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# The Impact of Employment and Education on the Economic Growth of Pakistan: A Time-series Analysis

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**Abstract:** *Economic development is a fundamental need for the nation of Pakistan. The independent variables in this research can have a direct influence on economic growth. The present research examines the influence of employment and education on the economic development of Pakistan throughout the period spanning from 1981 to 2022. Regression analysis was done to check the short-run and long-run relationship among GDP growth rate, education, and employment. The study implies an augmented-dickey fuller test to check the stationarity of the variables and error terms. In addition, the tests of Ramsey Reset, multi-collinearity, and heteroscedasticity have also been employed in the study. The results of the study indicate the importance of promoting education and the creation of employment opportunities, which in turn will provide a nation with rapid and sustained economic expansion over an extended period. Education and economic growth were shown to be correlated in the short term, but employment and growth were not. The study proposes boosting educational spending to make it more accessible to the public and raising school and higher education enrolment to boost Pakistan's literacy rate. Education quality and quantity should be prioritized. The government should also create jobs and invest in R&D to boost labor force participation and efficiency.*

## Introduction

### Background of the Study

Employment and education have both been considered imperative agents of economic development since the days of Adam and Smith (Hafeez, Subhan, & Naeem, 2016; Rashid, 2014). As highlighted by theoretical modeling by Lucas (1988), human competence can be improved by allocating resources to the employment and education sectors to stimulate economic growth (Hafeez, Subhan, & Naeem, 2016). The goal of reaching full employment is one of the fundamentals of macroeconomic objectives, where unemployment and underemployment are key reasons for pervasive poverty (Sodipe & Ogunrinola, 2011). According to Khan (2020), the influence of education on the economic prosperity of Pakistan is seen as favorable. Habibi & Amjad (2020) also concluded that education has a favorable and considerable influence on the economic prosperity of Middle Eastern nations.

Even though full employment is necessary to end poverty and boost economic development, there is a significant disparity between the number of individuals who are looking for work and the number of jobs that are now available. Thus, appropriate employment policies are required in most poor nations (Sodipe & Ogunrinola, 2011). Pakistan's current rate of employment-population ratio is 42.1% (2018–2019) for both sexes (see Table 1) (Pakistan Economic Survey, 2021-22) Whereas, whereas the employment-to-population ratio for Asia Pacific stands at 58.8%, and that of Southern Asia is 51.6%, as of the year 2020 (Heiko, S. International Labour Organization, 2020).

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**Figure 1**

*Employment-to-population ratio*
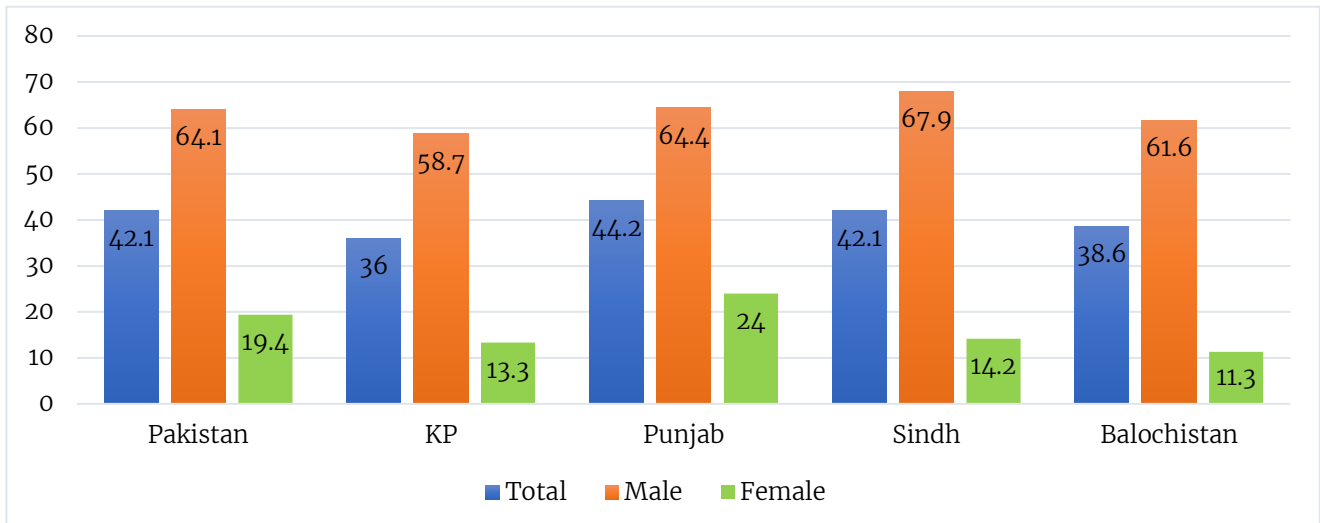


*Source: (Pakistan Economic Survey, 2021-22)*

The efficacy of employment creation strategies in several developing countries has been limited since there exists a substantial disparity between the available job opportunities and the number of those actively seeking employment in impoverished nations. The decline in the availability of satisfactory work opportunities is not the only concern; rather, the advent of globalization and economic liberalization has introduced novel circumstances that have ambiguous consequences for the generation of jobs in several emerging countries. (Ogunrinola and Osabuohien, 2010).

The Pakistani economy has shown a consistent annual growth rate of 5% over more than twenty years, although with substantial fluctuations around the mean (Khan, Amjad, & -ud Din, 2005). Pakistan's GDP growth, when compared to low and middle-income Southeast Asian countries, has been higher, whereas the growth rate is deteriorating in comparison with emerging economies like Malaysia, Thailand, and Singapore (Khan, Amjad, & -ud Din, 2005), As per figure 1, it can be seen that countries like Bangladesh, Bhutan, and India has highly positive economic conditions and the GDP is being robust while that of Pakistan had visibly deteriorated (United Nations, 2019).

