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An Analysis of the Impact of Human Capital on the Economic Growth of Pakistan

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Abstract:

Pakistan is a country on its course to advancement but during this period of growth, it has faced some significant dilemmas. Therefore, a study has been conducted with the aim to examine the impact of the e of human capital formation, interest rate, exports and capital formation on the economic growth of Pakistan GDP has been taken as the dependent variable to measure growth. Data was collected from 1972 to 2013. ADF has been applied to check stationarity between the variables. ARDL econometric approach has been used for co-integration among variables' is also applied for short run dynamics among the variables. The results finds that there is a positive and significant relationship between human capital and GDP. For increasing GDP, the government should reduce the economic misery index and increase human capital, capital formation, and exports in Pakistan. This study has several limitations. First, it is conducted in a developing nation context i.e., Pakistan, where it is required in the future to be conducted with same factor among different developing nations of the region.

Key Words: Economic Growth, Gross Domestic Product, Human Capital, Physical Capital, Impact Analysis.

Introduction

Pakistan appeared on the map of the world in 1947, with a literacy rate of around 10% and just 10,000 grade schools. In the wake of actualizing different arrangement measurers furthermore, changes, the literacy rate in Pakistan wound up 29.5%, 40.7%, 52.7%, and 57.4% in the 1980s, 1990s, 2000s, and 2008-09 separately This expansion in literacy rate is far underneath the Millennium Development Goals' literacy rate. In the current worldwide pattern of propelling innovation and developing rivalry, change in human capital has turned out to be basic for each country since it assumes a basic part of feasible financial development. (Lucas, 1988; Barro, 1991; Sala-i-Martin *et al.*, 2004) Taking the case of Pakistan as a developing country, there is an intensive shortage of trained labor majorly in every field. When we talk about economic growth, it doesn't encounter only some specific grounds but takes into consideration the entire sphere which could have contributed towards the evolutionary improvement of economic growth. So, here we can evaluate the role of "Human Capital" on the economic growth at large. Human capital could be increased through school enrollment, a lower infant mortality rate, consumption, physical capital, and gross domestic product. These factors help in the rapid creation of human capital which in turn affects economic growth. Human capital refers to education, health, on-the-job training, and skills acquired through interactions among individuals or societies. In more technical terms human capital is defined as the aggregation of the innate abilities and the knowledge and skills that individuals require and develop throughout their lifetime (Laroche & Merette 1999).

In 1997, the United Nations characterized human capital as productive wealth embodied in labor, abilities, and knowledge (UN, 2009). To understand the concept of the word Human Capital, we can divide it into two parts such as human and capital. Human identifies well-being of labor and capital is the investment in the human that intensifies its productivity.

According to the model of Lucas (1988), economic growth is continued by the human capital stock. GDP was significantly impacted by human capital. Simply put, human capital is essential during the creation process. More specifically, human capital increases a specialist's effectiveness in all tasks, however this may vary depending on the task, association, and situation.

Human capital is seen for the most part as the ability to adjust. As per this approach, human capital is particularly helpful in managing "disequilibrium" circumstances, or more by and large, with circumstances in which there is an evolving domain, and laborers need to adjust to this. The observable measures of human capital are progressively a standard of capacity that is autonomously valuable in the creation procedure. While Gross domestic product (GDP) is the money-related estimation of all the finished goods and services created inside a nation's border in a particular day and age. Even though GDP is typically figured on a yearly premise, it can be ascertained on a quarterly premise too. Gross domestic product incorporates all private and public consumption, government expenses, speculations, and exports less imports that happen inside a characterized region. The Consumption is the estimation of goods and services purchased by individuals. Individual purchasing acts are aggregated after some time and space. It is typically the biggest GDP component. This research is an attempt to determine the impact of the human capital on the economic growth of Pakistan.

Over decades, Pakistan's GDP growth has fluctuated due to several macroeconomic reasons. Human capital, which includes medical care, schooling, and training for skills, is one of the main factors that determine economic progress. Pakistan is still struggling with the development of human capital in the face of governmental initiatives, which has caused its economy to grow more slowly than it should by international standards. GDP growth is directly impacted by the nation's low productivity of the workforce, health indices, and literacy rates. Furthermore, the nation's economic landscape is shaped by economic factors including exports, capital formation, and interest rates.

Significance of the Study

This investigation is important because it offers both scholarly and policy input, shedding light on how human capital propels nation to grow its economy. It provides a solid empirical basis for comprehending the effects of expenditures in exporting goods, capital creation, healthcare, and educational institutions on GDP by utilizing econometric research on data collected in time from 1972 to 2013. The results highlight how putting the improvement of human

capital first can result in long-term economic expansion and lower the negative economic index by tackling hyperinflation and unemployment. To boost domestic production and attractiveness internationally, the report also emphasizes the country's need for significant investments in highly qualified workers, better health care, and an enhanced educational system. According to a social standpoint, it emphasizes how crucial medical care and schooling are to enhancing personal wellbeing and lowering costs. This research is addressing to following questions:

1. What would be the impact of human capital on GDP?
2. What would be the impact of capital formation on GDP?
3. What would be the impact of economic conditions on GDP?

