AND GDP WITH FISCAL DEFICIT in case of Pakista	1980 to 2009	gdp	Investment exports imports Interest rate inflation	Unit Root Test, Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests	They have found the consequences of fiscal deficit which affects economic growth directly and indirectly. The fiscal deficit itself showed a negative and significant impact on INV.
Rahul Lahoti	Measured the Economic Growth and Female Labor Force Participation in India	1983 to 2010	GDP	female literacy rate	Test robustness	He found that there is significant positive effect of growth in agricultural employment share on female employment, but growth in agricultural value share has no significant effect on female employment. The difference in results across value shares and employment shares might be due to low level of correlation between value added and employment generation in the agricultural sector.

Nooreen Mujahid	Economic Growth-Female Labor Force Participation Nexus An Empirical Evidence for Pakistan	1980 to 2010	Real GDP per capita, squared of natural log of real GDP per capita	Female labor force	ADF Unit Root Test Philips and Perron Unit Root Test Zivot-Andrews Unit Root Test The ARDL Bounds Testing Approach to Co-integration	They have found there is a strong link between Economic growth and female labor supply so that the policy makers should concentrate on Increasing and improving female's education and skills. The adoption of gender specific wage laws may be reduced the earning gap between both the genders. Moreover, measures to improve the employment opportunities along with the expansion of the manufacturing and industrial sector will contribute to increase the female labor supply.
Muhammad iqbal Hassan	The labor force and GDP in Bangladesh	2000 to 2009	GDP	Labor force	OLS method	He has found strong positive relationship and positive relationship accordingly between Labor Force and GDP
Novignon, J., Nonvignon, J., & Arthur, E.	Health Status and Labor Force Participation in Sub- Saharan	1990 to 2011	GDP	Labor force health	Panel analysis	The results suggest that population health status (measured by life expectancy at birth) has a positive and significant effect on total and female labor force participation across countries in SSA. That is, the higher the health status of the population the higher the participation in the labor market, other things remaining constant.
Ewa Lechman (2014)	Female Labor Force Participation and Economic Growth. Re-Examination of U-Shaped Curve	1990 to 2012	GDP	Labor force	GMM	He has found that the hypothesis on U-shaped relationship between female labor force participation and economic growth, however high cross-country variability on the field is evident.

Lechman, E., & Kaur, H. (2015)	Analyzed the Economic Growth and Female Labor Force Participation–Verifying the U-Feminization Hypothesis	1990-2012	GDP	Female labor force Total labor force	Pooled OLS method	They have found support for the U-hypothesis, which implicates that in early stages of economic growth female labor force participation tends to fall, as a country advances in economic development and its economy is gradually more service-based, it grows systematically. Although they empirically confirmed the U-shaped relationship, high cross-country variability on the field remains. In contrast, disaggregation of the evidence, and examination of analogous relationships between female labor force and GDP per capita, however in four distinct income-groups; unveils variations across analyzed country groups with this regard. Notably, in high-income and upper-middle-income economies, the existence of the U-shaped relationship is positively verified, although it vanished when introducing the dynamic effects.
Qadri and Waheed	The human capital and economic growth in Pakistan.	1978 to 2000	GDP	Human capital investment labor force employment	Unit root test and ADF	The result coming from this study is broadly in accordance with the result of various and employment and labor force has significant effect in economic growth. The result coming from this study is broadly in accordance with the result of various and employment and labor force has significant effect in economic growth.

Kakar, Z. K., Khilji, B. A., & Jawad, M.	Relationship between Education and Economic Growth in Pakistan: A time series analysis	1980To 2009	GDP	government expenditure on education as % of GDP labour force participation rate gross fixed capital formation	co-integration and error correction models	The results confirm that education has a long run relationship of economic growth. Better standards of education improve the efficiency and productivity of labour force and effect the economic development in the long -run. However, in the short-run education do not have any significant relationship with economic growth.
Nawaz, M.	Which Factors Influence the Economic Growth of the Country? Evidence with Reference to Pakistan	1998- 2013	GDP	Investment literacy rate health expenditure rate exchange rate inflation	co-integration VCM and Granger causality tests	The results of this study can be generalized only for the banking sector in Pakistan and in those developing countries which have same banking culture and environment.
Wilson, R. A., & Briscoe, G	Economic growth and human development economic growth and human development, identifying two chains, one from economic growth to human development, and the other ,conversely, from human development to economic growth	1970- 1992	GDP	Health expenditures investment education	panel unit root and panel co- integration tests,	They provide a comprehensive and critical Overview of the impact of education and training on economic performance and by implication, employment opportunities, at the macro level. They used the panel root and integration methods. They find that increase in the health expenditures/investments causes an increase in the economic growth.

