Nexus Between Human Capital Expenditures and Economic Growth in Pakistan

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Abstract

This study examines the relationship between Pakistan's economic growth and investments in human capital. It investigates how spending on human capital significantly affects economic expansion. The education and health sectors are two main areas where money is spent on human capital. Federal and provincial governments also track the total amount spent on the health and education sectors. At the federal level, GDP serves as a stand-in for economic growth, whereas per capita income is employed at the provincial level. The empirical association between the underlying variables has been estimated using time series data spanning 1985–2016. Both long-run and short-run coefficients have been calculated using the Autoregressive Distributed Lag (ARDL) and Error Correction models. The study's conclusions suggest that investing in human capital, particularly in health and education, raises GDP and per capita income because it boosts worker productivity. Furthermore, the results also showed that investing in human capital will strengthen Pakistan's economic expansion.

Keywords: Public Expenditure, Education, Health, Human Capital, Economic Growth.

Introduction

The collapse of the economies in Great depression in 1930 provided a food for thought to the economists to rethink the idea of laissez-Faire economy. The very example of Britain practicing small government forced the modern developed countries to adopt more interventionist form of government (Hanlon, 2016), In addition to carrying out essential duties like civil administration and national security, the interventionist form of government also shows a great deal of interest in advancing national development. In order to make economic growth conceivable, the contemporary government also recognizes the impact of public spending on employment and economic stability in a nation (Onifade et al., 2020).

Public expenditure comprises of development and non-development expenditures which are disbursed by the government to run public administration and finance government projects. Non-development expenditures includes salaries, costs of tax collection, defense expenditure, while development expenditure contains expenditure on projects that have greater rate of return. The role of public expenditure in economic growth is not universally agreed upon (Ahuja & Pandit, 2020) however, development expenditures do play a significant part to economic growth which (Sadıa Ejaz, 2017).Government's main focus is the accumulation and development of both physical and human capital. The contribution rate of physical capital to economic growth is approximately 4/5

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(Pomi et al., 2021) and physical stock capital adds undeniably to economic growth (Ng et al., 2019).

Despite the fact that physical capital play an irrefutable vital role, the prominence of human capital cannot be ignored (Pomi et al., 2021). Human capital refers to total knowledge, skills, education, trained and healthy manpower available in a country (Parkin & Bade, 1982). Human capital not only helps in efficiency and creativity, but also raises the labor productivity (Prasetyo & Kistanti, 2020). Additionally, it contributes to institutional development and greater chances of employment in developing countries.

However, modern economists believe that expenditure made on health, education and training of human being have greater influence on economic growth than the expenditure made on roads, dams, bridges and other tangible capital goods in the economy (Qadri & Waheed, 2017). Economists like (Todaro, 2000) firmly argues that human resource is the ultimate source of determining the economic and social development. A greater chunk of economic growth is derived from investment on human capital and this improvement is brought up by skilled human capital(Galbraith et al., 1975). Additionally, human capital is widely acknowledged as a crucial factor in economic growth, and current exogenous and endogenous growth models strongly promote its accumulation (Mankiw et al., 1992; Bergheim, 2005; Howitt, 2005).

Human capital develops through expenditure on five different categories. The expenses on schooling and expertise, the spending on crucial proper secondary and higher secondary schooling, the spending on grown-up schooling and the payments of extension program for the adults, the expenses for technical schooling and hiring of technical person, the payments for providing health facilities (Schultz, 1961). The stock of skills and training which is generated by education directly contributes to efficient factors of production (Saggi, 2002). Similarly, the expenditure on health sector is reported to be an encouraging and noteworthy provider of financial expansion in numerous observed cross-country model(Bloom & Canning, 2003).

Notably, the investment in human capital leads to attract other physical investment (Romer, 1990). The physical capital investment in return elevates accumulation of physical capital. Therefore, investing in human capital further escalate investment in physical capital leading to an increment in human and capital accumulation. This provides better economic outcomes that spending on physical capital only (Abbas & Mujahid-Mukhtar, 2000).

Education and Health Expenditure in Pakistan

Many developing nations are actively encouraging investments in human capital because they recognize its critical role. Nevertheless, as a developing nation, Pakistan has yet to recognize the importance of investing in human capital. The two sectors that contribute most to human capital—education and health—are the ones that are most often overlooked in this respect. As a proportion of GDP, public spending on the health and education sectors is the lowest. For many decades, the total amount spent on education stayed at about 2.0 percent of GDP (Qadri & Waheed, 2017); table 1 shows this.