Literature Review

The impact of human capital formation on the economic growth of Pakistan. By employing secondary data from 1990 to 2013. Conclusion is that both health and education sectors should be required highly attention to sustain economic growth of Pakistan (Shehzad ,2005). It is found that human capital formation plays an important role in the economic growth of Pakistan. By using variables such as fixed capital formation, infant mortality rate, Gini coefficient, education enrollment index, and GDP. Results show that human capital formation has a significant impact on Gross Domestic Product (GDP) (Samar & Waqas 2014). By employing Granger causality and co-integration to determine the relationship between human capital and economic growth. It is found that co-integration exists between GDP and public expenditures on health, education, and debt service payments (Imran *et al.*, 2012). The impact of human capital on economic growth of Pakistan has been examined from the period 1974 to 2009. The results indicate strong positive impact of human capital on economic growth, despite the fact Pakistan spends less of GDP on education and health for the generation of human capital (Asghar *et al*., 2012).

The influence of inflation and unemployment on economic growth in Pakistan has been investigated by using time series data. ARDL technique has been used for estimation. The results show that unemployment is negatively related to economic growth (Shahid, 2014). The relationship between human capital and economic growth in Pakistan has been explored in this study. Johanson's (1991) approach is used for getting results. This study indicates that human capital boosts the economy’s capacity to absorb world technical progress. It is concluded that deficient capital negatively contributes to economic growth (Abbas & Peck, 2008). Clarifying Pakistan's poor efficiency and intensity in worldwide markets at a current occasion, he portrayed the nation's position as "perilous", as said by Pakistan's previous fund Minister (Shah, 2017). This study investigates the causal relationship between economic development and the formation of human capital in Pakistan. By using data from 1972 to 2009.GDP is taken as an explained variable and human capital formation, investment in physical capital, and labor force as independent variables. By employing Autoregressive Distributed Lag (ARDL) they found bi-directional relationship between development and human capital formation. (Muhammad *et al*., 2012).

Pakistan's position at the base of most global rankings undermines development in the nation. In the Ease of Doing Business rankings, Pakistan is positioned 113 out of 185 nations; in the Human Development Index it is positioned 145 out of 189 nations; and in the Economic Freedom Index, it is positioned 120 out of 178 nations. In a globalized world, "monetary aggressiveness is the way to development. Pakistan positions 128 out of the 140 nations positioned by the World Economic Forum in 2015-16 in the Global Competitiveness Index. The index is made of the "12 pillars of competitiveness". Each of the 12 pillars is itself a composite score of various measures. For instance, the fourth pillar, health and essential instruction (Pakistan: 122) is comprised of five measures, which incorporate primary education and primary education enrollment. The fifth pillar is advanced education such as higher education and preparation (Pakistan: 129) is comprised of eight segments including the nature of the training framework and the nature of math and science instruction in both of which Pakistan scores ineffectively. Education expenditure as a percentage of GNP remained at 0.8%, 2.3%, and 2.1% in the 1980s, 1990s, and 2000s (Finance Division, 2009).

Many economists have explained about economic growth. According to Adam Smith, economic development depends not only on capital growth but also on technological and societal changes. The schooling of the people positively affects the economic growth of a nation. Schooling and economic growth are exceedingly associated with

each other (Barro, Benhabib & Spiegel, Barro also, Sala-i-Martin, 1991, 1994, 1995, 1997). A labor force without some basic levels of education and good health status then a nation is unequipped to keep up a condition of persistent development (Lopez-Casasnovas *et al*., 2005). By providing value education a country can expand its economy, growth, and income. Education helps to break poverty by directly contributing to growth. It increases fairness and social justice which, in turn, brings about solidness and improves the investment climate (Dzingai Mutumbuka, 2004). The role of human resource development and professional training is very necessary for economic growth in Pakistan (Mustafa *et al*, 2005). Human capital and its growth rate both are measured as the main determinants of growth (Gemmell, 1996).

The regression results of this study suggest that growth in government expenditures has a greater impact on changes in nominal income than growth in Ml. The dynamic analysis of the model shows that the long-run effects of an unexpected shock on the monetary and fiscal policy variables are different. The effects of a shock to government expenditures on the dynamic analysis of the model show that the long-run effects of an unexpected shock to the monetary and fiscal policy variables are different. The effects of a shock to government expenditures on nominal. Likewise, the effect is greater in case the income lasts for a longer period as compared to the shock of MI (Chowdhury, 1986). It has been declared that educated and healthy individuals live more years and have higher incentives to put resources into their capacities since the present estimations of their human capital development are higher (Sprout & Canning, 2000). It has been evaluated that the role of Human Capital in economic development is very vital (Benhabib and Spiegel, 1994). The group confirms a strong positive correlation between human capital and economic growth (Mbanefoh, 1980; Akangbou, 1983; Barro, 1991; Mankiw *et al.*, 1992; Burnett *et al.*, 1995; Grammy and Assane, 1996; Bloom & Sachs, 1998; Abbas, 2000; Qadri & Waheed, 2011). Using school enrolment rates at primary, secondary, and higher secondary levels for human capital variable for Pakistan of 1970-1994. He observed that secondary schooling has a significant and positive correlation with economic growth for both countries whereas primary education significantly increases economic growth and higher education effects positively only in Pakistan at a 10% level of significance (Abbas, 2000). They analyzed their study with the objective for evaluation of the relation between real GDP rise in the physical capital, human capital, and health investments, the results concluded that health and education had a positive and significant effect on economic growth (Li & Huang, 2009). Ali *et al.* (2012) examined the effect of human capital arrangement on the economic development of Pakistan from 1972 to 2011. Education enrollment is used as a proxy in the model. They inferred that a few markers had a positive and predominant effect on GDP, while others impacted GDP in Pakistan (Ali *et al.*, 2012). The Countries having high rate of enrollment in schools grow more rapidly in per capita income because high enrollment rate causes speedy enhancement in productivity (Bilsand Klenow, 2000). It is a generally utilized marker of the accessibility, usage, and adequacy of human services since it offers a sign of the health status of a population through those most helpless to collapse (MacDonald & Roberts, 2004).