III. Research Methodology and Model

Research methodology provides a framework to identify the research areas that are most likely to be academically, and practically worthwhile and realistic by using the variety of research approaches, and methods. It also provides proper guidelines for systematic planning of research by exploring new methods or replicating the existing methods to accomplish the different stages of the research process. Therefore, the choice of research approach is one of the stages of research methodology, which depends upon two factors, such as; aim of the inquiry and use of the findings. These two factors create two different approaches of research, one is structured approach which is known as quantitative research and other is the unstructured, known as qualitative (Kumar, 2008; Blessing & Chakrabarti, 2009). The current study is quantitative in nature, first the methodology that has been adopted is to quantify economic relationships among the variables and second, the data set consists of observations of several variables over period of time and cross section (Asteriou & Hall, 2007). This study try to develop the relationship between economic growth and human capital by using the panel estimation. There are different proxies that has been used in literature to measure the human capital, i.e. investment, net secondary school enrollment, health expenditures, total labor force and life expectancy birth. The other variables, like inflation is also added in the model to measure the economic plans and complete quality of organizations.

$$\text{Economic Growth} = f(\text{Human Capital}) \quad \text{eq. (1)}$$

$$\text{Economic Growth} = f \left(\begin{array}{c} \text{inflation, invetment,} \\ \text{net secondary education, health expenditure,} \\ \text{total labour force, life expectancy birth} \end{array} \right) \quad \text{eq. (2)}$$

The regression equation developed on the above function form for the panel is stated below:

$$gdp_{it} = \beta_0 + \beta_1 inf_{it} + \beta_2 inv_{it} + \beta_3 educ_{it} + \beta_4 hexp_{it} + \beta_5 tlb_{it} + \beta_6 leb_{it} + u_{it} \quad \text{eq. (3)}$$

Where;

gdp_{it}	=	Gross domestic product
inf_{it}	=	Inflation
inv_{it}	=	Investment
$educ_{it}$	=	Net secondary school enrollment
$hexp_{it}$	=	Health expenditures
tlb_{it}	=	Total labor force
leb_{it}	=	Life expectancy at birth
β	=	constants (intercepts and slope)
u_{it}	=	error term
it	=	i for cross section and t for time period

The variable of economic growth (gdp) is measured in real US dollar. The variable of inflation is measured in annual percentage. The variable of investment is measured by gross capital formation in real US dollar. The variable of net secondary school enrollment is measured in percentage. The variable of health expenditures is measured by health expenditure per capita in real US dollar. The variable of total labor force is measured in numbers. The variable of life expectancy at birth is measured in total years.