Table 1: Public expenditure on health and education as % of GDP and GDP Growth rate in Pakistan

Years	GDP Growth Rate	Expenditure on Education as % of GDP	Expenditure on Health as % of GDP
2000-01	2.0	1.82	0.58
2001-02	3.1	1.79	0.57
2002-03	4.7	1.86	0.59
2003-04	7.5	2.20	0.58
2004-05	9.0	2.15	0.58
2005-06	5.8	2.24	0.49
2006-07	6.8	2.50	0.54
2007-08	3.7	2.47	0.56
2008-09	1.7	2.10	0.56
2009-10	3.8	2.05	0.53
2010-11	2.4	1.08	0.23
2011-12	3.8	2.00	0.27
2012-13	3.7	2.14	0.56
2013-14	4.1	2.14	0.59
2014-15	4.0	2.20	0.42
2015-16	4.7	2.40	0.45
2016-17	5.5	2.20	0.90
2017-18	4.4	2.40	1.11
2018-19	6.1	2.31	1.00
2019-20	2.5	2.51	1.10
2020-21	-1.3	1.50	1.21

Sources: Economic Survey of Pakistan (2020-2021)

It is an incontestable fact that education and health sectors contribute maximum for the advancement of human capital which directly or indirectly serves an engine for economic growth. Unfortunately, these social sectors have been the most ignored one in Pakistan.

Literature Review

A literature review is divided into two primary parts. The first section discusses several viewpoints regarding the strong and poor correlation between economic growth and investments in human capital. The second portion, on the other hand, asks about the many empirical methods that have been used in different nations to examine how human capital spending affects economic growth. To determine the long-term relationship between the underlying variables, a variety of methodologies are employed.

Impact of Human capital Expenditure on Economic Growth

Human Capital expenditure and economic growth nexus has a very extensive literature. Various studies have confirmed a strong relationship whereas some studies found a weak or no association between these two. (Musaba et al., 2013) investigated the factors influencing Nigeria's economic expansion. They discovered a favorable correlation between human capital expenditure and Nigeria's economic growth. According to their findings, Nigeria's economic growth was considerably boosted by investments in human capital. Similar studies on India and Pakistan have been conducted by Chandra (2010) and Qadri & Waheed (2017), respectively. According to

Chandra (2010), spending on education does have an impact on economic growth after a period of time. (Qadri & Waheed, 2017) also discovered that Pakistan's economic growth is positively correlated with the coefficients on human capital expenditure.

Likewise (Shafuda & De, 2020) examined the underlying indicators of human capital i.e. education and health. They realized that expansionary fiscal policy favors economic growth in case of Namibia. The results also demonstrated a significant long-term positive correlation between public spending on education and the gross tertiary enrollment rate, net primary enrollment rate, and literacy rate. (Berger & Fisher, 2013) also indicated investment on education can strongly build a firm foundation for economic growth and prosperity. Not only high quality education expands the horizon of more economic opportunities in a country, but also it helps to develop the overall economy. Approximately, a percent surge in education spending per worker leads to an increase in the output by 0.04% in the short run and 0.6 % increase in the long run. (Musila & Belassi, 2004) indicated these results while working on Uganda.

While trying to investigate the association between fiscal policies, public expenditure and economic growth for 35 lower middle income countries. (Semmler, 2007) experienced a substantial impact of public spending on infrastructure, health and schooling facilities. If two-third of the public investment is allocated towards development of infrastructure, more opportunities would be created for market production.

Remarkably, the long-term relationship between economic growth and human capital investment was found to be negligible when (Paul & Akindele, 2016) examined the effect of public spending on human capital development and economic growth in Nigeria. It was a negative trend in addition to being inconsequential. Similar outcomes were suggested by (Ogunrinola & Oluwatobi, 2011). They observed the impact of money payments on schooling and health and their effect on fiscal expansion of the country. They came across a negative association between government capital expenditure on education and health and the level of actual income. (Aremu et al., 2015) in case of Indonesia. The study depicted an insignificant relationship in both short and long run. In short run. It was negative as well. Public education expenditure has direct and indirect effect on economic growth, the indirect channel is more pertinent for economic growth as compared with direct channel (Urhie, 2014).

Modelling the Impact of Human Capital Expenditures on Economic Growth

Human capital expenditure and economic growth as mentioned above has a vast literature. The above studies indicated different perspective that how human capital expenditure is an essential factor in economic growth. Short run effect of human capital expenditure can be negative or positive, but in long run, most of the studies confirmed a strong positive relationship. Even though, the impact is either direct or indirect.

Several approaches have been used to find out the impact of public expenditure on economic growth for different countries and regions. (Oluwatobi & Ogunrinola, 2011) while working on economic progress of Nigeria, based their modeling on Solow model. They worked on secondary data, where real output was used as the dependent variable and capital expenditure on education and health were considered the independent variables. Whereas, (Semmler, 2007) and (Aremu et al., 2015) applied the production function approach to examine the association between public expenditure on economic growth for 35 lower-middle income countries and on Indonesia, respectively.(Aremu et al., 2015) and (Shafuda & De, 2020) further utilized the autoregressive Distributive lag approach and Bound Test Cointegration. (Paul & Akindele, 2016) integrated the underlying variables into an Autoregressive Distributive Lag model (ARDL) for probing the

relationship between economic growth and public expenditure. Likewise , (Musaba et al., 2013) also analyzed this relationship for Nigeria by using Autoregressive distributive lag model. On the contrary, (Musila & Belassi, 2004) applied Error Correction regression model to examine the impact of expenditure on schooling on economic growth for Uganda.

Hence, the literature endorses both positive and negative impact of human capital expenditure on economic growth of a country. Some of the work experienced results that were beyond their expected result i.e. a negative impact of public expenditure on economic growth. While some of literature illustrated a positive impact of public expenses on economic growth.