He demonstrated the easygoing connection between pay and mortality. Great health builds the wage level of the people while it conflicts with the other side of the study (Shehzada, 2004). Thus, for good health, the laborer needs to have proper food consumption so there will be an increase in the human capital as well as an increase in his productivity. Bokreta (2016) asserted the relative usefulness of monetary and fiscal policy in Algeria using the econometric modeling techniques of integration. The chosen variables of fiscal policy are K government expenditure and net taxes on products, while the effect of monetary policy is presented by the inflation rate and the official exchange rate. The results show that in the long run, the impact of government expenditures is positive, while the effect of taxes is negative on growth. Moreover, the inflation rate is found to have little effect on GDP per capita but the impact of the exchange rate is insignificant. The conclusion is that fiscal policy is more powerful than monetary policy in promoting economic growth in Algeria. Bokreta Benanaya (2016) (Amir *et al.*) concluded that attempts to estimate the relationship between health status and economic growth. Cobb–Douglas production function is used. UsingECM, VECM, and Granger causality are used to find short-run and long-run relationships. Their study affirmed the positive impact of human capital on economic growth.

Theoretical Framework

This study aims to grounded with endogenous growth theory particularly with the model of Lucas presented in 1988. According to the model of Lucas (1988), economic growth is continued by the human capital stock. Human capital incorporates information and aptitudes procured somewhat through training, and their quality and efforts, which

cause their well-being. Human capital practice concentrates on health and training as contributions to monetary creation. Training influences the viability of work and the level of specialized advancement which truly impacts the monetary development of a nation. So also, enhanced human capital is also crucial to maintain economic growth. Now a trained person is an asset for a country and plays an important role in increasing the economic growth of a country. Any innate or acquired learning ability or characteristics that increase a worker's "efficiency" are considered human capital. There are both significant benefits and drawbacks to this broad concept. The benefits are obvious: it enables us to consider a variety of attributes in addition to the decades of tutoring when making predictions about human capital (Lucas Jr, 2003).

Method

GDP = f (INTt, HCt, CFGt, EMt, EXPTt) (3)
GDP = gross domestic product
INT = interest rate
HC = human capital
CF = capital formation
EMI = economic misery index (unemployment +inflation)
EXPT= exports
t = period

To find the responsiveness of the dependent variable to independent variables, the equation can be written in the following form

$$GDP = \alpha_0 INT_t^{\alpha 1} HC_t^{\alpha 2} CF_t^{\alpha 3} EMI_t^{\alpha 4} EXPT_t^{\alpha 5} \quad (4)$$

e = represents the base of the log

Following the log-linear form of the function, the model becomes as:

$$LGDPt = \alpha 0 + \alpha \text{LINT} t + \alpha 2 LHCt + \alpha 3 LCFt + \alpha 4 LEMIt + \alpha 5 LEXPTt + et \ (5)$$

This study's primary goal is to examine how nation's GDP was affected by fiscal and monetary policy between 1972 and 2013. Most of the factors' data comes from the World Bank's World Development Indicators database and different Pakistan Economic Survey editions. One of among the most crucial components of quantitative economic analysis is the application of econometric methods in macroeconomic frameworks. Most macroeconomic data contain time trends, which render data from time series non-stationary and could lead to erroneous regression conclusions. Many macroeconomic variables in time series data have unit root issues, according to Nelson and Plosser (1982). They get to the conclusion that the presence or absence of unit roots aids in verifying the legitimacy of the producing mechanism. Some characteristics distinguish stationary data from non-stationary data. Transient disturbances in the stationary time series data eventually go away and the series returns to its long-term mean values. In contrast, shocks in non-stationary time series data are persistent. Because of this, a nonstationary time series' variance and mean are dependent on the time trends. The series has two characteristics: (a) no long-term mean from which it comes back and (b) variance that varies with time and approaches infinity as it approaches infinity. Temporal serial data is nonstationary if it only contains positive or negative shocks (see Dickey and Fuller, 1979 for more information). There are several unit root analyses to make data stable in the literature. The study used the Augmented Dickey-Fuller (ADF) unit root model for this reason.

H_0: $\delta = 0$ *non-stationary time series; so, it has a unit root problem*.