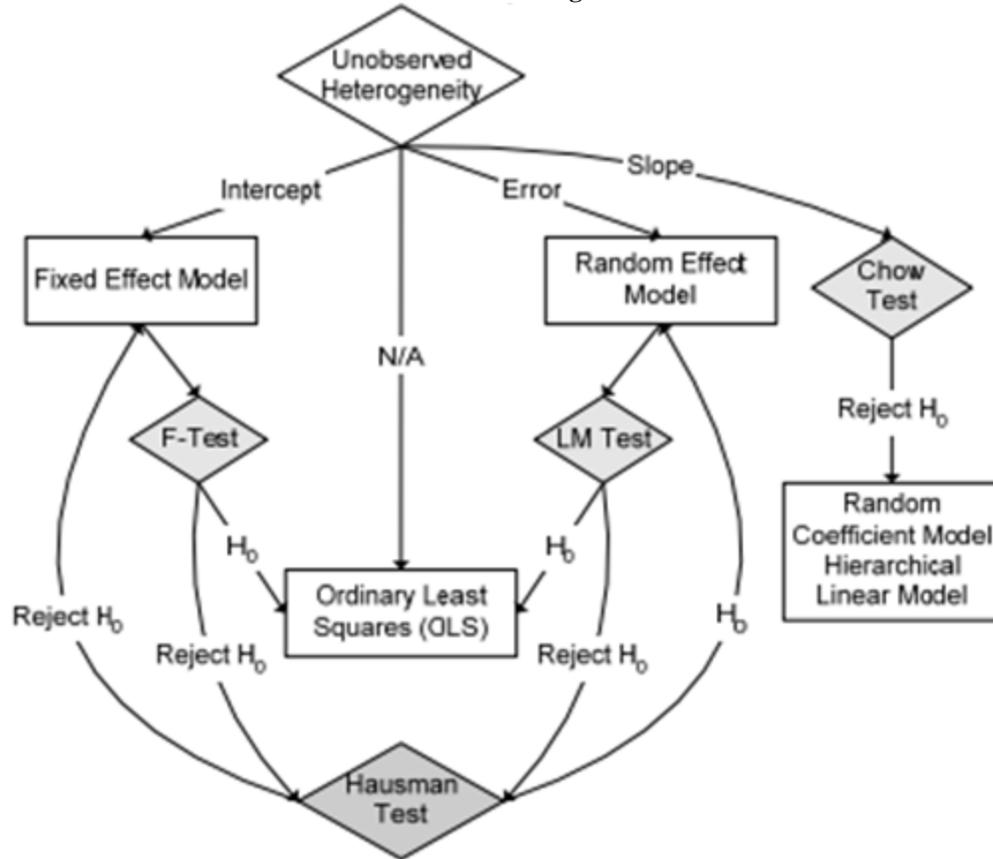
The hypothesis that are developed on the basis on above model are stated below:

- H_{10} : There is no relationship between human capital and economic growth.
- H_{1A} : There is a relationship between human capital and economic growth.
- H_{20} : There is no relationship between inflation and economic growth.
- H_{2A} : There is a relationship between inflation and economic growth.
- H_{30} : There is no relationship between investment and economic growth.
- H_{3A} : There is a relationship between investment and economic growth.
- H_{40} : There is no relationship between school enrollment and economic growth.
- H_{4A} : There is a relationship between school enrollment and economic growth.
- H_{50} : There is no relationship between health expenditure and economic growth.
- H_{5A} : There is a relationship between health expenditure and economic growth.
- H_{60} : There is no relationship between total labor force and economic growth.
- H_{6A} : There is a relationship between total labor force and economic growth.
- H_{70} : There is no relationship between life expectancy at birth and economic growth.
- H_{7A} : There is a relationship between life expectancy at birth and economic growth.

The panel of eleven (11) countries haven taken for analysis, which are: Bangladesh, Bhutan, China, India, Malaysia, Nepal, Pakistan, Sri Lanka, Thailand, Turkey and Ukraine. The data covered the time period from 1992 to 2014, which covered twenty-three (23) years. The reason behind using such period data is, having data for longer time period provides more reliable results. The data has been collected from the World Bank’s (WB) *World Development Indicators* database (2015). There are different computerized packages that have been normally used to analyze the panel data, like: EViews, STATA, MicroFit etc. But EViews 9 features have the most extensive changes and improvements package since the initial release of EViews in 2015. The more powerful new estimation techniques and new methods of working with the samples are introduced in this package (Quantitative Micro Software).

This often happens in the financial modeling; we have the data, including the time series and the cross-sectional elements, and such data set is referred to as panel data or longitudinal data. The technical panel data estimation can consider to take this heterogeneity, allowing individuals to specific variables. Through a combination of time-series and cross-sectional observation panel data provide more informative data, more variability, reduce collinearity between variables, more degree of freedom and greater efficiency (Brooks, 2008). The panel data modelling process is shown in Figure 3.1.