While reviewing all the above literatures, it has clearly implied that there is an association between public spending and economic growth. Most of the researchers used education and health sector to represent the human capital. No earlier researchers used the provincial and federal level separately to know the impact of public expenditure of these two sectors on economic growth especially in case of Pakistan. Thus, a gap to work on this nexus is created. Working up on this area is an attempt to fill that gap which has not been studied earlier. This work may provide some new ideas to the future researchers to know the relationship of public expenditure on human capital and economic growth in context of Pakistan.

Theoretical Framework and Methodology

Theoretical Framework

The theoretical framework of the study based on most relevant theories of Keynesian and Solow's theory of growth. The Keynesian growth model asserts that a rise in public consumption leads to an expansion of economic through a multiplier effect on aggregate demand and Solow's model explains that other thing remain same, increased rates of saving and investment result in the accumulation of more capital per worker, leading to higher output per worker hence when per capita income will rise, focusing government to increase the expenditure specially on infrastructure, education and health sector etc. that results economic growth. But Solow's model also explores the adverse impact of high population growth on economic growth because of diminishing return. Thus following these models our study carries out the objective how public expenditure on the education and health sectors (human capital) affects economic growth in the context of Pakistan.

Empirical Methodology

This study is purely empirical and quantitative in nature. The study uses latest statistical and econometric model for analyzing the impact of public expenditure on education and health sector on Pakistan's economic growth. Economic growth on both federal and provincial level is investigated. The purpose of the study is to investigate the long run association between our underlying variables on federal and provincial level of Pakistan. The empirical methodology is applied on both federal and provincial level of Pakistan.

Many applied econometricians suggest co integration techniques for long run association (Johansen & Juselius, 1990) and (R. Engle & Granger, 1991). However, the co-integration techniques are deeply sensitive with the integrating order of the variables. Therefore, Engle and Granger's (R. Engle & Granger, 1991) co integration analysis is not applicable when the variables are integrated in different orders. Hence, for econometrics estimation, Autoregressive Distributive Lag (ARDL) model developed by (Pesaran and Shin, 1999 and Pesaran et al., 2001) is used for long run and the Error Correction Model (ECM) will be used for short run analysis. For that purpose, the variables for modelling are specified in the following section

Variables

In this study, the dependent and independent variables are stated in the following functional form.

For Federal Government's Economic Growth

1. Gross Domestic Product (GDP) = f(Expenditure on Human Capital, Other Control Variables)

For Provincial Government's Economic Growth

Baluchistan's per capita income = f(Expenditure on Human Capital, Other Control Variables)

2. Punjab's per capita income = f(Expenditure on Human Capital, Other Control Variables)
3. Sindh' per capita income = f(Expenditure on Human Capital Other Controlling Variables)
4. Khyber Pakhtunkhwa (KPK)'s per capita income = f(Expenditure on Human Capital, Other Control Variables)

Dependent Variables

The study used GDP and Provincial per capita income as dependent variables at federal and provincial level, respectively. The GDP of Pakistan and per capita income of provinces are used as proxy variables for analyzing economic growth. Increase in total GDP indicates higher economic growth in the country. Similarly, a decrease directs lower economic growth. Whereas, increase in provincial per capita income points out a greater economic growth in province and vice versa.

To sum up, the dependent variables are defined as the following.

1. GDP of Pakistan is used as dependent variable at federal level to represent the economic growth in the model.
2. Per capita income is used as dependent variable at provincial level to measure the economic growth in the model as the concept of GDP is not plausible to represent the growth rate for each province. Per capita income of each provinces is measured by dividing the total income of that particular province with the total number of population of the province. Per capita income for each province measures the economic growth of all provinces of Pakistan.

Independent Variables

The independent variables, which are used in this study, are public expenditures on Education and Health sector of Federal government of Pakistan. Furthermore, the public expenditures of Punjab, Sindh, Khyber Pakhtunkhwa and Baluchistan province. The independent variables as classified as the following.

1. Federal government of Pakistan's Public expenditures on Education sector.
2. Federal government of Pakistan's Public expenditures on Health sector.
3. Provincial Government of Punjab's, Sindh's, Khyber Pakhtunkhwa's and Baluchistan's public expenditures on Education Sector.
4. Provincial government of Punjab's, Sindh's, Khyber Pakhtunkhwa's and Baluchistan's public expenditures on Health sector.

Econometric Modelling

Dealing with time series data requires great precautions. For estimation, properties of the variables has to be constant over time. Stationary variables have constant mean, variances and other properties over time (Studenmund, 2015). Variables in question has to go for stationarity check.

For that purpose, Augmented Dickey Fuller (ADF) test is applied to check for unit root in each variable.

Unit Root Test for Stationarity

The Augmented Dickey-Fuller (ADF) test is conducted on each variables to test if the variable is stationary or not. It is done with optional inclusion of both trend and constant. For the unit root test, null hypothesis is stated as

H_0: the variable follows unit root i.e. the variable is non-stationary

$H_o: \beta - 1 = 0$

Against the alternative hypothesis:

H_1: the variable does not follow unit root i.e. variable is stationary.

