The Role of Population Growth, Inflation, and Public Education Expenditure in Shaping Pakistan's GDP Growth

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Introduction

Economic Growth refers to an increase in aggregate production of goods and services in an economy. Economic Growth as a concept of economics is observed in the form of a function that includes Labor Force, Capital (Physical and Human) and Technology. The unit used to describe economic growth is the "GDP" or Gross Domestic Product. GDP is defined as the total monetary value of all final goods and services produced in the market within a country during a period of 1 year. In an economy economic growth is the expansion in the production of goods and services that is in capital merchandise, workforce, innovation, and human resources. Economic process can be generated using various ways like, by expanding the volume of capital and assets. Adding capital raises the productivity of labor within the economy. Achieving innovations and enhancements in the technological sector and promoting economic growth in the labor force. Equality encourages creation of more workers which eventually generates more economic goods and services. Lastly, recruitment of human capital that enhances their skills by providing them training at the job that makes them more productive. Economic growth is immensely important as it indicates about the performance and magnitude of the economy.

To estimate economic growth three methods have been developed known as the Expenditure Approach, Production and Income Approach. For Instance, Expenditure Approach is the summation of Government spending and Investment, Private Consumption and Investment and (exports –imports). The GDP growth Rate is the percentage change in real GDP over a time period. Economic growth Rate is an important unit measure as it indicates the progress of an economy more importantly the direction and extend of such growth or fall. Thus, a positive number indicates Expansion while a negative value indicates Contraction in the Economy. Economic growth can be expressed in a formula as follows: Economic growth = GDP 2 – GDP 1 / GDP 1. Whereas GDP 1 is previous time period GDP for Example 2021 while GDP 2 is current time period i.e. GDP 2022.

Population Growth

The concept of Population growth is defined as increase in the number of people in a population or dispersed group. Estimates reveal that globally Human population increment each year is observed at approximately 83,000,000. In the form of growth rate percentage, it is 1.1% yearly. The estimate that was 1 billion in the 1800's is observed to have escalated to 7.9 billion in Fiscal year 2020. Population Growth Rate is the annual average rate of change of population size, for any country, territory, or geographic area, during a specified time period. It expresses ratio between the annual increase in population size and total population for that year, usually multiplied by 100. The annual increase in population size is defined as a sum of differences that is the difference between births and deaths and the difference between immigrants and emigrants, in a given country, territory or geographic area at a given year.

As we study World population, we observe that it has been rising continuously since end of the Black Death, in year 1350. In Western world during the industrial revolution population accelerated rapidly. Since 1950s significant increase in the world's population has been, mainly due to rise in agricultural productivity and medical advancements. Generally, developed nations have been observed to have a decline in their growth rates in recent decades, while developing countries have a positive growth with annual growth rates above 2% in some countries of the Middle East and Sub-Saharan Africa, and also in South Asia, Southeast Asia, and Latin America.

Population Growth and Economic Growth

Studying the two Concepts that are population growth and economic growth together we observe that increasing population rates played a factor in increasing the economic growth. World bank (2017) reveals that the correlation between the population growth and real per capita GDP growth in the world over the period of 1990 to 2015 was –0.1849. While the data reveals no correlation between them Economists on the other side have put forward notable undeniable research and theoretical models revealing the intensity of their relationship. Economic Research has developed three cases of relationship between population growth and economic growth: Positive, that population stimulates economic growth, Negative: that population reduces economic growth and a recent and third case known as neutralism is also studied and observed that in the presence of other control variables, Population has no relation with or impact on economic growth.

Thomas Malthus (1798) in His Famous essay known as "Essay on the principle of Population" observed that human Population increases geometrically and food production increases arithmetically. He emphasized Population growth will always limit the well-being of the people economically. In His well-known theory of "Malthusian growth model" He argued that population growth will cause the average incomes to fall up to a point when just basic low-level standard of living is possible (rise on living standard not possible). Malthusian growth model's implication is that only war, misery or extreme public policies could check the explosive rate of population growth.

The impact of demographic processes is often neglected by economists. Thomas P. (2014) in his research highlights that solely the economic component of economic growth i.e., growth in per ca-pita GDP plays the part in increasing economic growth and living standard excluding the demographic component. Bloom and Canning (2001) Present their analysis as their findings reveal that the relationship of population dynamics and economic growth causes Poverty trap such as the following scenarios where one has low income and high Population or high income but low Population. Studying the demographic component Sylvia et al (2010) in his research highlighted that a fall in mortality rate contributes to a rise in Growth.