In recent years, the growth performance of Pakistan has been a pure mystery as compared to other high-growing economies in the Asian region, while the rate of investment, level of education, and quality and quantity of institutions are at a low. (Khan, Amjad, & -ud Din, 2005).
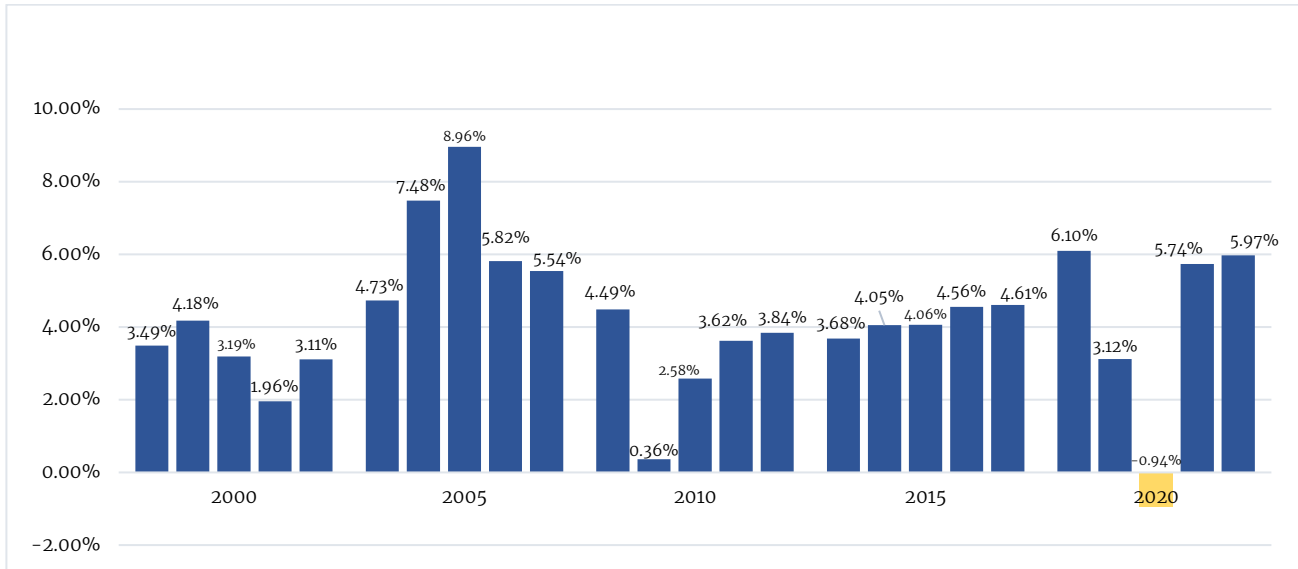
**Figure 2**

*GDP growth in South Asia, 2015-2021*
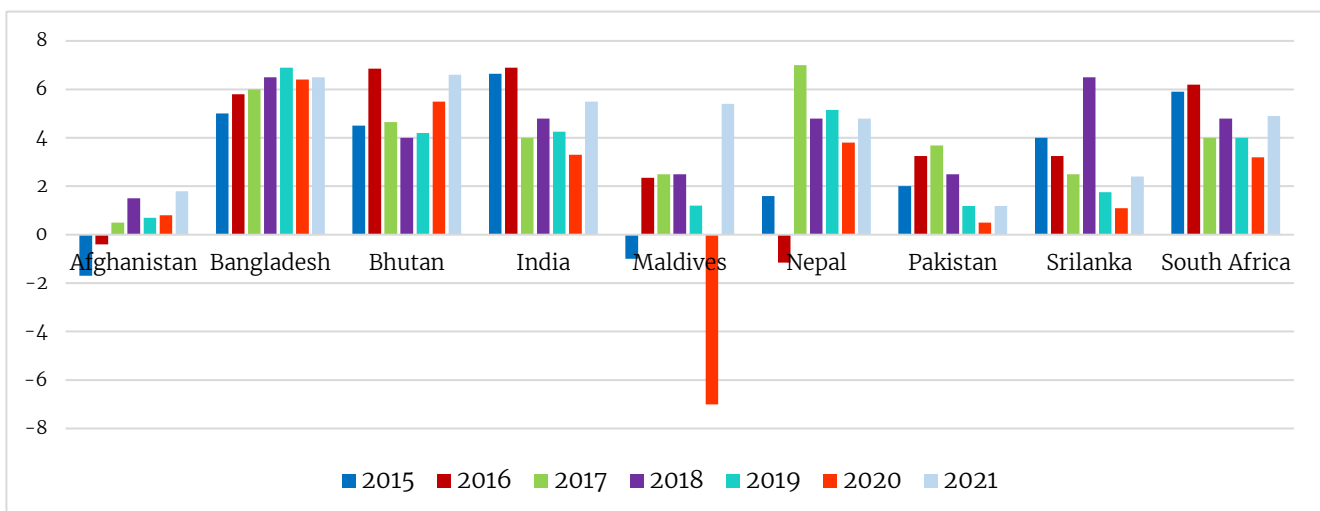


*Source: (World Development Indicators | Data Bank, 2022)*

**Figure 3**

*GDP growth rate of Pakistan 2000-2020*



*Source:* (*Pakistan Bureau of Statistics*, 2022)

Education affects the economic growth of Pakistan in two ways: firstly, skilled and educated workers are better at productivity, affecting economic growth positively; secondly, education has a key role in enhancing an individual's exposure and knowledge, hence fostering innovation and creativity. (Jaoul, 2004). Education is categorized into two forms: formal and informal education (Rashid, 2014). Formal education is an essential investment in human capital which augments and develops skills to boost earnings by raising marginal products Lbolaborhultz, 1962) Whereas, informal education starts from within the household, where they acquire basic skills through learning how to clean, organize, and cook to lead a better living lifestyle (Schultz, 1962; Rashid, 2014).