Augmented Dickey-Fuller (ADF) Test

Dickey and Fuller (1981) propose the Augmented Dickey-Fuller (ADF). The general forms of the ADF can be written as:

$$\Delta X_t = \delta X_{t-1} + \sum_{j=1}^{q} \phi_j \, \Delta X_{t-j} + e_{1t}$$

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^{q} \phi_j \, \Delta X_{t-j} + e_{2t}$$

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{j=1}^{q} \phi_j \, \Delta X_{t-j} + e_{3t}$$

Unit roots are tested using a time sequence called Xt, where t is the duration of the trends and Xt is a term for error with white noise characteristics. The simple ADF test is represented if j = 0. The ADF model of regression incorporates the delayed variables that are dependent until the error item turns into white noise. The test known as the LM test is used to examine the serial relationship of term errors. The following are the alternate and null hypotheses for ADF component roots:

There is a unit core issue since H_0: $\delta = 0$ is a non-stationary series of times.
H_a: stationary time series with $\delta < 0$.

By using OLS to determine the τ statistic of the predicted coefficient of Xt-1 and comparing it to the crucial τ values of Dickey-Fuller (1979), the H_0 is rejected if the resulting τ statistic level exceeds than the critical point. The time data is stable in this instance. However, the sequence is non-stationary if we are unable to reject H_0. We can quickly determine each variable's order of integration by using this process on all of them.

Auto Regressive Distributed Lag Model (ARDL) Approach to Cointegration

Numerous cointegration examinations for econometric analysis are to be found in the academic literature. The most well-known and conventional assessments of cointegration are the Johansen-Juselius (1990), Highest Likelihood-based on Johansen (1991/1992), and residual-based Engle-Granger (1987) analyses. These tests have a single feature in common: their evaluation calls for an identical order of execution. When the equation's parameters have varying degrees of integrating, these assessments of cointegration are rendered ineffective and incorrect. Pesaran and Pesaran (1997) Among the drawbacks of traditional cointegration assessments are their poor prediction power and incapacity to take into consideration structural breakdowns in time series data. Since traditional approaches usually check for merely one structural break, they are unable to tackle the differences in structure introduced by financial crises, alterations to policy, and transformations in institutions.

Pesaran and Shin (1999), and Pesaran, Shin, and Smith (2001) Biased results may result from disregarding those modifications. Pesaran and colleagues' ARDL limits testing methodology has several benefits over conventional techniques (Pattichis, 1999). Pesaran and Shin (1997) and later Pesaran *et al*. (2001) claimed that it is applicable regardless of the sequence of integration, performs well with tiny sample sizes, and allows for enough lags to record the process for information generation (Mah, 2000). Furthermore, using the Unrestricted Vector Error Correction Model (UVECM), ARDL efficiently detects breakdowns in structure and offers trustworthy predictions of equilibrium over the short and long terms. ARDL is a reliable technique for examining long-term correlations between macroeconomic variables since OLS estimation guarantees correct inferences once the ideal lag order has been chosen (Laurenceson *et al*., 2003).

$$lnY_t = \beta_1 + \beta_2 t + \beta_3 lnY_{t-1} + \beta_4 lnX_{t-1} + \beta_5 lnZ_{t-1} + \cdots + \sum_{h=1}^{p} \beta_h \, \Delta lnY_{t-h} + \sum_{j=0}^{p} \gamma_j \, \Delta lnX_{t-j} + \sum_{k=0}^{p} \phi_k \Delta lnZ_{t-k} + \cdots + u_{it}$$

Initially, the study will employ the test known as Wald to determine the direction of the link between the variables in this instance of the nation of Pakistan. The variable that is dependent in this study is a variety of proxies for

advancement in society, and each model includes a unique control variable related to macroeconomic volatility or instability

H_0: β3 = β4 = β5 = 0 (variables do not cointegrate)
H_A: β3 ≠ β4 ≠ β5 ≠ 0 (variable cointegration).

The Vector Error Correction Model (VECM) is used in the investigation to determine a short-term connection when there is a long-term cointegration between each of the variables being studied. The following is an explanation of the VECM:

$$\Delta \ln Y_{it} = \beta_1 + \beta_2 t + \sum_{h=1}^{p} \beta_h \Delta \ln Y_{it-h} + \sum_{j=0}^{p} \gamma_j \Delta \ln X_{t-j} + \sum_{k=0}^{p} \phi_k \Delta lnZ_{it-k} + \omega ECT_{t-1} + u_t$$

Empirical Results and Discussion on Major Findings

Table 1 displays the descriptive statistics for a summary of the data's temporal characteristics. According to the projected results, interest rates are positively skewed whereas the GDP, capital formation, human capital, economic suffering index, and exports are adversely skewed.

All factors have positive Kurtosis, according to the results. We reject the null hypothesis that there is no normalcy because the calculated Kurtosis and skewness are negligible and deviate from zero. The model's variables all have zero means and finite covariance, according to the Jarque-Bera values, which validates that the chosen data sets are normally distributed.