Economists on the basis of population-poverty cycle theory Observe that Population plays a detrimental role for the growth of Developing Countries. The research highlights that

explosive population growth rates in the Least developing countries (LDC) reduces the GDP per ca-pita. The Lower class experiences the detrimental effects of the unsustainable Population as it impacts each and every aspect of their lives. Becoming homeless, unemployed, no aid or support from governments in form of health facilities and free education. Environment degradation, Pollution and Food scarcity just to name a few problems that erupt in a country with rapid population rates. Lastly, it is the major factor causing increase in international migration.

Pakistan's total land area is 770,880 km2 square kilometers (297,638 sq. miles). The Population of Pakistan is 220,892,340 (2020) according to United Nations data. Pakistan ranks as world's fifth most populous in the list of countries as it represents 2.83% of world total population. Urban Population of Pakistan comprises of 35.1 % (77,437,729 people in 2020) while the population density is 287 per Km2 (742 people per mi2). Future Projection reports for 2050 suggests Pakistan will rank as sixth in the list of countries with expected population of 363 million.

Pakistan being a developing country with a rapid population growth develops an unachievable demand on the already scarce resources. Pakistan recorded its Gross Domestic Product per capita at 1465.89 US dollars in 2020. The population growth will inversely reduce economic growth. According to reports published in 2004 Economic growth rate is observed to be gradually falling since Fiscal Year 1981 while population growth has maintained rapid growth. Such an alarmingly growth in population is an issue of great concern as it directly effects our economic growth. With such indicators, development plans and policies will be not that impactful as population hinders development and indirectly effects the education and health sectors.

Thus, the productivity of such a country's labor remains low despite numerous efforts are being put forward as supporting a huge population becomes a burden especially in developing economies with least efficiently working bodies like Politics and State bank of Pakistan. Social indicators (HDI) and overall living standard is negatively impacted by high population growth rates. Afzal (2009) in his report highlighted the relationship between Population and economic growth. His report emphasized adverse effects the population growth can have on economic growth of Pakistan.

Public Education Expenditure

Research and finding recognize that for poverty alleviation Education is utmost significant. Education is a sound secure investment that the government can provide its people with so their living standard and economic growth can improve in the long term.

The Economic Survey for year 2020-2021 describes the literacy rate at 60 percent in 2019-20 since 2014-15 as stagnant. In Comparison with 2019 (2.3%) the Public Education Expenditure by the Federal and Provincial governments in 2020 was observed at 1.5%. The report by Pakistan Social & Living Standard Measurement Survey (PSLM) highlighted that literacy rate of ages 10 years and above is stagnant since 2015. Urban areas observed literacy rate is 74 percent that is higher than in rural areas which is 52 percent. International benchmarks for public expenditure on education (as a percentage to economic growth) have set targets of 15-20% from total budget and 4% of the GDP while Pakistan allocated 2.3% in 2020 highlighted to be the least allocated in the south Asian region.

Provincially data reveals Literacy rates in the following order: Punjab 64%, Sindh 58%, Khyber Pakhtunkhwa 55% and Baluchistan 46%. Such dismal figures can be highly influenced by increasing the government expenditure on education. The indicators rank among the bottom in international surveys.

Inflation

Inflation is the rate of change in prices for commodities over a given period of time which eventually reduces purchasing power. With the presence of inflation value of pensions, savings, and treasury notes steadily decreases. The rest of the world buys less of its exports as prices in a country rise more rapidly than it does, but people in that country tend to buy cheaper foreign goods. Inflation has the opposite effects of fostering purchases from home producers, which would encourage home output and substitution of home-produced goods for imports.

When demand exceeds supply, the inflation get high which results in demand-pull inflation. This leads to price increases. While a Cost-push inflation is observed when cost of production (wages and raw material) causes a decrease in aggregate supply of the economy. Cost of intermediate goods rises when an economy is hit by economic shock as it directly impacts the supply of key commodities. The consumer price index is scrutinized by the weighted average

index for a basket of goods and services. It consists of food, transportation, and medical care. Change in price for each item is calculated and then weight them in the whole basket.