Investment in education enriches human capital and is linked with the expectations of getting lavish jobs and a higher level of income (Gylfason & Zoega, 2003). Education changes the contemporary production function based on these distinctive qualities (Rashid, 2014). In the past few years, as can be seen from resource allocation in the documents, the government has been working hard to improve the quality of education by expanding and improving school facilities (Rashid, 2014). The main objective of the government is to increase enrollment in primary schools faster than the increase in the population of Pakistan (Rashid, 2014). In 2009, the government of Pakistan introduced the 'National Educational Policy,' which was considered a revolutionary step.

The Educational policy discussed the problems faced by the educational sector, such as the quality of education and the number of educational institutes, improving the school's facilities, providing primary education for all, initial stage education programs for children, and last but not least, the conversion and enhancement of the level of primary schools to elementary schooling system (Rashid, 2014). As a result, the rate of enrollment in primary school and the rate of literacy showed an upward trend in the year to follow, but Pakistan is still lagging in comparison to the nations that are around it.

Currently, the low quality of education level in Pakistan is causing a significant problem in terms of creating productive employment (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016). Employment is considered a lubricant for the economic growth of a country and is only possible through advancement in technologies, but since Pakistan lags in education. As a result, we lack innovation as well, which is hindering technological progress (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016). Technically, employment and technological advancement don't go hand in hand. Despite this fact, developed economies of the world have succeeded in keeping up the pace of both technological progress and full employment (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016).

Employment is believed to be a significant macroeconomic indicator, which is measured based on employment and unemployment rates, demographic characteristics, the structure of jobs by industries,

etc. (Mạnh, Ngọc, & Dao, 2014). The intensive growth in the economic development of a country is dependent upon education, research, development, and innovation. Henceforth, it is of the utmost importance to raise the quality of education, as well as to increase the number of students enrolled in educational programs. (Mạnh, Ngọc, & Dao, 2014).

The primary purpose of this research is to objectively explore the influence of education on the economic development of Pakistan by measuring it through the rate of literacy throughout the years. In addition, the study will investigate the impact of employment on the economic growth of Pakistan by measuring it through the rate of employment. In addition to this, we will investigate the cause-and-effect link between education and employment in Pakistan's gross domestic product (GDP).

## Objective of the Study

The objectives of the study are

1. To examine the impact of education and employment on the economic growth of Pakistan.
2. To examine the short-run and long-run relationship between education and economic growth.
3. To examine the short-run and long-run relationship between employment and economic growth

## Scope of the Study

This study involves analyzing Pakistan's secondary data on education and employment from the years 1981 – 2022 to investigate how both of these factors affect overall economic expansion.

## Problem Statement

The literacy rate of a country has a huge contribution to its economic growth, and similar is the case with employment. Hence, a thorough investigation is required to contrast and compare the rate of employment and literacy over the years to explore how our country has been doing over the years and where we stand. Once these two factors are known, appropriate policies can be devised for the better future of Pakistan.

## Research Questions

- What is the impact of education on the economic growth of Pakistan?
- What is the impact of employment on the economic growth of Pakistan?
- What is the long-run and short-run relationship between education and economic growth?
- What is the long-run and short-run relationship between employment and economic growth?

## Hypotheses

**H1:** There exists a significant impact of education on the economic growth of Pakistan.
**H2:** There exists a significant impact of employment on the economic growth of Pakistan.
**H3:** There exists a short-run relationship between education and the economic growth of Pakistan.
**H4:** There exists a long-run relationship between education and the economic growth of Pakistan.
**H5:** There exists a long-run relationship between employment and the economic growth of Pakistan.
**H6:** There exists a long-run relationship between employment and the economic growth of Pakistan.

## Literature Reviews
### Empirical Review of Literature

The topic of economic growth has been debated and discussed by uncountable researchers. According to Mạnh (2014), "an increase in the overall output of an economy in a given period" is one definition of "economic growth." To expand further, it is a growth in the Gross Domestic Product (GDP), Gross National Product (GNP), or personal income in a certain time, demonstrating a change in the economy in quantitative terms. This may take place in either the short term or the long term.

The fundamental of a nation's macroeconomic policies is the creation and expansion of respectable and productive employment as a means of poverty reduction (Sodipe & Ogunrinola, 2011). Despite the importance of job creation in a nation for economic growth, the implementation of such policies has not resulted in being very impactful as there is a wide gap between the number of jobs being generated and

the number of individuals who are seeking a job. Thus, this is an area of concern for most poor and under-developed nations, as discussed by (Sodipe & Ogunrinola, 2011).

There have been several empirical studies conducted to explore and analyze the link between employment and economic growth. It has been a most debated issue in the past literature (Sodipe & Ogunrinola, 2011; Siddique, Mustafa, Safdar, Khan, & Hussain, 2016). Numerous empirical investigations have shown a robust and affirmative correlation between employment and economic development, particularly within the context of the European Union. These findings suggest that economic expansion engenders the generation of novel employment opportunities, although with variations in magnitude across different member states (Cohen, 2012).

Siddique (2016) conducted an empirical study linking economic growth and employment in Pakistan from 1981 to 2015, where he conducted an ADF test and a Granger causality test to find the cause and effect of the mentioned variables. The estimated results of the study indicated a long-term, significantly positive relationship between employment and economic growth in Pakistan. The study recommended making the policies favorable for the poor by creating a trickle-down effect by making economic growth pro-employment. Rashid (2014) conducted an empirical study for the period of 1972-2012 to investigate the relationship between education and economic growth in Pakistan. The relationship was tested by using the Granger causality and bounding test approach. The results concluded have a long-term relationship where both the variables act as a catalyst for each other as education tends to trigger economic growth, and economic growth leans on the education of a nation.