Table 1
Descriptive Statistics

	GDP	INT	HC	CF	EMAIL	EXPORT
Mean	10.54859	2.375672	7.033395	2.864516	2.507519	22.46172
Median	10.61820	2.302585	7.122320	2.898225	2.551732	22.67323
Maximum	10.93459	2.995732	7.953670	3.035831	3.296690	23.95733
Minimum	10.06093	1.791759	6.006107	2.559587	1.509930	20.77445
Std. Dev.	0.268175	0.253525	0.625516	0.112030	0.432326	0.980566
Skewness	-0.312242	0.453113	-0.092661	-1.088750	-0.368050	-0.231380
Kurtosis	1.933595	3.131885	1.621912	3.488101	2.496825	1.952921
Jarque-Bera	2.672599	1.467617	3.383574	8.714554	1.391300	2.293412
Probability	0.262816	0.480077	0.184190	0.012813	0.498750	0.317681
Sum	443.0408	99.77823	295.4026	120.3097	105.3158	943.3923
Sum Sq. Dev.	2.948629	2.635278	16.04206	0.514578	7.663124	39.42192
Observations	42	42	42	42	42	42

Table 2 reports the correlation, t-statistics, and probability, the results reveal that gross domestic product has a positive and significant correlation economic misery index and exports whereas it has a positive but insignificant relationship with capital formation in the case of Pakistan.

The interest rate has a positive and significant correlation with human capital, capital formation, economic misery index, and exports. The results show human capital has a positive and significant correlation with the economic misery index and exports, but it has an insignificant correlation with exports whereas it has a negative and significant correlation with the economic misery index. The economic misery index has a positive and significant correlation with exports. The overall estimation results show that all the variables of the model have positive and significant correlation except capital formation when gross domestic product is the dependent variable the results of the correlation matrix show there is the problem of weak multicollinearity among the explanatory variables which can be ignored.

Table 2
Pairwise Correlation

Covariance Analysis: Ordinary
Date: 9/8/17 Time: 18:59
Sample: 1 42
Included observations: 42
Balanced sample (listwise missing value deletion)

Correlation t-Statistic **Probability**	**GDP**	**INT**	**HC**	**CFG**	**EM**	**EXPORT**
GDP	1.000000					

INT	0.466330	1.000000				
	3.334042	-----				
	0.0019	-----				
HC	0.984462	0.482368	1.000000			
	35.45752	3.482726	-----			
	0.0000	0.0012	-----			
CFG	0.114878	0.304058	0.028291	1.000000		
	0.731395	2.018608	0.178999	-----		
	0.4688	0.0503	0.8588	-----		
EM	0.359829	0.365515	0.422800	-0.235177	1.000000	
	2.439133	2.483570	2.950735	-1.530309	-----	
	0.0193	0.0173	0.0053	0.1338	-----	
EXPT	0.990883	0.456092	0.978243	0.077793	0.381184	1.000000
	46.51665	3.241344	29.82203	0.493500	2.607705	-----
	0.0000	0.0024	0.0000	0.6244	0.0128	-----

Estimation Results of Unit Root Tests

Table 3
Pairwise Correlation

Covariance Analysis: Ordinary
Date:9/8/17 Time: 18:59
Sample: 1 42
Included observations: 42
Balanced sample (listwise missing value deletion)

Correlation t-Statistic Probability	GDP	INT	HC	CFG	EM	EXPORT
GDP	1.000000					

INT	0.466330	1.000000				
	3.334042	-----				
	0.0019	-----				
HC	0.984462	0.482368	1.000000			
	35.45752	3.482726	-----			
	0.0000	0.0012	-----			

CFG	0.114878	0.304058	0.028291	1.000000		
	0.731395	2.018608	0.178999	-----		
	0.4688	0.0503	0.8588	-----		
EM	0.359829	0.365515	0.422800	-0.235177	1.000000	
	2.439133	2.483570	2.950735	-1.530309	-----	
	0.0193	0.0173	0.0053	0.1338	-----	
EXPT	0.990883	0.456092	0.978243	0.077793	0.381184	1.000000
	46.51665	3.241344	29.82203	0.493500	2.607705	-----
	0.0000	0.0024	0.0000	0.6244	0.0128	-----

Estimation Results of Unit Root Tests

The results of unit root tests of the gross domestic product model are reported in Table 4. The results of the T-statistics and probability of the ADF test reveal that the interest rate and economic misery index are stationary at this level. The estimated results of the ADF test highlight that gross domestic product, capital formation, exports, and human capital are not stationary at this level. At 1st difference gross domestic product, interest rate, capital formation, economic misery index, exports, and human capital are stationary in the case of the ADF test. Hence there is a mixed order of integration which is a suitable condition for applying the ARDL cointegration approach.

Table 4
Unit Root Tests

Augmented Dickey-Fuller Unit root test		
At level		
Variables	T-Statistic	Prob.
GPD	-1.195204	0.6672
INT	-3.149041	0.0310
CF	- 2.224159	0.2012
EM	3.450888	0.0147
EXPT	-0.609530	0.8574
HC	-0.785834	0.8125
At first difference		
ΔGDP	-4.913764	0.0003
ΔINT	-5.332364	0.0001
ΔCF	-5.996864	0.0000
ΔEM	-8.105453	0.0000
ΔEXPORT	-6.936391	0.0000

Estimates ARDL Bound Testing Approach

For investigating the cointegration among gross domestic product, interest rate, capital formation, economic misery index, exports and human capital ARDL bounds testing approach is used. The results of ARDL bounds testing approach are presented in Table 5.