$H_1: \beta - 1 < 1$

When the calculated value of ADF test statistics is greater than the critical value, then the null hypothesis fails to be rejected i.e. the variable follows unit root. On the contrary, if the null hypothesis is rejected, the variable is considered as stationary.

If the variables are found to be non-stationary, they are converted into differenced form and again checked for stationarity. If the variables are stationary at different integration order, then Autoregressive Distributive Lag (ARDL) technique is the appropriate one.

Autoregressive Distributive Lag (ARDL) Model

Using the ARDL model, the following econometric equations are estimated.

Equation 1

$$\text{LogFGDP} = ¥ + \sum_{k=0}^{n} \emptyset_s \text{LogFGDP}_{t-k} + \sum_{k=0}^{n} \beta_s \text{LogFHET}_{t-n} + \sum_{k=0}^{n} \alpha_s \text{LogFEET}_{t-n} + \mu_s$$

Equation 2

$$\text{LogBPC} = ¥ + \sum_{k=0}^{n} \emptyset_s \text{Log BPC}_{t-k} + \sum_{k=0}^{n} \beta_s \text{LogBHEC}_{t-n} + \sum_{k=0}^{n} \alpha_s \text{LogBEEC}_{t-n} + \mu_s$$

Equation 3

$$\text{LogPPC} = ¥ + \sum_{k=0}^{n} \emptyset_s \text{LogPPC}_{t-k} + \sum_{k=0}^{n} \beta_s \text{LogPHEC}_{t-n} + \sum_{k=0}^{n} \alpha_s \text{LogED}_{t-n} + \mu_s$$

Equation 4

$$\text{LogSPC} = ¥ + \sum_{k=0}^{n} \emptyset_s \text{LogSPC}_{t-k} + \sum_{k=0}^{n} \beta_s \text{LogSHEC}_{t-n} + \sum_{k=0}^{n} \alpha_s \text{LogSEEC}_{t-n} + \mu_s$$

Equation 5

$$\text{LogKPC} = ¥ + \sum_{k=0}^{n} \emptyset_s \text{LogKPC}_{t-k} + \sum_{k=0}^{n} \beta_s \text{LogKEEC}_{t-n} + \sum_{k=0}^{n} \Psi_s \text{LogKHEC}_{t-n} + \mu_s$$

The equations explain that the log of dependent variables depends its own lag values and the lag of independent variables and the error term.

For short run relationship, Error correction model (ECM) is applied

Error Correction Mechanism (ECM)

Sargon first proposed the error correction mechanism (ECM) in 1964, and Granger's efforts (R. F. Engle & Granger, 1987; R. Engle & Granger, 1991) helped it become more well-known. The Error Correction Mechanism is carried out by Engle and Granger in two parts: first, the cointegration of the variables is checked, and then ΔYt is regressed on ΔXt and the first step's lag residuals.
We initiate our modelling specifications from the first step:

1st Step: Cointegration Test

A non-stationary series' residuals are assumed to be stationary at I(0) by cointegration. Engle and Granger recommend a number of techniques, including Dickey Fuller (DF), Durbin Watson regression, Augmented Dickey-Fuller (ADF), and Restricted Vector Auto regression (RVAR), to test for cointegration. Because it allows for more dynamics, the residuals are subjected to the Augmented Dickey-Fuller Test (ADF) to check for stationarity. We start by performing a straightforward linear regression of Yt on every Xt variable.

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \beta_5 X_{5t} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(a)}$$

2nd Step: **Regression of ΔY_t on ΔX_t and U_{t-1} (Lagged Residuals):**

Regression analysis of the first differenced variables is the second phase. As stated below, ΔYt is regressed on ΔXt and Ut-1 in this regression;

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_{1t} + \alpha_2 \Delta X_{2t} + \alpha_3 \Delta X_{3t} + \alpha_4 \Delta X_{4t} + \alpha_5 \Delta X_{5t} + \gamma U_{t-1} + u_t$$

Or

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_{1t} + \alpha_2 \Delta X_{2t} + \alpha_3 \Delta X_{3t} + \alpha_4 \Delta X_{4t} + \alpha_5 \Delta X_{5t} + \gamma (Y_{t-1} - \beta_0 - \beta_1 X_{1t-1} - \beta_2 X_{2t-1} - \beta_3 X_{3t-1} - \beta_4 X_{4t-1} - \beta_5 X_{5t-1}) + \varepsilon_t \quad \ldots. \text{(b)}$$

The "Error Correction Model" is displayed in equation (b), where (Y_(t-1)- 〖β_0-β〗 _1 X_(1t-1)(t-1) -β_2 X_-(3t-1) -β_3 X_Our error correction term is represented by -β_4 X_(4t-1)-β_5 X_(5t-1), and the speed at which the error term is corrected is denoted by γ. When Y_(t-1) deviates from its long-term value, the error in the prior period is repaired; this is known as error correction. 1-t-1 β_0-β_1 X_-(2t-1)-β_2 According to Griffiths et al. (2012), -β_3 X_(3t-1)-β_4 X_(4t-1)-β_5 X_(5t-1). In the short term, this model also creates a connection between variables.