Figure 3.1
Panel Data Modelling Process



There are three types of panel estimator: common constant method; fixed effects model; and random effects model. The fixed effects model which allows different in intercept of the regression model to cross section, but not with the passage of time, all of the slope estimates are fixed cross section with the passage of time (Brooks, 2008). It is assumed that the maximum time period is T and N is the largest cross sectional observation unit. If each cross section unit having the sequence of observations of the same amount of time, then this panel (data) is referred to as a balance of the panel. If the members of the Panel include different number, we said this panel unbalanced panel. In this chapter, we will mainly focus on a balanced panel (Gujarati, 2004). Common constant method (also known as the pooled OLS method) means that there is no significant difference between the estimates of the cross-section; it is useful under the assumption that the data set is a priori uniform samples and only applies on the high-income

countries or the European Union countries. In this method constant is taken for each country. This means that model, allowing for a different constant for each country. It has been used in a number of studies, when the explanatory variables in these areas were non-random. Another approach is a random effects model, that random to deal with the constants for each cross-section not as fixed, but random parameters. The random effects model has been used to the selected model fitting standard. This model is not new in the literature; many researchers use this model to explore different aspects at different time periods. It is often said that the random effects model is the appropriate when samples have been randomly selected from the population of the entity, but a fixed effects model is credible when the sample entities, including the entire population. The redundant fixed effect f-test is used to determine either the result of pooled OLS (common constant) method or fixed effect is better. The hypothesis of f-test is:

H_0 : The series (means individual intercept) does not belong to equation (Pooled OLS)

H_1 : The series (means individual intercept) belongs to equation (Fixed Effect Model)

The estimated chi-square is compared with the critical value, reject the null hypothesis and accept the alternative hypothesis, which suggests that fixed effects model is appropriate over pooled OLS.

Making the choice between random effects and fixed effects methods the Hausman test is used. If the value of the statistic is large, then difference between the estimates is significant so null hypothesis is rejected which show that random effects model is inconsistent and fixed effects estimators will be used. In order to find out which model (Fixed or Random) is appropriate, first establish the hypothesis:

H_0 : Random effects are consistent and efficient.

H_1 : Random effects are inconsistent and inefficient (Fixed Effect Model)

The estimated chi-square is compared the critical value, reject the null hypothesis and accept the alternative hypothesis, which suggests that random effects model is appropriate over fixed effects model.

The estimation of unit root test for panel data is more complex than that used in time series. The crucial factor is panel data estimation appears to be the degree of heterogeneity. It is important to realize that all the individuals in a panel may not have same property, i.e. may not be all stationary or non-stationary. Some panel data have unit root and some do not the situation becomes quite complex. Some of test proposed require balanced panels, whereas others allow for un-balanced panel. The ADF panel unit root is used and the hypothesis of this test is:

H_0 = Unit Root, non stationary

H_1 = Stationarity

The estimated ADF chi-square is compared the critical value, reject the null hypothesis and accept the alternative hypothesis, which suggests that the panel is stationary.

IV. Estimations

The different research methodologies have been used by different researchers to measure the relationship between economic growth and human capital. Previous researchers have applied the linear, non-linear, and GMM to measure the relation between economic growth and human capital. The analysis of the current study is based on the panel econometrics tools to measure the relationship between economic growth and human capital in case of pool of eleven (11) countries. The current study comprises of five major steps as shown in the Figure 3.1. At the first step, the descriptive stats of panel of eleven (11) countries and individual country is reported in below tables.