## Literacy Rate among the Population Aged 15 Years and Older
### Figure 1
*Literacy rate in Pakistan*
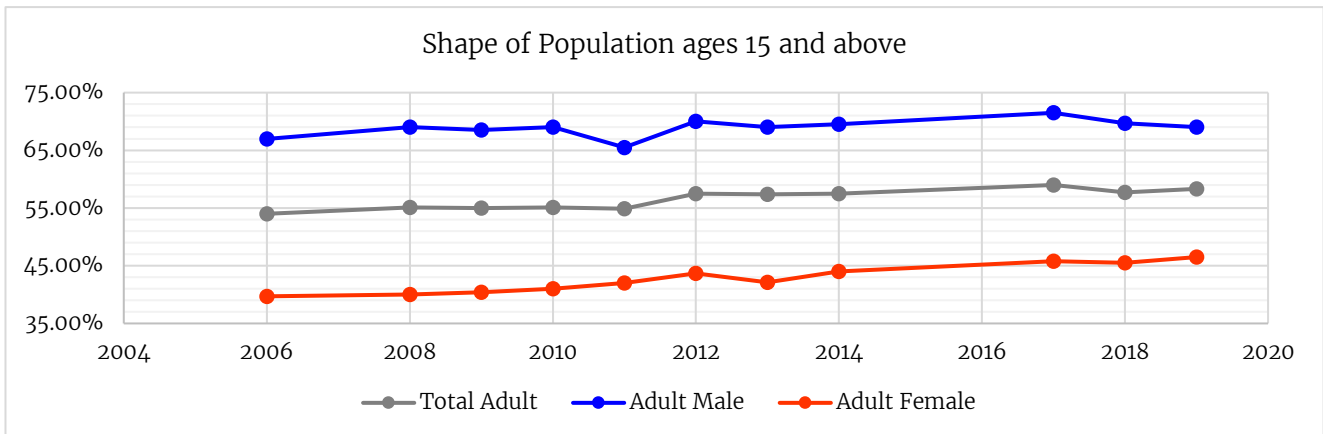


*Source: (UNESCO, 2020)*

Meulemeester & Rochat (1995) Conducted an empirical investigation aimed at elucidating the causal relationship between higher education and economic development, using econometric techniques such as Granger causality and cointegration tests. The results of the study revealed a statistically significant and unidirectional causal linkage between national higher education systems and economic growth in four selected nations, namely Sweden, the United Kingdom, Japan, and France. However, it should be noted that no causal relationship has been identified in Italy and Australia.

Moving towards the path of success, education is one of the fundamentals of development in a nation (Raja, 2005). Pakistan is categorized as an underdeveloped country with abundant socioeconomic problems, and a high rate of illiteracy is one of the significant reasons. Raja (2005) discussed the link between literacy and economic development, where he stated that there are many nations in the world bearing high literacy rates but yet are termed underdeveloped. However, countries have high literacy rates and are emerging as economic powers. Hence, to understand the phenomenon, Freire's concept of Literacy education is quite hopeful, suggesting optimism in these cruel situations. Education helps in development in two ways: it builds the skill set and knowledge of an individual, which helps in increasing productivity

and reducing the poverty level of a nation. On the other hand, the increased knowledge and skills help in the economic growth of a country. He concluded that skilled labor is a significant reason for foreign direct investment, and this is only possible by investing in the education sector of a nation.

As per the statistics, the literacy rates of several countries are as follows: "Brazil 81%, Myanmar 81%, Turkey 81%, Indonesia 84%, Mexico 87%, Sri Lanka 88%, Thailand 93%, Philippines 94%, Vietnam 94%, Kyrgyz Tan 97%, Azerbaijan 97%, Kazakhstan 98%, and North Korea 100%" (United Nations, 2019; Raja, 2005). Despite these countries having almost 100% literacy rate, these still bear sufficient socio-economic problems. However, other countries are categorized as developed nations, having high literacy rates such as 97% of Italy, 98% of Poland, 98% of South Korea, 99% of Japan, 99% of South Korea, 99% of New Zealand, 99% of Norway, 99% of Switzerland, 99% of France, 99% of Denmark, 99% of the United Kingdom, 99% of Germany, 100% of Australia, and 100% of Austria" (Raja, 2005). Hence, the researcher has concluded that education is not a golden key to success as it does not come with a guarantee. On the other hand, as seen in the empirical studies, without education, none of the countries in the world can ever be successful in development both in the near term and throughout the long run (Raja, 2005).

Abbas & Mujahid-Mukhtar (2001) worked to determine the impact that human capital has on the expansion of the economy throughout the period of 1970 – 1994 for India and Pakistan, which are two developing nations. The researcher concluded that the presence of human capital, as measured by primary school attendance, has a notable and favorable influence on the economic development of India alone. In contrast, the influence of human capital, as measured by secondary school enrollment, is shown to have a positive and substantial effect on the economic development of both India and Pakistan. However, when human capital is limited to upper secondary school enrolment, it is seen to have a detrimental effect on India's economic growth while still exhibiting a favorable impact on Pakistan's economic growth. A study done by Mercana & Sezer (2014) suggested that a larger expenditure of resources on educational costs may stimulate economic growth in Turkey. Kakar, Khilji, & Khan (2011) considered education as an essential characteristic for forming human capital. They conducted a study to examine the long-term association between education and economic growth in Pakistan. The data taken was a time series from the year 1980 to 2009, where they ran co-integration and error correction tools for econometric analysis of the data. The study was done to obtain a long-run and short-run relationship (if any) between the two variables. They also analyzed the educational trends, implemented educational policies at the time, and the faced challenges and its role in the economic development of Pakistan. This study also verified the long-run relationship of education with economic growth. They suggested having better policies to enhance the level of education in the country to improve labor forces' efficiency and level of productivity to have a favorable impact on development in the long run. Nonetheless, they found an absence of a relationship in the short run between education and economic development.