The Pakistan Bureau of Statistics (PBS) reported that the measured inflation rate was 13.4%. The rate of food and transport commodity groups went up faster than the prices. The inflation was recorded at 13.7% in January 2020. According to the PBS the CPI-based inflation rate jumped 12.2%. Prices for energy, food and commodities is affected by the economy whereas cost of living, borrowing money, mortgages, corporate business costs, and government bond yields are all influenced by inflation.

Problem Statement

In Developing Countries such as Pakistan the sources of an increase in economic growth need to observed and enhanced to stimulate economic growth. Likewise, the causes of Fall in the economic growth need to studied to observe how these factors cause a fall in economic growth for our country. From this Perspective, this study focuses on the Macro-economic factors effecting economic growth in Pakistan. This research will thus evaluate the Impact of Population Growth Rate, Public Education expenditure and Inflation Rate on Pakistan's economic growth.

Objectives of the Research

The Empirical research will inspect the impact of Population growth, public expenditure on education and inflation on Pakistan's Economic Growth.

- Using the Data, Analyze the relationship or level of significance each variable holds for Economic Growth.
- To evaluate the Impact of the dependent variables on the Economic Growth of Pakistan.
- To Develop a Model that specifies how the variables impact the Economic Growth of Pakistan.

Significance of the Research

It is Important to study the Impact of the Population growth rate, Public Expenditure on Education and Inflation have on the Economic Growth of Pakistan. It helps us in studying the relationship each variable holds with Economic Growth and consecutively indicates what needs

to be done to achieve a higher economic growth. An increase in economic growth shows the economy is growing and thus is beneficial for its inhabitants.

Scope and Limitation of the Research

The Research is conducted to study the Macro-economic factors effecting for the economic growth economy of Pakistan. Therefore, we included Impact of Population Growth Rate, Public Education Expenditure and Inflation Rate on Pakistan's Economic Growth while not taking into account other factors that could also be studied like Demographic Changes over time. Fertility, morality rates and Foreign Direct Investment etc. can be added for a detailed analysis.

LITERATURE REVIEW

Population growth

Atanda & Akinwande (2012) Studied the Impact population growth has on the economic growth of developed and developing nations. For analysis 30 years of data was considered of the time period 1980 to 2010. The independent variable for the research were Life expectancy, Birth rates, fertility rate and mortality rate while the economic growth was employed as the dependent variable. The results observed that in developed countries population growth observes a positive influence with economic growth while

developing nations, a negative impact is observed. He suggested that the developing countries should develop policies and invest more on the public to provide better health and education for its people so they can achieve economic growth.

Chang & Gupta (2014) analyzed the impact population growth rates has on economic growth. For their research they examined time series data from 1871 to 2013 for 21 countries. The research used the Bootstrap Panel Granger Causality Test for data analysis. Results observed Population growth adversely impacts Economic Growth.

The study Provided suggestions and policies to tackle with issues of rapid population, as investing in Family planning and awareness programs better results can be achieved. For a rise in living standards, increase in per ca-pita income and labor productivity the research Suggests Technological development. Research concludes that such steps can help demographers, economists and even policy makers to control the explosive rate of population in developing countries as it has been observed to counter Economic Growth.

Dao (2012) in their research examined the relationship the relationship between population and growth in developing countries, by using the Least Square Method to examine sample data. His research sample data set included forty-three 43 developing countries. The research studied fertility rate, old population, population growth rate, urban population, working age population and mortality rate as independent variable while the dependent variable was ca-pita income growth rate. The results reveal that the Population increase impact on per ca-pita income to be negative for population growth. The data observed in the case of developing nations the old population dependency ratio has negative influence on economic growth while the young dependency ratio have been revealed as a positive impact for economic growth.

Essien (2016) researched impact of population growth on economic growth for Nigeria. He employed different tests to study time series data sample of the time period 1981-2013. The tests to analyze the data included Johansen Co-Integration Test, Adf test and Augmented Cobb-Douglass Production Function. The Test results observed for population growth in Nigeria to have a positive impact on economic growth. Research concluded that for Nigeria Population growth increases economic growth.

Ali & Alam (2015) analyzed that rapid population increase as a major hindrance for the Economy of Bangladesh as it decreases investment growth and diminishes saving rate. In the research they analyzed the relationship between population growth and economic growth of Bangladesh for the specified time period 1981-2014. The applied different tests to examine the data by using multivariate analysis. Tests included the LM test, JB test, HS test.