Hypothesis Development

Ho= is the existence of a link between economic growth and government spending on human capital (the health and education sectors).
H_1= Government spending on human capital (the health and education sectors) and economic growth are unrelated.

Data and Variable Description

Data Description

To examine the long run and short run relationship of fundamental variables, a time series data of annual frequency over a period of 1980-2016 is obtained. The sources from which the data is collected are Federal Bureau of Statistics Government of Pakistan, State Bank of Pakistan, PRSP Budgetary Expenditure (yearly reports), Budget Documents Government of Pakistan and Provinces (yearly reports) and Economic Survey of Pakistan (yearly reports).

Table 2: Variables and measurement

Variables	Measurement
FGDP	Gross Domestic Product of federal government of Pakistan in million Rupees
BPC	Per capita income of Baluchistan province in thousands Rupees
PPC	Per capita income of Punjab province in Thousands Rupees
KPC	Per capita income of Khyber Pakhtunkhwa province in Thousands Rupees
SPC	Per capita income of Sindh province in Thousands Rupees
FEET	Federal government of Pakistan total expenditure on education in million Rupees
FHET	Federal government of Pakistan total expenditure on health in million Rupees
BEEC	Government of Baluchistan total expenditure on education in Million Rupees
BHEC	Government of Baluchistan current expenditure on health in million Rupees
KEEC	Government of Khyber Pakhtunkhwa current expenditure on education in million Rupees
KHEC	Government of Khyber Pakhtunkhwa current expenditure on health in million Rupees
SEEC	Government of Sindh current expenditure on education in million Rupees
SHEC	Government of Sindh current expenditure on health in million Rupees
PEEC	Government of Punjab current expenditure on education in million Rupees
PHEC	Government of Punjab current expenditure on health in million Rupees

Empirical Results and Discussion

Testing for Unit Root in Each Variables

All the variables that are essential for the study have been tested for their properties over time. Being stationary is significant in time series analysis so Augmented Dickey Fuller test is applied on all the variable in question. The results are depicted in the table below.

Table 3: Augmented Dickey Fuller Test Results

Variables	T-statistics	C- value	Probability	I-Order
BPC	-5.369590	-3.574244	0.0008	I(1)
PPC	-6.457984	-3.568379	0.0000	I(1)
SPC	-3.482501	-3.595026	0.0624	I(0)
KPC	-4.963957	-3.568379	0.0020	I(1)
FGDP	-3.803932	-3.603202	0.0334	I(0)
FEET	-5.702528	-3.568379	0.0003	I(I)
SEEC	-6.825802	-3.568379	0.0000	I(I)
FHET	-3.570017	-3.568379	0.0498	I(0)
BEEC	-3.905150	-3.574244	0.0248	I(0)
PEEC	-4.466785	-2.976263	0.0016	I(0)
KEEC	-5.454568	-3.568379	0.0006	I(I)
BHEC	-6.301247	-3.568379	0.0001	I(I)
PHEC	-5.795921	-3.568379	0.0003	I(I)
SHEC	-4.323285	-3.587527	0.0104	I(I)
KHEC	-4.069601	-2.963972	0.0037	I(I)

The table indicates that while some of the variables are stationary at first differencing I (1), or integrated at order 1, others are stationary at level form Per capita income in Sindh, health spending by the federal government, education spending in Baluchistan, and education spending in Punjab are the variables that are stationary in their level form. In contrast to the alternative that they are stationary, the unit root null hypothesis is rejected. At first differencing, the remaining variables stay steady.

Long Run Analysis by Autoregressive Distributive Lag Model

The results from the ADF tests suggested that the study should adopt a methodology that allow variables being stationary at different integrating order. The study chose Autoregressive distributive lag model which if effective in finding out the long run coefficients. The results are discussed below.

Table 4: ARDL Long Run Coefficients of Model 1

Dependent variable is Federal Government Gross Domestic Product (FGDP)

Variables	Coefficients	Std. error	T-statistics	Prob.
FEET	0.668701	0.158781	4.211472	0.0029
FHET	0.471966	0.206241	2.288416	0.0514
C	1.339508	0.165954	8.071550	0.0000

The coefficient of total federal education expenditures is 0.668701 and P-value is 0.0029 which is statistically significant. Thus, if the education expenditures increase by 1 unit, the GDP will increase by 0.668 units if other factors remain constant. The possible reason for this result is that the higher education expenditures lead to higher numbers of educated and qualified labor force in the economy. As a result, the economy GDP will increase. The long run coefficient of health expenditures is 0.471 indicates that 1 unit rise in health expenditures will lead to increase the GDP by 0.47 units when the other factor is constant. The p-value for this coefficient is 0.0514 which is highly significant at 5% significant level. The appropriate economic interpretation for this result is that the higher health expenditures increase the health institutions, doctors, and higher health facilities in the country. As a result, there will be greater numbers of healthy worker in the economy. Hence, the output per workers will increase which ultimately effect the GDP.