Table 4.1 Descriptive Stats

Description	GDP _{11,23}	INF _{11,23}	INV _{11,23}	EDU _{11,23}	HEXP _{11,23}	TLF _{11,23}	LEB _{11,23}
Mean	10.8942	10.5873	10.2488	62.8843	161.7287	7.2009	69.7957
Median	11.1093	6.7643	10.3963	65.9953	114.3993	7.3642	69.4153
Maximum	11.9155	81.4548	11.1428	90.9337	628.5030	7.8798	75.1759
Minimum	8.64262	-5.9922	8.4399	22.3701	8.5461	5.3493	60.2908
Std. Dev.	0.7757	12.7131	0.6615	18.3433	158.7939	0.6555	3.5184
Skewness	-1.3904	3.2069	-1.2977	-0.2846	1.3643	-1.7374	-0.2455
Kurtosis	4.3642	15.1366	4.1104	1.9206	4.1711	5.2318	2.2147
Jarque-Bera	36.3797	714.4870	30.2168	5.6464	33.4317	64.6726	3.2523
Probability	0.0000	0.0000	0.0000	0.0594	0.0000	0.0000	0.0966

The above Table 4.1, shows the descriptive stats of panel data. If the value of skewness is zero (0) and the value of kurtosis is three (3), it indicates that the variables are normally distributed. If the distance from median to the largest value is greater than distance from the smallest value to the median, then it shows right skewed and vice versa. The variable inflation and health expenditure is right skewed and the value of skewness is also positive. The remaining variables, i.e. economic growth, investment, secondary school enrollment, total labor force and life expectancy at birth is left skewed and the value of skewness is also negative. If the value of kurtosis is less than 3, then, it shows it is platykurtic and the value of kurtosis is greater than 3, then, it shows it is leptokurtic. The above table shows the economic growth, inflation, investment, health expenditure and total labor force is leptokurtic, it means the more peakedness of distribution. The remaining variables, education and life expectancy at birth is platykurtic, it means the flatter distribution than normal distribution. Table 4.1 results show the JB-stat value, which also explain the normality of variables (null hypothesis). The p-value of JB-stat is less than 10% level of significance, which means that there is non-normality in all variables. The JB-stat also support that all of the variables are non-normally distributed and kurtosis also shows no mesocratic distribution.

Panel ADF Unit Root test has been used to check that the economic variables are stationary. In stationary panel series, the shock can be temporary and over time their effects will be eliminated as the series regresses to their long term variance.

Table 4.2: Panel ADF Unit Root Test Statistic

Variables	Level I(0)		Level (1)	
	Trend and Intercept	Lag length	Trend and Intercept	Lag length
GDP_{11,23}	21.4694	3	66.0795*	4
INF_{11,23}	79.7604*	4	NA	NA
INV_{11,23}	30.2225	2	100.519*	4
EDU_{11,23}	9.96033	1	27.5513*	1
HEXP_{11,23}	17.9586	3	69.1978*	3
TLF_{11,23}	32.3732	4	59.8861*	3
LEB_{11,23}	21.6875	4	83.7002*	4

*denotes Fisher Chi -square critical values for rejection of null hypothesis of a unit root and significance at the 10% level.

The test result shown in Table 4.2, indicates that the series data at level $I(0)$ is non--stationary at 10% level of significance at different lags, except inflation which is stationary. The rejection of null hypothesis (H_0) to make the series stationary at 10% significance level at level $I(1)$ by using Schwarz Info Criterion (SIC) the lag differences (k) and GDP investment, education, health expenditure, total labor force and life expectancy at birth become stationary at first difference $I(1)$, which shows the deterministic trend. The deterministic trend means that the time series is now completely predictable and not variable. The coefficients for the GDP obtained from the Pooled OLS (common constant method) are shown Table 4.3:

Table 4.3: Pooled OLS

Dependent Variable: GDP _{11,23}				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	-0.568628	0.362433	-1.568919	0.1204
INF _{11,23}	-0.002560	0.001250	2.047861	0.0437
TLF _{11,23}	0.457925	0.052241	8.765565	0.0000
EDU _{11,23}	0.002037	0.000992	-2.054366	0.0430
LEB _{11,23}	0.032437	0.008542	3.797340	0.0003
HEXP _{11,23}	0.001009	0.000136	7.391687	0.0000
INV _{11,23}	0.569742	0.073817	7.718276	0.0000
R-squared	0.979312	F-statistic		662.7199
Adjusted R-squared	0.977834	Prob(F-statistic)		0.000000