The research studied Explanatory variables like consumption, FDI, population growth and local investment while the dependent variable was real economic growth. The research Concluded that evidence on the relationship between population and economic growth is observed to be not consistent. Further the research suggests policy makers to take concrete steps to counter rapid population growth by awareness and family planning services to encourage and educate about the ideal smaller family size.

Schramm (2011) in their research analyzed the infamous policy of People's Republic of China called the One-Child-Policy. They researched the extent to which family planning policies have impacted the economic growth. For the research they applied the Solow model

to analyze the impact of the family-planning-policies of the economy. The study time series data from 1979 to 2005. The One-Child-Policy has helped China in lowering down their explosive population Growth from 2.8% in 1970 to just 0.3% in 2020.

While The One-Child-Policy is observed to have deeply (positively) impacted the economic growth of China (for 32 years) but analysis of this research concludes that the consequences of such a policy will turn into a negative effect. The results show that China will experience struggle due to change in population growth.

Amin (2013) for the specific case of Pakistan Studied impact that of population growth on the economic growth. They examined unemployment rate, Human Resource development, population growth rate and trade openness as independent variable. The dependent variable was the real gross domestic product GDP. They employed the ARDL co-integration technique to analyze the data of thirty-four 34 years annually. The results observed that population growth rate has a positive impact on economic growth of Pakistan. Research claims that increase in labor force stimulates economic growth thus population growth rate is a critical variable for expanding economic growth.

The Study Concludes that for the case of Pakistan unemployment and development policy are more of a hindrance than population growth. The research suggests that the authorities need to tackle unemployment and development policy, human capital etc. to attain sustainable growth.

Safdar et al (2013) analyzed that literacy rate and domestic saving rate have a long run relationship with population growth rate while not with unemployment and FDI. The Research analyzed the time series data of 43 forty years using the Co integration approach. The research studied the literacy, FDI, domestic saving, and unemployment as Independent variables. As for dependent variable population growth rate is used. The results observed that Population Growth is positively linked with FDI and unemployment for Pakistan. The research also claims that population growth and economic growth have negative effect. The Research claims that Population Growth is observed to cause a fall in the Economic Growth. The study claims that gender discrimination, no steady awareness and educating campaigns with Government mismanagement are contributing to hindrance in attaining economic growth. The researchers

suggest that providing information and creating awareness can help build a better understanding of this grave issue that is rapid Population Growth.

Mushtaq (2006) examined the relationship among the variables of population growth and economic growth in the case of Pakistan from 1960-2001. He employed Augmented Dickey Fuller test and Co integration test. Test concluded in long run, the data suggest no such relationship exists for the selected variables. The research concluded that in long run the population growth rate has no impact on the economic growth for Pakistan

H1: Population Growth rate has a significant impact on the Economic Growth.

Education expenditure

Barro (2001) researched to study Human Capital and Economic Growth from 1960 to 1995 and he analyzed the data of over 100 countries. The results showed that school attainment has a positive relationship with economic growth. Abington & Blankenau (2013) similarly studied public education expenditures and economic growth. The research analyzed 70 countries that indicated a positive relationship between education expenditure and economic growth.

Ogundari et all. (2018) for their research about Does health status matter more than education, analyzed 35 countries in Africa for the time period of 1980 to 2008. The results indicated that education has a positive impact on GDP growth.

Suri et al. (2011) studied to highlight the significance of education especially of public policies adopted for young people can have on economic growth. The study analyzed the data of over 110 countries.

Teixeira et all. (2016) studied the importance of human capital in the process of economic growth. The empirical study analyzed OECD countries. The results indicate positive effect for highly developed countries (>50 years) while a negative effect for less developed countries (20 years). Similarly, Yew and Churchill. (2017) results observed that there is positive affect of government spending on education in developed countries and from the prospect of developing countries the effect is observed to be insignificant.

Malik (2010) this study highlighted problems that arise due to lower allocation of government budget towards education expenditure. This paper stated that since 1990s, expenditure assistance to education have displayed substantial improvements for determining

policy priorities for that nation's education sector. The commitment of the government for this matter is disappointing, as the quantity of budget allocation for education expenditure is low. Studies that have examined the requirements through Cost assessments observe that allocation 4% of economic growth to public education is an at most critical requirement. This allocation of resources failed in the past 2 decades, in spite of government's own determination and donor involvement. Pakistan is still observed to spend less than the regional average on Public Education Expenditure.