Education and employment are a major driver of economic growth, and its relationship is well documented in the literature. Pegkasa & Tsamadias (2014) did an extensive review of empirical literature relating to higher education (HE) and economic growth in Greece for the period of 1960-2009. The researcher applied co-integration and error correction tools to analyze the data, and the result showed a long-run relationship between HE and physical capital investment and economic growth. HE tends to show a significant role in economic growth and is considered endogenous to HR and physical capital investment. Mallick & Dash (2015) examined the causal link between educational spending and economic development in India over the period from 1951 to 2010. The data was analyzed using several econometric approaches, including the bivariate Vector Autoregressive (VAR) model, co-integration analysis, Granger causality test, variance decomposition analysis, and impulse response analysis. The findings of the research demonstrated a significant and enduring correlation between investment in education and the economic advancement of a nation. The researcher's suggestions imply that a greater focus on educational investment is necessary to enhance human capital and, hence, increase its impact on economic development.

Mallick et al. (2016) included the dynamic of 14 Asian countries in their study investigating the impact of expenditure on education on economic growth from 1973 to 2012. When he analyzed the data through Pedroni cointegration. The results were similar to that of other literature in this regard, stating a long-run equilibrium between educational expenditure and economic growth. Mallick (2016) also stated that

education is the fundamental ingredient of economic growth and should be better and most emphasized out of all. In addition, he also suggested improving the expenditure allocation towards the educational sector to have a better outcome of skilled labor and productivity.

Afridi (2016) described that human capital comprises education, health, skills, training, and other related talents. HC is comprised of a set of resources and is defined as an individual's overall ability. Afiri further elaborated that HC is an asset of a country in the shape of its citizens and helps in forecasting an economic growth pattern that contributes to development. He conducted a study to investigate the relationship between human capital and economic growth where HC is proxied to the primary enrolment rate, birth rate, and infant mortality rate. The outcome of the study confirms the HC to be a significant and positive contributor to the economic growth of Pakistan. He also gave a suggestion for policy implementation for the betterment of the education sector and health sector, as that can help a country to have stable and long-term economic growth. Kazmi, Ali, & Ali (2017) took the variables of primary, secondary, higher, technical, degree college, and university enrollment as proxies of education and GDP for economic growth were taken into consideration to investigate and research the connection between these two factors. He considered HC to be the intangible source, which is a collective input of individuals as well as the groups of the population. The proxies for HC considered in the study are the social indicators such as school enrolment, mortality rate, health, and knowledge. In this study, formal education has been used to assess the impact of HC on GDP. The results indicated a cointegration between the two, that is, HC and economic growth. The researcher advised that to maximize the HC, investment is required to be made in the educational sector to escalate economic growth.

Hassan & Kalim (2012) examined triangular causality among real GDP per capita, per capita education, and health per capita from 1972 to 2009 in the country of Pakistan and found a long-run relationship among all three variables. He also reached an additional conclusion to have found a bi-directional relationship between per capita education and per capita real GDP. In addition, he also concluded through the macro econometrics tests that per capita health expenditures and real GDP per capita do not have a cause-and-effect relationship among them. The researchers validated that to improve and uplift economic growth, human capital based on education and health plays an essential part. Sarwar, Jadoon, & Azeem (2017) studied both the key variables of this study in one, which is education and employment. The researcher investigated the long and short-term relationship between all the key variables to answer his research question of whether education and employment are among the factors that could boost the economic growth of a country, particularly for the developing nation of Pakistan. She concluded that both determinants are the key indicators for economic growth, and enhancing the sectors of education and employment can result in higher economic growth for Pakistan. This could be done by providing employment opportunities in the country, promoting education, and making it available to the masses. The study also highlighted the important role of both education and employment in achieving rapid economic growth for Pakistan.

## Conceptual Network
### Figure 2
*Conceptual model*
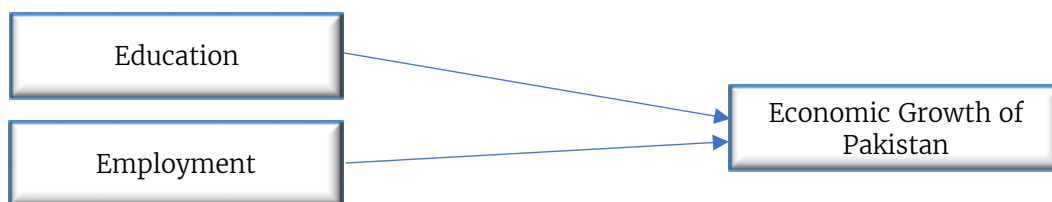


*Source: (Hafeez, Subhan, & Naeem, 2016; Siddique, Mustafa, Safdar, Khan, & Hussain, 2016; Sarwar, Jadoon, & Azeem, 2017; )*

## Research Methodology
### Variables
The nature of this study is secondary, and the major sources where data is obtained are the Pakistan Bureau

of Statistics year-wise published reports, UNESCO yearbooks, United Nations website, World Bank reports, and various issues of Pakistan business review. Moreover, year-wise reports published by the International Labour Organisation (ILO) were also concerned related to Pakistan. The gathered data are annual and are based on the period from 1985 to 2018. The regressor understudy is education proxied by literacy rate and employment proxied by employment to population ratio. The regressand is economic growth proxied by GDP per capita for the economy of Pakistan.