Table 5: ARDL Long run coefficients of model 2

Dependent variable is Baluchistan Per Capita Income (BPC)

Variables	Coefficients	Std. error	T-statistics	Prob.
BEEC	0.63029	0.087112	7.235491	0.0000
BHEC	0.283456	0.123699	-2.291501	0.0449
C	1.115613	0.105406	10.583950	0.0000

The coefficient value of Baluchistan's education expenditure is 0.63 indicates that 1 unit increase in Baluchistan's education expenditure will increases per capita income by 0.63 units. When the education expenditure increases, then there will be better education to the residents and their of Baluchistan's health expenditure is 0.28 indicating per capita income will increase by 0.28 units if health expenditure change by 1 unit in productivity will increase. The coefficient Baluchistan. Both variables are statistically significant at 5% significant level as their p-value is less 0.05.

Table 6: ARDL Long run coefficients of model 3

Dependent variable is Punjab Per Capita Income (PPC)

Variables	Coefficients	Std. error	T-statistics	Prob.
PEEC	0.195	0.056647	3.442788	0.0022
PHEC	0.220765	0.063683	3.466624	0.0021
C	0.460471	0.048083	9.576620	0.0000

The coefficient of Punjab's education expenditure is 0.195 and is statistically significant at 5% significant level. The coefficient indicates that if 1 unit increases in education expenditures leads to increase the per capita income by 0.195 units. The possible economic interpretation is that when the education expenditure increases then there will be better education to the residents and the residents become more qualified and skilled. As a result, their productivity will increase.
The coefficient of health expenditure is 0.22 and is also statistically significant with a p-value of 0.0021. The coefficient indicates that 1 unit increases in health expenditures will lead to increase the per capita income by 0.22 units. The possible economic interpretation is that when the health expenditure increases, then there will be better health to the residents. Consequently, the productivity of healthy worker will increase.

Table 7: ARDL Long run coefficients of model 4

Dependent variable is Sindh Per Capita Income (SPC)

Variables	Coefficients	Std. error	T-statistics	Prob.
SEEC	0.187111	0.041759	4.480784	0.0029
SHEC	0.292724	0.069221	4.228821	0.0039
C	0.218503	0.071193	3.069174	0.0181

The coefficient of Sindh's education expenditure is 0.187. The coefficient indicates that 1 unit increases in education expenditures will lead to increase the per capita income by 0.187 units. The possible economic interpretation is that when the education expenditure increases then there will be better education to the residents and the residents become more qualified and skilled. As a result their productivity will increase. The coefficient is statistically significant with a p- value at 0.0029. It is significant at 5% significance level. The coefficient of health expenditure is 0.21 which is also statistically significant. The coefficient indicates a unit increase in health expenditures increases per capita income by 0.21 units.

Table 8: ARDL Long run coefficients of model 5

Dependent variable is Khyber Pakhtunkhwa Per Capita Income (KPC)

Variables	Coefficients	Std. error	T-statistics	Prob.
KEEC	0.395191	0.027064	14.602104	0.0000
KHEC	0.026802	0.030530	0.877915	0.3938
C	0.476291	0.030532	15.599539	0.0000

The coefficient of Khyber Pakhtunkhwa education expenditure and health expenditure are 0.39 and 0.026, respectively. The p-value for coefficient on education is 0.0001 which is less than 5% significance level. This shows that education expenditure is statistically significant. The positive coefficient indicates a positive relationship between education expenditures and per capita income.

The better education expenditure, more qualified and skilled the residents become. As a result, their productivity will increase. The p-value for health expenditure is greater than 0.05 which shows that health expenditure in Khyber Pakhtunkhwa is statistically insignificant. From the above tables all long run coefficients of 5 models are statistical significant except the KHEC. Thus, we move to present the short run coefficients.

Short Run Analysis by Error Correction Model

Table 9: Short run coefficient (ECM) Model 1

Dependent variable Federal government Gross Domestic Product (FGDP)

Variables	Coefficients	St. Error	T-statistics	Prob.
FEET	0.382331	0.149863	2.551201	0.0380
FHET	-0.208573	0.067469	-3.091384	0.0175
ECT(-1)	-0.502354	0.433112	-3.468765	0.0104

The short run coefficient of model 1 is negative and statistically significant. The P-value is 0.0104 which is less than 0.05 i.e. 5% significance level. The negative value of ECT indicates the short run convergence. In case of any disequilibrium in short run, 50% of disequilibrium would be adjusted within the period. In other words, the convergence speed is 50% toward the long run equilibrium.

Table 10: Short run coefficient (ECM) Model 2

Dependent variable Baluchistan Per Capita Income (BPC)

Variables	Coefficients	St. Error	T-statistics	Prob.
BEEC	0.084	0.223073	-0.377294	0.7147
BHEC	0.034319	0.187760	0.182779	0.8590
ECT(-1)	-0.294212	0.387623	3.341752	0.0086

The short run coefficient of model 2 is negative, but statistically significant at 5% significant level. The negative value of ECT (-0.29) indicates the short run convergence 29% of disequilibrium would be adjusted within the period if any disequilibrium occurs in short run. In other words, the convergence speed is 29% toward the long run equilibrium.