Table 5
ARDL Bounds Testing Approach

Dependent Variable GDP ARDL (1,1,0,1,2,2)		
Critical values	**F-Statistics** 6.340857	
	Lower Bound	Upper bound
95%	2.62	3.79
90%	2.26	3.35

The calculated F-Statistics (6.340857) is greater than (3.79) value of Pesaran, Shin and Smith (2001) at 5 percent. So null hypothesis of no cointegration is rejected which confirms cointegration among the variables of the model. The calculated F-Statistic have verified the existence of cointegration among the variables of model. Now long-run relationship among gross domestic product, interest rate, capital formation, economic misery index, exports, and human capital can be examined. The estimated long run results are presented in table 6.

Table 6
Estimated Long Run Coefficient using the ADRL Approach

ARDL (1,1,0,1,2,2)
Dependent variable is
GDP
Period 1972-2013

Regressor	Co-efficient	Standard-Error	T-Ratio (Prob)
INT	-0.017335	0.030089	-0.576130(0.5693)
HC	0.110002	0.051662	2.129241(0.0425)
CF	0.131856	0.064083	2.057597(0.0494)
EM	-0.081094	0.022386	-3.622503(0.0012)
EXPT	0.218174	0.033232	6.565258(0.0000)
C	4.777048	0.403672	11.833987(0.0000)

The coefficient of interest rate shows there is a negative and insignificant relationship between interest rate and GDP. There is a positive and significant relationship between human capital and GDP. The estimated results show 1 percent increase in human capital brings a (0.110) percent increase in GDP and this relationship has a 5 percent level of significance level. Capital formation has a positive and significant relationship with GDP in the case of Pakistan.

The estimated results show that a 1 percent increase in capital formation brings a (0.132) percent increase in GDP and this relationship has a 1 percent level of significance. The estimated results show that there is a negative and significant relationship between the economic misery index and GDP in the case of Pakistan.

The results reveal that a 1 percent increase in the economic misery index brings a (0.081) percent decrease in GDP and this relationship is significant at 1 percent. The coefficient of exports shows that there is a positive and significant relationship between exports and GDP in Pakistan. The estimated results show that a 1 percent increase in exports brings a (0.218) percent increase in GDP at a 1 percent level of significance. The overall long-run results show that human capital, capital formation, and exports have a positive and significant impact on GDP. Whereas the economic misery index has a negative and significant impact on GDP in Pakistan. This shows that for increasing GDP the government should reduce the economic misery index and increase human capital, capital formation, and exports in Pakistan.

Estimated Short-Run Dynamics

The short-run dynamics are presented in Table 7, the study uses the Vector Error-Correction Model (VECM) to investigate the short-run dynamic among GDP, interest rate, human capital, capital formation, economic misery index, and exports in the case of Pakistan. The estimates show that interest rate has a positive and insignificant impact on GDP in Pakistan.

The results show that in the short run, there is a positive and insignificant relationship between human capital and GDP and this relationship is positive and significant to long-run results. The estimates show that there is a positive and significant relationship between capital formation and GDP in Pakistan. The estimated results show that there is a negative and significant relationship between the economic misery index and GDP in Pakistan. There is a positive and significant relationship between exports and GDP in Pakistan.

The short-run dynamics show that capital formation and exports are more fruitful for increasing GDP in Pakistan whereas by reducing the economic misery index the government can also achieve targeted GDP in Pakistan. The negative and significant coefficient (-0.450) of CointEq (-1) is theoretically correct. The negative and significant value of CointEq (-1) shows the speed of adjustment from short-run to long-run equilibrium.

Table 7
Vector Error-Correction Model (VECM)

ADRL (1,1,0,1,2,2)
The dependent variable is the GDP
Period 1972-2013

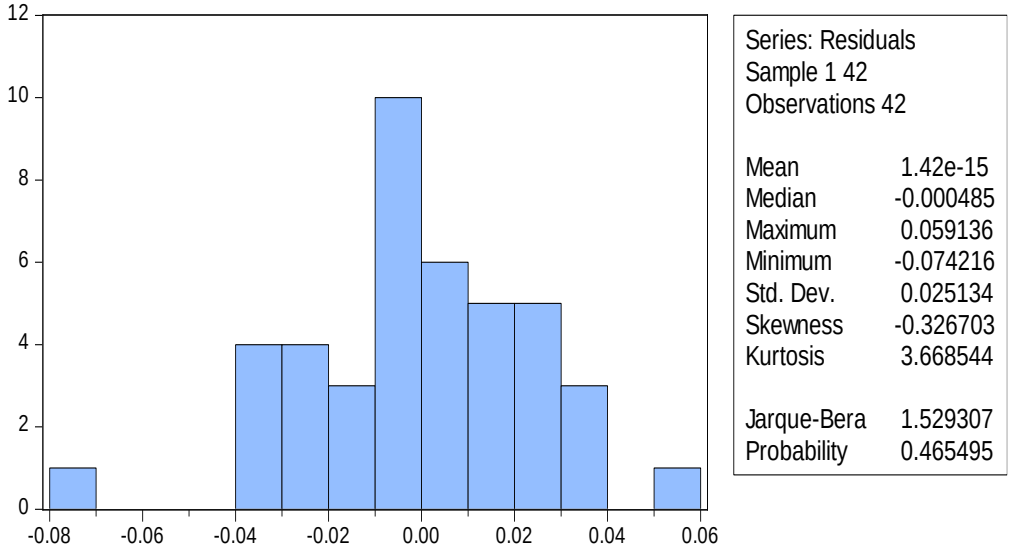
Regressor	**Co-efficient**	**Standard-Error**	**T-Ratio (Prob)**
D (INT)	0.0273	0.0204	1.335(0.192)
D (HC)	0.0495	0.0299	1.652(0.110)
D (CF)	0.1234	0.0017	2.950(0.007)
D (EMI)	-0.0208	0.0087	-2.378(0.0247)
D (EMI (-1))	0.0245	0.0073	3.344(0.0024)
D (EXPT)	0.0569	0.0190	2.990(0.0059)
D (EXPT (-1))	-0.0360	0.0222	-1.6218(0.1165)
CointEq (-1)	-0.4502	0.1096	-4.1067(0.0003)