**Table 1**
*Variable sources*

| Variable | Source |
|---|---|
| Education | (Hafeez, Subhan, & Naeem, *2016*) (Gylfason & Zoega, 2003) (Jaoul, 2004) (Mercana & Sezer, 2014) (Rashid, 2014), (MALLICK & DASH, 2015), (Gylfason & Zoega, 2003), (Hassan & Kalim, 2012) (Hassan & Rafaz, 2017) (Jaoul, 2004) (Kakar, Khilji, & Khan, 2011) (MEULEMEESTER & ROCHAT, 1995) (Pegkasa & Tsamadias, 2014) |
| Employment | (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016), (Döpke, 2001) (Herman, 2011) (Mạnh, Ngọc, & Dao, 2014) (SODIPE & OGUNRINOLA, 2011), (Cohen, 2012), (Sarwar, Jadoon & Azeem, 2017). |
| GDP per capita | (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016), (Hafeez, Subhan, & Naeem, *2016*), (Sarwar, Jadoon, & Azeem, 2017), (Afridi, 2016), (Hassan & Kalim, 2012), (MALLICK & DASH, 2015), (Rashid, 2014), |

## Data Description and Model Specification

Education and employment are essential indicators of economic growth and play a vital role in the development of an economy, as discussed in the previous section of the literature review. Both factors play a crucial role in facilitating economic development, necessitating an examination of the influence of education and employment on economic growth. Additionally, it is important to analyze the long-term and short-term relationships between education, employment, and economic growth.

The regressor education is measured by literacy rate, and employment is measured by employment-to-population ratio. The regressand economic growth is measured by the GDP per capita of Pakistan's economy. GDP per capita is measured in millions, whereas the rate of literacy and employment is in percentages. For this purpose, the current study uses the time series data from 1981 – 2022, focusing on the economy of Pakistan.

For estimation, the equation used is as follows;

$GDPCY = B_0 + B_1 (LFPR) + B_2 (EDU) + e$
Where,
GDPGR = Gross Domestic Product growth of Pakistan's economy
LFPR = Labor Force Participation Rate
EDU = Level of Education in Pakistan (Rate of Literacy)
e = random error term

The Gross Domestic Product per Capita (GDPCY) is derived by dividing the aggregate Gross Domestic Product (GDP) of a nation by its population. The value of all of the products and services that are generated inside an economy by residents is what is meant to be represented by the term "Gross Domestic Product," or GDP for short. It takes into account the gross value contributed by these producers in addition to any product taxes that may be relevant, but it does not take into account any subsidies since they are not accounted for in the product value. The computation does not take into account the wear and tear that is experienced by natural resources, nor does it take into account the depreciation of manufactured assets. All monetary values are shown in current US dollars. EMP (Siddique, Mustafa, Safdar, Khan, & Hussain, 2016; Döpke, 2001; Herman, 2011; Mạnh, Ngọc, & Dao, 2014; SODIPE & OGUNRINOLA, 2011) shows the number of people employed in a country in comparison to its total population. EDU (Hafeez, Subhan, & Naeem, *2016*; Gylfason & Zoega, 2003; Jaoul, 2004; Mercana & Sezer, 2014; Rashid, 2014) shows the level of education of the country.

## Empirical Results and Discussion
### Statistics for Normal Distribution

It is an assumption while taking the data that the variables should be normally distributed. If the data is normally distributed, the skewness of the coefficient is zero, the Kurtosis coefficient is three, and the value of Jarque-Bera is expected to be zero.

### Table 2
*Normality distribution for employment, education, and economic growth*

|              | LFPR      | GDPGR    | Literacy Rate |
|--------------|-----------|----------|---------------|
| Mean         | 50.47794  | 4.443235 | 45.93853      |
| Median       | 50.78000  | 4.70000  | 49.43500      |
| Maximum      | 53.43000  | 7.71000  | 62.30000      |
| Minimum      | 32.20000  | 1.01000  | 24.00000      |
| Std. Dev.    | 3.466036  | 1.811595 | 11.47009      |
| Skewness     | -4.427353 | 0.038841 | 0.522800      |
| Kurtosis     | 24.21914  | 2.360018 | 2.079223      |
| Jarque-Bera  | 748.932   | 0.588782 | 2.749904      |
| Probability  | 0.00000   | 0.744985 | 0.252852      |
| Sum          | 1716.250  | 151.0700 | 1561.910      |
| Sum Sq. Dev. | 396.4424  | 108.3019 | 4341.581      |

Looking at the results for normality distribution for the variables undertaken in the study, we can see that LFPR, which is taken as a measurement for employment, is not normally distributed as the value for JB is quite high, and the p-value is statistically highly significant. In addition, the value for skewness is not zero, and kurtosis is quite higher than 3. Considering the variables of GDPGR and LR, both the values are normally distributed as kurtosis value being near three and Skewness near 0. LR is statistically insignificant, and the same is the case with GDPGR.

### Augmented Dickey-Fuller Unit Root Test

The augmented Dickey-Fuller (ADF) unit root test is used to assess the stationarity of the time-series data since it is crucial to examine the stationarity of the variables utilized. Ideally, the data needs to be stationary to produce the best linear unbiased estimators (BLUE) results. Non-stationarity of the data is one of the common problems of time-series data, which results in spurious regression for the estimates.

Variables are classified as stationary if the Augmented Dickey-Fuller (ADF) value exceeds 10%, whereas they are considered non-stationary if they fall below this threshold. The presence of a unit root is assessed for all the regressors and regressands. The results of the ADF unit root test are shown in Table 4.

### Table 3
*Augmented dickey-fuller results on the first difference*

|            | Without Intercept and Trend | | Without Intercept | | With Intercept and Trend | |
|------------|--------------|-------------|--------------|-------------|--------------|-------------|
| Variables  | t-Statistics | Probability | t-Statistics | Probability | t-Statistics | Probability |
| GDPGR      | -6.669597    | 0.00000     | -9.536415    | 0.00000     | -9.367129    | 0.00000     |
| Literacy Rate | -6.387972 | 0.00000     | -8.855394    | 0.00000     | -8.773625    | 0.00000     |
| LFPR       | -9.141459    | 0.00000     | -11.68237    | 0.00000     | -11.47919    | 0.00000     |

The results of the ADF test for testing stationarity of the variables show that GDP growth rate, literacy rate, and labor force participation rate are stationary at first difference. With the P-values of the augmented-dickey fuller test being highly significant, we conclude that there is very strong evidence to reject the null hypothesis and state that GDP growth rate, literacy rate, and labor force participation rate time series don't have a unit root or in other words is stationary.