The fitted line equation by using the above value is shown below:

$$gdp_{it} = -0.568628 - 0.002560 * inf_{it} + 0.569742 * inv_{it} + 0.002037 * educ_{it} + 0.001009 * hexp_{it} + 0.457925 * tlb_{it} + 0.032437 * leb_{it}$$

In Table 4.3 and above fitted equation show that increase in one independent variable leads to increase or decrease in dependent variable. The results that are presented in above table show that the coefficient of inflation is -0.002560 and statistically significant which implies that 1% increase in inflation will lead to 0.00260% of decrease in the economic growth in the long run. The coefficient of investment is 0.569742 and statistically significant which implies that 1% increase in investment will lead to 0.569742% of increase in the economic growth in the long run. The coefficient of secondary higher education is 0.002037 and statistically significant which implies that 1 unit increase in secondary higher education will lead to 0.2037% of increase in the economic growth in the long run. The coefficient of health expenditure is 0.001009 and statistically significant which implies that 1% increase in health expenditure will lead to 0.001009% of increase in the economic growth in the long run. The coefficient of total labor force is 0.457925 and statistically significant which implies that 1% increase in total labor force will lead to 0.457925% of increase in the economic growth in the long run. The coefficient of life expectancy at birth is 0.032437 and statistically significant which implies that 1% increase in life expectancy at birth will lead to 0.032437% of increase in the economic growth in the long run. The value of R² is 0.979312, it means that the 97.9312% of variation in economic growth is due to all explanatory variable. The value of f-test is 662.7199, which is statistically significant at 1% level, which shows that there is a combined effect of all independent variables on economic growth. It means that the human capital has statistical significant effect on economic growth at 1% level. The redundant fixed effect f-test is used to determine either the result of pooled OLS (common constant) method or fixed effect is better. The null hypothesis of f-test is the series (means individual intercept) does not belong to equation (Pooled OLS) and alternative hypothesis the series (means individual intercept) belongs to equation (Fixed Effect Model). The results of redundant fixed effect f-test is shown in Table 4.4:

Table 4.4: Redundant fixed effect f-test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	21.825490	(8,76)	0.0000
Cross-section Chi-square	108.575771	8	0.0000

Table 4.4 shows that p value is less than 1% level of significance, which means rejection of null hypothesis that the series (means individual intercept) does not belong to equation (Pooled OLS) and alternative hypothesis the series (means individual intercept) belongs to equation (Fixed Effect Model). It means the Fixed Effect Model is more appropriate than pooled OLS results. At this step the results of Fixed Effect Model is estimated and shown in Table 4.5:

Table 4.5: Fixed Effect Model

Dependent Variable: GDP _{11,23}				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF _{11,23}	-0.004846	0.000759	6.380986	0.0000
INV _{11,23}	0.352035	0.056389	6.242996	0.0000
HEXP _{11,23}	0.001222	0.000100	12.22128	0.0000
EDU _{11,23}	0.000472	0.001160	0.407038	0.6846
TLF _{11,23}	0.144242	0.068393	2.108999	0.0368
LEB _{11,23}	0.054258	0.007287	7.445523	0.0000
Intercept-Bangladesh	2.406537	0.647067	3.719149	0.0003
Intercept-Bhutan	1.484320	0.516334	2.874727	0.0047
Intercept-China	3.512258	0.560674	6.264354	0.0000
Intercept-India	3.098023	0.681208	4.547840	0.0000
Intercept-Nepal	2.027051	0.597059	3.395061	0.0009
Intercept-Pakistan	2.751844	0.650698	4.229066	0.0000
Intercept-Sri Lanka	1.995927	0.585043	3.411591	0.0009
Intercept-Malaysia	2.122291	0.614233	3.455191	0.0007
Intercept-Thailand	2.306589	0.634360	3.636087	0.0004
Intercept-Ukraine	2.212317	0.585204	3.780419	0.0002
Intercept-Turkey	2.174106	0.602920	3.605961	0.0004
R-squared	0.993726	F-statistic		859.8196
Adjusted R-squared	0.992570	Prob(F-statistic)		0.000000