R-squared	0.998187	Mean dependent var	10.57196
Adjusted R-squared	0.997381	S.D. dependent var	0.252632
S.E. of regression	0.012929	Akaike info criterion	-5.601672
Sum squared resid	0.004514	Schwarz criterion	-5.052786
Log-likelihood	125.0334	Hannan-Quinn criteria.	-5.403212
F-statistic	1238.561	Durbin-Watson stat	2.286296
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Figure1

Data Normality



Above figure shows the normality of data. The probability of Jarque-Bera is insignificant which is showing that data is normal.

Table 8

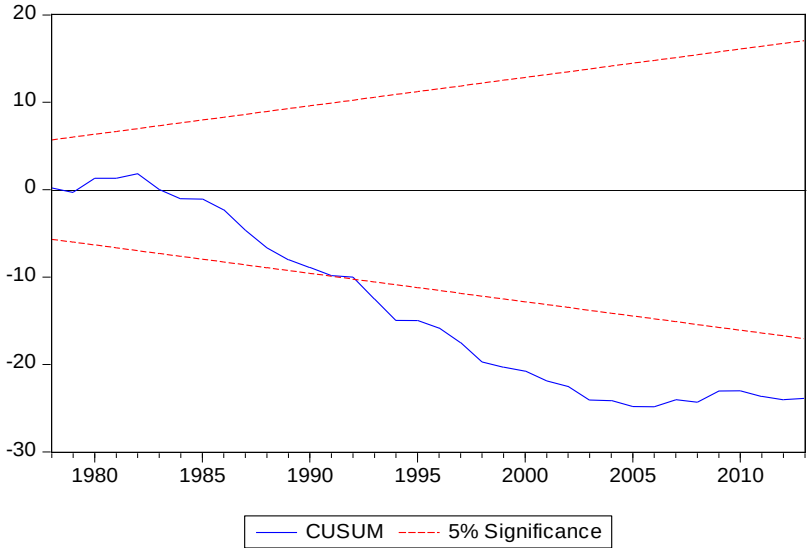
Heteroscedasticity Test: White

F-statistic	1.179039	Prob. F(20,21)	0.3550
Obs*R-squared	22.21569	Prob. Chi-Square (20)	0.3289
Scaled explained SS	21.77763	Prob. Chi-Square (20)	0.3527

White test for heteroskedasticity has been used which shows that there is no heteroskedasticity problem in the data.

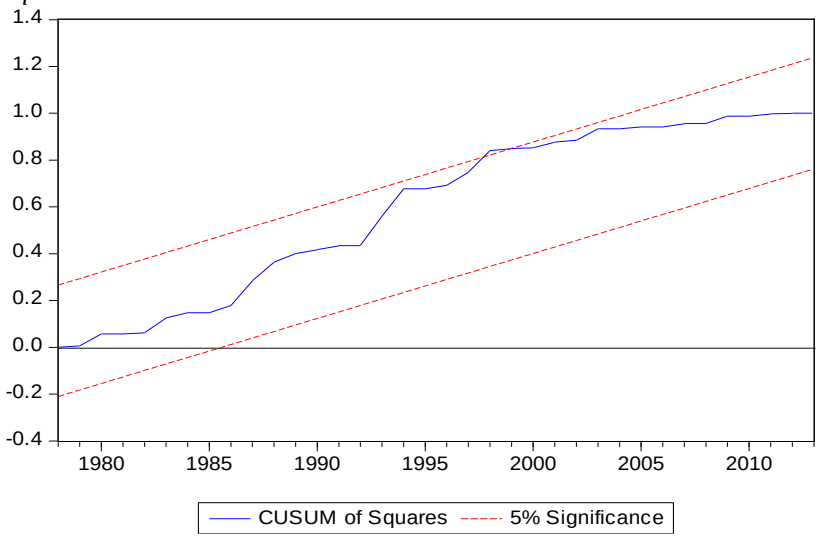
Graph 1

Heteroskedasticity Problem in Data.