Table 11: Short run coefficient (ECM) model 3

Dependent variable Punjab Per Capita Income (PPC)

Variables	Coefficients	St. Error	T-statistics	Prob.
PHEC(-1)	-0.385411	0.023160	-16.64142	0.0000
PEEC(-1)	0.228336	0.031707	7.201369	0.0000
ECT(-1)	-0.806007	0.201291	4.004176	0.0005

The coefficient on ECT (-1) = -0.80.The negative value of ECT indicates the 80% of disequilibrium would be adjusted within the period. In other words, the speed of convergence toward the long run equilibrium is 80% of its total distance from the long run equilibrium. The short run coefficient of model 3 is negative and statistically significant as well. The P-value is 0.0005 which shows statistical significance.

Table 12: Short run coefficient (ECM) model 4

Dependent variable Sindh Per Capita Income (SPC)

Variables	Coefficients	St. Error	T-statistics	Prob.
SEEC(-1)	0.071023	0.061837	1.148561	0.2643
SHEC(-1)	0.033219	0.071957	0.461649	0.6493
ECT(-1)	0.789321	0.777090	1.015740	0.0219

The short run coefficient of model 4 is negative and statistically significant as well with the value ECT (-1) = -0.78 and the P-value is 0.0219. The negative value of ECT indicates the short run convergence of any disequilibrium in short run. Approximately, 78% of disequilibrium would be adjusted within the period. In other words, the speed of convergence speed is 78% toward the long run equilibrium.

Table 13: Short run coefficient (ECM) model 5

Dependent variable Khyber Pakhtunkhwa Per Capita (KPC)

Variables	Coefficients	St. Error	T-statistics	Prob.
KEEC	0.022150	0.089857	0.246502	0.8078
KHEC	-0.018130	0.080870	0.224180	0.8249
ECT(-1)	-.606714	0.371782	1.631910	0.0183

The short run coefficient of model 5 is also negative, but statistically significant at 5% significant level. The negative value of ECT(-1) = -0.60 indicates the short run convergence 60% of disequilibrium would be adjusted within the period if any disequilibrium occurs in short run. In other words, the convergence speed is 60% toward the long run equilibrium.

The result of ECM model shows that the above coefficients of ECM are negative and statistically significant. The negative coefficients of ECM implies that in case of any disequilibrium in short run from the long equilibrium point will be adjusted within that period.

Stability Test

The long run and short run relationship has been confirmed from the above tables and results. It is imperative that the models have to go for parameters stability check. In order to check for stability, the Cumulative Sum of Square (CUSUM) is used for all five models. If all the CUSUM curve falls within the boundary, it suggests that our model exhibits long-run stability.