## Regression Analysis

Regression analysis is used in the model to determine the long-term and short-term relationship between regressor (literacy rate, LFPR) and regressand (GDPGR). Moreover, through regression, we are also determining the goodness of fit of the estimated model through the coefficient of R square, adjusted R square, Akaike information criterion, and Schwarz's criterion.

### Table 4
*Estimated regression coefficients with dependent variable as GDP growth rate*

| Variables | Eq (01) at Level | | | Eq (02) at First Difference | | |
|---|---|---|---|---|---|---|
| | Coefficients | t-Statistics | Probability | Coefficients | t-Statistics | Probability |
| Literacy Rate | −0.02672 | −0.805694 | 0.4266 | 0.226701 | 2.043382 | 0.0499 |
| LFPR | 0.017732 | 0.161569 | 0.8727 | 0.081004 | 1.070834 | 0.2928 |

| Diagnostic Tests | | |
|---|---|---|
| | Eq (01) | Eq (02) |
| R Square | 0.023637 | 0.144595 |
| Adjusted R Square | −0.039354 | 0.087568 |
| Durbin-Watson | 1.143664 | 2.156302 |
| F-Statistics | 0.375245 | 2.535557 |
| Probability F-statistics | 0.375245 | 0.096067 |
| Akaike info Criterion | 4.148989 | 4.143993 |
| Schwarz Criterion | 4.283668 | 4.28004 |

The result of regression ran on the first difference between regressand GDP growth rate and regressor literacy rate and labor force participation rate. The P value of education results in being statistically significant, whereas employment shows insignificant results. The value of the R-square is less than the Durbin-Watson value; hence, the regression is not spurious. The results of running the regression at first difference are better than all the other regression results. The regression ran on the first difference (eq02) shows the short-term relationship between regressand and regressor. Hence, we conclude that education has a short-term relationship with the economic growth of Pakistan, while employment has not shown a long-term relationship with economic growth. Whereas regression ran on level (eq01) shows a long-term relationship between GDP growth rate and literacy and labor force participation rate. The P-values of all the variables are highly insignificant; thus, we conclude that the Literacy rate and labor force participation rate don't have a long-term relationship with the GDP growth rate in Pakistan.

By looking at the results of the R-square of both equations, we can see that equation 2, which is a regression at first difference, has a better R-square value as compared to regression run at a level that shows that there is a 15% variation in independent variables ( literacy rate and LFPR) which is explained by the dependent variable of GDPGR. Furthermore, considering the values of the Akaike information criterion (AIC) and Schwarz's criterion (SC), we see that they are one digit and near zero, whereas both equations have the same results for AIC and SC. Henceforth, we conclude that the estimated model is a good fit.

The regression equation is as follows:

GDPGR= −0.340921 + 0.2267(EDU) + 0.081004(LFPR)

The results of the regression model also indicate that if the literacy rate increases by one percent, the GDP growth rate tends to increase by 23%. In addition, if the Labor force participation rate increases by one percent, the GDP growth rate would increase by 8%.

## Augmented Dickey-Fuller Test on Error Term

ADF test has been used to determine the unit root/stationarity of the error term. Error term needs to be stationary for the model to produce BLUE results. If the ADF value is above 0.1, we retain the null

hypothesis, which is that the error term has a unit root, and if the p-value is less than 0.1, we have strong evidence to reject the null hypothesis and declare the absence of a unit root.

### Table 5
*Augmented dickey-fuller test on error term*

|  | Eq(01) | Eq(02) |
|---|---|---|
| t-Statistics | -3.579598 | -6.119409 |
| Probability | 0.0008 | 0.0000 |

The results of ADF on error term were run both on level and first difference and found to be stationary in both of the results. In other words, the error term does not have a unit root at the level and first difference. The P-value is highly significant; hence, we reject the null hypothesis of the error term having a unit root. Also, the calculated t-statistic is greater than tau-critical values, which gives us very strong evidence to reject the null hypothesis and conclude that the error term is stationary or the error term does not have a unit root.

## Ramsey Reset Test

The regression specification error test (RESET) developed by Ramsey has been used to determine whether or not the initial model has been accurately described.  To determine whether or not we are perpetrators of omission variable bias, the Ramsey test was carried out.

### Table 6
*Results of the Ramsey reset test*

| Ramsey Reset Test | | | |
|---|---|---|---|
|  | Value | df | Probability |
| t-Statistics | 0.004423 | -29 | 0.9965 |
| F-Statistics | 1.96 | (1,29) | 0.9965 |

As seen from the results of the Ramsey Reset test, where the null hypothesis is that the original model is correctly specified with the P-value being highly insignificant, we can say that we have very strong evidence to retain the null hypothesis.  Hence, we conclude that the original model is correctly specified. Another important finding of this table is that the estimated F-value of 1.96 is also statistically highly insignificant.

## Test for Multicollinearity

The time series used in the study should be free of Multicollinearity issues because if there is the presence of Multicollinearity in the data, it means there exists a relationship between regressors, which violates one of the assumptions of the classical linear regression model that there is no exact relationship among the regressors.

### Table 7
*Results of multicollinearity test (variance inflation factors)*

| Variable | Coefficient Variance | Uncentered VIF | Centered VIF |
|---|---|---|---|
| D(LITERACY_RATE) | 0.012309 | 1.165423 | 1.003831 |
| D(LFPR) | 0.005722 | 1.004886 | 1.003831 |

The cut-off for the Variance Inflation Factors test is ten, and the results of the VIF test indicate the absence of Multicollinearity as the values of both the LR and LFPR are below 10.  Hence, we conclude that the time series taken in this study are free from the issue of Multicollinearity.