Graph 2

Cumulative Sum of Square lies between the two Critical Lines.



The results of Cumulative Sum of Squares test are reported in above figure. This figure shows that Cumulative Sum of Square lies between the two critical lines which indicates that estimated model is stable.

Conclusion

The basic aim of this study was to find out the impact of macroeconomic variables like human capital, interest rate inflation, unemployment, and exports on the economic growth of Pakistan which is measured through GDP. After analysis it is concluded that the human capital has a positive and significant impact on GDP. Economic misery has a negative but significant impact on economic growth. Jarqu Bara test is applied to find the normality of the data which is insignificant. There is no heteroskedasticity problem in the data. There should be a reduction the economic misery through inflation and unemployment to enhance human capital productivity.

Policy Recommendations

The government should invest in both education and health sector particularly as there are indirect benefits of such investments which individuals may not let for in their investment decisions. The primary policy implication of our study is the need to support continuous human capital development. As we know human capital is positively linked with GDP. Therefore, the government should boost the human capital by enlightening the system of education and health in Pakistan. Furthermore, the government should provide quality of education. Quality of education means more balance and opportunity to develop the socio-economic status of individuals. Primary education should be necessary for every citizen. Because it is the important right of human and base for the development of any country. Additionally, with education attention must be given on the health-related centers and institutions. Government should develop programs for the awareness of people especially in rural areas. More job opportunities must be given so that economic misery may decrease. More investment must be made in the development of human capital.

Limitations and Future Directions

This study has several limitations. First, it is conducted in a developing nation context i.e., Pakistan, where it is required in the future to be conducted with same factor among different developing nations of the region.

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Data Availability

The data related to this study could be available to the interested audience upon formal request.

Declaration of Interest

The authors declare that they have no clash of interest.

References

Acaroglu, H., & Ada, A. A. (2014). The relation between human capital and economic growth in MENA Countries. *Journal of Public Administration and Governance*, *4*(3), 205-216.

Afridi, A. H. (2016). Human capital and economic growth of Pakistan. *Business & Economic Review*, *8*(1), 77-86.

Ali, S., Sharif Chaudhry, I., & Farooq, F. (2012). Human capital formation and economic growth in Pakistan. *Pakistan Journal of Social Sciences (PJSS)*, *32*(1).

Amir, M., Mehmood, B., & Shahid, M. (2012). Impact of human capital on economic growth with emphasis on intermediary role of technology: Time series evidence from Pakistan. *African Journal of Business Management*, *6*(1), 280.

Asghar, N., Awan, A., & Ur Rehman, H. (2012). Human capital and economic growth in Pakistan: a cointegration and causality analysis. *International Journal of Economics and Finance*, *4*(4), 135.

Azam, M., & Ahmed, A. M. (2015). Role of human capital and foreign direct investment in promoting economic growth: evidence from Commonwealth of Independent States. *International Journal of Social Economics*, *42*(2), 98-111.

Chani, Muhammad Irfan & Hassan, Mahboob Ul & Shahid, Muhammad (2012). *Human capital formation and economic development in Pakistan: An empirical analysis*. MPRA Paper 38925, University Library of Munich, Germany.

Fernandez, E., & Mauro, P. (2000). The role of human capital in economic growth: the case of Spain. *Finance*, *4*(4), 135.

Imran, M. U. H. A. M. M. A. D., Bano, S. U. M. A. I. R. A., Azeem, M. A. S. O. O. D., Mehmood, Y. A. S. I. R., & Ali, A. B. I. D. (2012). Relationship between human capital and economic growth: Use of co-integration approach. *Journal of Agriculture and Social Sciences*, *8*(4), 135-138.

Jahangir, A. (2008). *Promotion and protection of all human rights, civil, political, economic, social, and cultural rights, including the right to development*. United Nations Digital Library, available: https://digitallibrary.un.org/record/3938651?v=pdf

Khan, Jangraiz & Khattak, Naeem Ur Rehman Khattak & Khan, Amir (2015). *Human capital-economic growth nexus: A causality analysis for Pakistan*. MPRA Paper 65689, University Library of Munich, Germany.

Khan, M. S., Amjad, R., & Din, M. U. (2005). Human capital and economic growth in Pakistan [with Comments]. *The Pakistan Development Review*, 455-478.

Lucas Jr, R. E. (2003). Macroeconomic priorities. *American Economic Review*, *93*(1), 1-14.

Manuelli, R., & Seshadri, A. (2005). *Human capital and the wealth of nations*. March.

Mujahid, N., Amin, A., & Khattak, S. W. (2014). Human capital investment and physical capital nexus (A path to economic growth of the country): A case study of Pakistan 1980-2010. *PPUTAJ Humanities & Social Sciences*, *21*(2).

Sarker, A. S. (2017). Human resource management practices and employee performance in banking sector of Bangladesh. *Journal of Human Resource Management*, *20*(1), 68-80.

Shahid, M. (2014). Effect of inflation and unemployment on economic growth in Pakistan. *Journal of Economics and Sustainable Development*, *5*, 15.

Shahzad, F. (2015). Role of human capital on economic growth: A case study of Pakistan. *International Journal of Accounting and Economics Studies*, *3*(1), 20-24.

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