In Table 4.5 shows that the coefficient of inflation is -0.004846 and statistically significant which implies that 1% increase in inflation will lead to 0.00260% of decrease in the economic growth in the long run. The coefficient of investment is 0.352035 and statistically significant which implies that 1% increase in investment will lead to 0.352035% of increase in the economic growth in the long run. The coefficient of secondary higher education is 0.000472 and statistically insignificant in the long run. The coefficient of health expenditure is 0.001222 and statistically significant which implies that 1% increase in health expenditure will lead to 0.001222% of increase in the economic growth in the long run. The coefficient of total labor force is 0.144242 and statistically significant which implies that 1% increase in total labor force will lead to 0.144242% of increase in the economic growth in the long run. The coefficient of life expectancy at birth is 0.054258 and statistically significant which implies that 1% increase in life expectancy at birth will lead to 0.054258% of increase in the economic growth in the long run. The value of R^2 is 0.993726, it means that the 99.3726% of variation in economic growth is due to all explanatory variable. The value of f-test is 859.8196, which is statistically significant at 1% level, which shows that there is a combined effect of all independent variables on economic growth. It means that the human capital has statistical significant effect on economic growth at 1% level. Next step is to choose either random effects or fixed effects methods, the Correlated Random Effects - Hausman test is used. The null hypothesis of test is random effects are consistent and efficient; and alternative hypothesis is random effects are inconsistent and inefficient (Fixed Effect Model). The results of correlated random effects - Hausman test is shown in Table 4.6:

Table 4.6: Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	20.031650	6	0.0027

Table 4.6 shows that p-value is less than 1% level of significance, which means rejection of null hypothesis that random effects are consistent and efficient; and accept the alternative hypothesis, that is random effects are inconsistent and inefficient (Fixed Effect Model). It means the Fixed Effect Model is more appropriate then random effects model.

V. Conclusions

The relationship between human capital and economic growth has been the subject of extensive research over the past few decades. This research explored the same relationship among economic growth and the proxies of human capital, i.e. investment, education, health expenditure, total labor force and life expectancy, adopting panel of eleven different countries, which include: Bangladesh, Bhutan, China, India, Malaysia, Nepal, Pakistan, Sri Lanka, Thailand, Turkey and Ukraine. This issue is more sensitive in nature because developing countries are in the race of economic development, and consuming their resources on human capital to run their economic cycle in better way. The different approaches have been used in the previous literature to measure the relationship between human capital and economic growth. Some studies have used the linear, or nonlinear or single country or panel data analysis. The analysis of the current study is based on the panel data analysis by using the different panel econometrics tools to measure the relationship between human capital and economic growth in case of Pakistan. Using the panel methodology and approach, the present study investigated the relationship among economic growth and the other explanatory variables like inflation, investment, education, health expenditure, total labor force and life expectancy from 1992 to 2014. At the first step, the descriptive stats of all economic variables are determined. The results show that all of the variables are non-normally distributed and no mesocratic distribution. At the next step, the panel ADF Unit Root test has been used to check that the economic variables have unit root. The test result indicates that the *time series data is stationary* at level I(1), except inflation, which is at level I(0). The deterministic trend means that the time series is now completely predictable and not variable. At third step, the long run relationship has been measured by applying pooled OLS and the results of test reported that there long run relationship exists among all the variables. The f-test of pooled OLS showed the combined effect of all independent variables on economic growth. It means that the human capital has statistical significant effect on economic growth at 1% level. At the next step, redundant fixed effect f-test is used to determine either the result of pooled OLS (common constant) method or fixed effect is better. But the test results show the Fixed Effect Model is more appropriate than pooled OLS results. At the fifth step, Fixed Effect Model is estimated and the results of test reported that there is long run relationship among all the variables. All the explanatory variables have significant effect on economic growth at 10% level of significance, except education. The f-test of pooled OLS showed the combined effect of all independent variables on economic growth. It means that the human capital has statistical significant effect on economic growth at 1% level. In last step, it is to choose either random effects or fixed effects

methods, the Correlated Random Effects - Hausman test is used. But the test results show the Fixed Effect Model is more appropriate than random effects model.

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