## Test for Auto-Correlation

Another assumption of CLRM is that the error terms are uncorrelated at present time or any other error term in the past. If the error term is correlated, then the results of the OLS estimation don't remain efficient. Thus, to detect auto-correlation, the Breusch-Godfrey (BG) serial Correlation test is used, and as we stated above, ideally, the time series should be free of auto-correlation.

### Table 8

*Results of LM test for detection of auto-correlation*

| Breusch-Godfrey Serial Correlation LM Test | | | |
|---|---|---|---|
| F-statistic | 0.917105 | Prob. F(2,28) | 0.4113 |
| Obs*R-squared | 2.028844 | Prob. Chi-Square(2) | 0.3626 |
| Durbin-Watson | 2.030538 | | |

BG test has a null hypothesis that there is no auto-correlation. Looking at the results of the above BG test with the P value of F-statistics insignificant, we have very strong evidence to retain the null hypothesis. In addition, the value of Durbin-Watson, which is 2.03, lies between 1.5-2.5, which is a rule of thumb for the absence of auto-correlation. In conclusion to the BG test, we can summarize the absence of serial correlation from the time series of GDPGR, literacy rate, and LFPR. Thus, the results are satisfactory and confirm the validity of the estimates.

## Heteroscedasticity Test: Breusch-Pagan-Godfrey

One of the commonly encountered problems in time-series and cross-sectional data is heteroscedasticity, where the major reasons for it are the presence of outliers, incorrect functional form of the regression model, or incorrect transformation of data. Breusch-Pagan (BP) and white's test have been used to detect heteroscedasticity.

### Table 9

*Breusch-pagan test for detection of heteroscedasticity*

| Heteroscedasticity Test: Breusch-Pagan-Godfrey | | | |
|---|---|---|---|
| F-statistic | 0.025656 | Prob. F (2,30) | 0.9747 |
| Obs*R-squared 0 | 0.056346 | Prob. Chi-Square (2) | 0.9722 |
| Scaled explained SS | 0.095996 | Prob. Chi-Square (2) | 0.9531 |

As seen from the results of the BP test where the P-value is statistically insignificant, we retain the null hypothesis and conclude that the data is homoscedastic, or in other words, the results of BP tests are satisfactory and confirm that the data is free of heteroscedasticity confirming the validity of the estimates.

### Table 10

*White's test for heteroscedasticity*

| Heteroscedasticity Test: White | | | |
|---|---|---|---|
| F-statistic | 0.613463 | Prob. F(5,27) | 0.6904 |
| Obs*R-squared | 3.366494 | Prob. Chi-Square(5) | 0.6437 |
| Scaled explained SS | 5.735474 | Prob. Chi-Square(5) | 0.3328 |

White's test was also done to test the existence of heteroscedasticity, and the test further confirms our claim for the time series of GDPGR, literacy rate, and LFPR being free of heteroscedasticity and not violating the assumptions of the CLRM model.

## Discussion

Economic growth is always a vital element, especially for underdeveloped and developing nations, and achieving rapid economic growth has always been a priority on the government's agenda. Economic growth brings about an affirmative change in the social welfare of the country, which is an important

factor when considering the weak institutions of developing and underdeveloped nations. Moving forward, the need arises to figure out the factors that can positively enhance the economic growth of a country, more importantly, the developing an underdeveloped nation. The study took into consideration two important elements of education and employment that are believed to be majorly contributing to the economic growth of a country, as suggested by the literature. The results of the study indicate that investment in education and the creation of employment opportunities promote economic growth, and the same is held for the economy of Pakistan.

The results of the study are in line with (Kakar, Khilji, & Khan 2011; Rashid 2014; and Sarwar, Jadoon, & Azeem 2017), indicating that education has a positive and significant short-run relationship with the economic growth of Pakistan, whereas the data considered for the study resulted in having an insignificant short-run relationship between employment and economic growth of Pakistan. However, the literature suggests a long-run relationship between education, employment, and economic growth in Pakistan, but our results indicate otherwise. One of the reasons could be the small sample size. Linking our findings with the review of literature, it is suggested to promote education among the masses and work on increasing primary school enrolment to increase the literacy rate of Pakistan, which will contribute towards the economic growth of the country. The provision of employment also results in achieving high economic growth, but as the literature suggests, its impact is more visible in the long run.

## Conclusion and Policy Recommendations

To conclude the results of the study, it is recommended that policymakers contemplate educational policies and consider increasing the level of education in Pakistan to achieve rapid and stable economic growth. However, it is also recommended to focus on employment creation as increasing labor participation accelerates economic growth. The same is suggested by the literature and holds for the economy of Pakistan. Educational standards need to be worked upon to increase the efficiency as well as labor productivity of the working class, which will contribute towards stable long-term economic growth. The educational budget for investment is required to be increased to give a boost to the education sector with an utmost focus on the quality of education via contributing towards the sector of research and development.

Considering the circumstances in Pakistan, where female education and LFPR are major issues, a streamlining of the supply and demand of education needs revisiting. Also, educational reforms in terms of promoting free education need focus, which is expected to make tremendous success in education for both males and females and hence will essentially contribute towards economic growth in the long run. On the other hand, the development of skills is another area where Pakistan lacks; thus, the government needs to prioritize quality with quantity of education. On the contrary, the employment sector needs a radical change as well, and it is recommended to invest in creating employment opportunities with a focus on skills development to enhance the efficiency as well as the productivity of the labor force in Pakistan.

Based on the results of the study, it is recommended that the government increase school enrolment, higher education, research & development sector, and employment opportunities to enhance the efficiency of the Pakistani economy, which shall result in long-term stable economic growth. Furthermore, creating awareness of the importance of education is also another important factor that can benefit the education sector in the long run. The creation of employment will increase the LFPR, bringing up our employment ratio and enabling the economic progress of Pakistan. It is also advised to consider and take into account more human capital factors, which will eventually contribute towards the economic growth of Pakistan along with education and employment.

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