Figure 1: CUSUM of Model 1

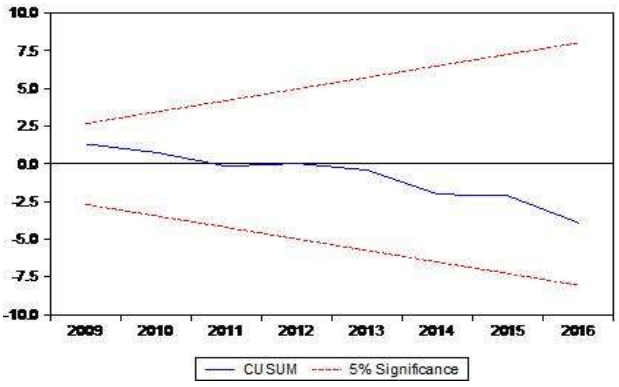


Figure 2: CUSUM of model 2

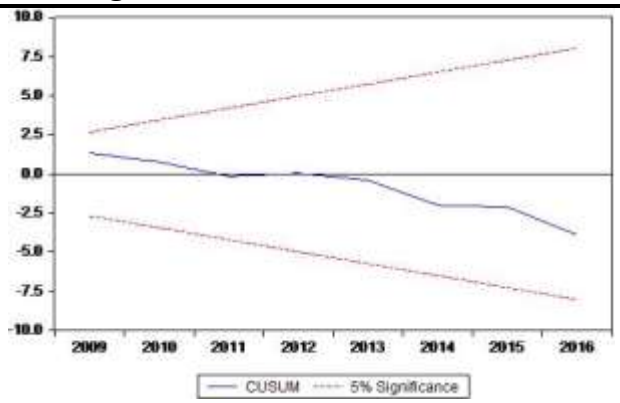


Figure 3: CUSUM of Model 3

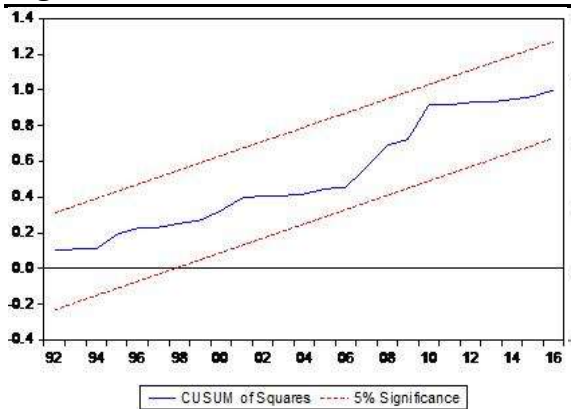


Figure 4: CUSUM of Model 4

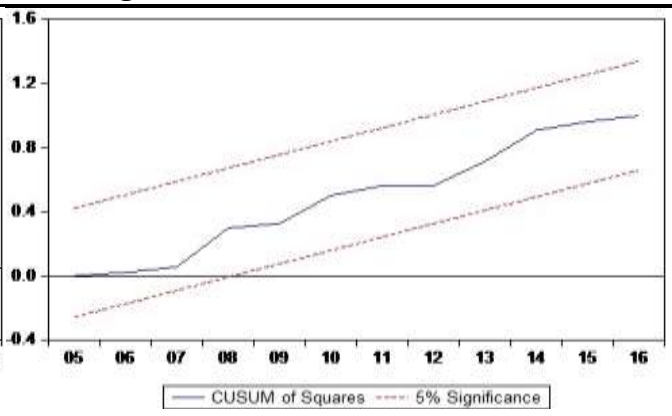
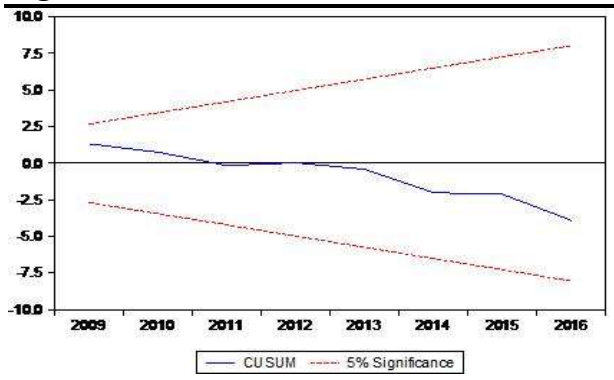


Figure 5: CUSUM of model 5



The graphs show CUSUM curves for 5 models. The plots of all the models in the context are within the boundary. This implies that there is long run stability in long run coefficient.

Conclusion and Policy Recommendations

Five models were estimated in this study, four of which were calculated for Pakistan's provinces and one for the federal government. Per capita income and the gross domestic product (GDP) serve

as stand-ins for national and provincial economic growth. Thus, the federal and provincial dependent variables, respectively. The independent variable is the amount of money the government spends on human capital (health and education). Spending on health and education serves as a stand-in for spending on human capital. The Autoregressive Distributed Lag (ARDL) model was used to evaluate the variables' long-term associations in order to investigate the empirical link between them. Following a stationarity test of the variables, this model is used. Stationary variables are checked using the enhanced Dickey Fuller test. At a different integrating order, the ADF test results remained stationary. While some of them were motionless at first differencing, others were motionless at level. For this reason, variables that are stationary at I (0) and I (1) are included in the ARDL model. Furthermore, the small data set is a good fit for this econometric technique. This study employed the Error Correction Model (ECM) to capture both the short-term outcomes and the long-term convergence. The model's long-term convergence is indicated by the ECM's negative coefficient. With the exception of the Khyber Pakhtunkhwa government's health spending, all of the study's findings are statistically significant. Model 1 estimates the relationship between GDP, health, and education spending. Both the health and education coefficients are statistically significant and positive. These model 1 positive coefficients suggest that the nation's economy will grow more rapidly when spending on the health and education sectors rises. Model 2 has been calculated by comparing the province of Baluchistan's per capita income with its health and education spending. The model's good results also suggest that Baluchistan province's increased health and education spending will coincide with the nation's increased economic growth. There is statistical significance in these findings. Model 3 is calculated by dividing Punjab province's per capita income by its health and education spending.

Model 4 estimates the relationship between Sindh province's health and education spending and per capita income. The positive and noteworthy outcome of health and education spending suggests that greater investments in human capital lead to greater economic growth in the province. Lastly, model 5 estimates the relationship between Khyber Pakhtunkhwa province's health and education spending and per capita income. The coefficients are positive. The health spending coefficient is statistically negligible in contrast to the education expenditure coefficient. By adding a few new variables to the model, future research on the relationship between government spending, human capital, and economic growth can be conducted at the federal and provincial levels for different nations.

Policy Recommendations

Based on the empirical findings from our study, we suggest the following policy suggestions for consideration by policymakers.

1. The findings of the study evidence positive association between government spending on human capital and economic outcomes. It is therefore recommended that there should be higher human capital expenditure in the country to accelerate the economic growth. In other words, based on the empirical findings of the study, the education led economic growth is proposed. Moreover, the knowledge based economy and better health facilities for the worker will result higher GDP in the region.
2. In provincial level, the findings of the study suggests that the expenditure on education and health (human capital) will help the per capita income of the provinces to increase. Based on the result, this study proposes that the knowledge based economy is useful in provincial level. Therefore, the provincial governments ensure high education and health expenditures so that the per capita income would increase.

3. It could also be suggested that government should promote the resource allocation on human capital development sectors through private sectors and partnership of private organizations, which can be further helpful for the growth and development of the country.
4. Since the empirical result of this research work confirms the positive association between health and education expenditures and GDP or economic growth. Therefore, the percentage of human capital expenditure in public expenditure should be increased.
5. The healthier and skillful human capital encourages the development and growth of the country. Therefore it is necessary that education and health sectors should be given an important priority on allocation of resources.

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