Riasat et al. (2011) researched the Impact of education expenditure on the economic growth of Pakistan for duration of 1972-2010. The research employed bonds testing approach. His research reveals a significant and Positive impact in long run between education expenditure on Education and economic growth. The econometric model reveals that for education expenditure on Education 1% rise propels an increment of 0.04% in economic growth.

Kiani (2007) through Regression analysis observed the impact of key macroeconomic factors on growth for the years 1980 to 2007. The result estimated have led us to the following major conclusion. The quantitative evidence shows positive relation between economic growth increase and primary school enrollment rates. This suggested that primary level of education is an important requirement for increase in economic growth. The research portraits that it is the utmost responsibility of government officials to provide children with primary level of education so they can acquire literacy and knowledge within minimum time frame. Correspondingly, the analysis observed the important variable i.e., labour force participation as it provides increments in economic growth. In addition, literacy rate exhibited strong effect on economic development and human development which shows positive sign for sustainable economic growth.

H2: Public expenditure on Education has a significant impact on Economic Growth.

Inflation

Kryeziu et all. (2019) in the research examined the impact of inflation rate on economic growth in the European Nations. They used panel data for the time period 1997 to 2017 annually that had 257 observations. For data analysis a multiple linear regression analysis was used to observe effects of Inflation rate as significant impact factor on the Economic Growth. Diagnostic Tests such as Durbin-Watson for detecting serial correlation and Breusch-Pagan

LM Test for heteroskedasticity were used. The results observed that there was no existence of serial correlation as well as heteroskedasticity in the data. The econometric results from the data sample observed that there was a positive relationship between inflation rate and economic growth. Thus, the research concluded that there is a significant impact of Inflation rate on the economic growth for the selected European Countries.

Fikirte (2012) analyzed the Impact of Inflation rate on the GDP Growth Rate for (SSA) Sub-Saharan African Countries. The Study of Panel Data consisted of 13 (SSA) Sub-Saharan African Countries for the duration of 40 Years i.e. from 1969-2009. This research specifically considered investment, population growth rate, inflation rate, and initial GDP as independent variable whereas dependent variable was GDP growth. For testing the causality between inflation and GDP growth Researchers used panel Granger causality test. The results revealed that to Predict GDP growth inflation can be used for all the nations except Rep and Zimbabwe and Congo. Research concluded that economic growth and inflation have a negative relationship.

Mallik et all (2001) Examined the Relationship of Inflation Rate and Economic Growth for South Asian Countries specifically Pakistan, India, Bangladesh and Sri Lanka. The study obtained empirical evidence from using the co-integration and error correction model. For analysis the data was collected on yearly bases from IMF International Financial Statistics. The Research Concluded that Inflation and Economic Growth have a Positive Long run Relationship. The Research also suggested that such data results should push the respective authorities to act on Policies to curtail high inflation Rates to Moderate Inflation that is helpful for the Economy as High Inflation are observed to be harmful in the long run.

Ayyoub (2011) analysis observed that for the Growth of Pakistan's economy inflation is harmful. The statistically significant results indicate that continuous increase in the general price level inhibits economic growth. The study also finds the feasible threshold level of inflation which causes to reduce the growth of GDP. Studies reveal that this threshold level has been estimated at the level of 7 percent of inflation. Inflation below this level brings positive impact to the economic growth while Inflation Rate above this level is observed to be the cause of a fall in the Economic growth of the economy of Pakistan.

Ijaz (2021) The empirical research studied the relationship between inflation and GDP growth in Pakistan for time frame 1990-2015. This research applies Augmented dickey fuller (ADF) for stationary. While, for long run and short run analysis Engel Granger Co-integration test is used. The study suggests that in Pakistan relationship between inflation and GDP growth is Positive. Results reveal that 0.27 unit of GDP give rise in inflation of 1 unit.

Ali (2021) uses independent variables and the dependent variables such as inflation rate, exchange rate and economic growth (GDP), (IR), (MS). The paper employed the (ADF) unit root test and (ARDL) test. There's an affirmative relation between Inflation, Gross Domestic Product, and Rate of interest. The study claims that a inverse relationship between inflation and money supply exists. The results also show a negative relationship between inflation and exchange rate. In short higher inflation resulted in lower GDP and on the second side low inflation caused higher GDP.

Shabir et al (2022) studied the impact of inflation rate and unemployment on the growth rate during the period 1974 to 2020 in Pakistan. The study used the Autoregressive Distributed Lag (ARDL) technique for empirical investigation. GDP growth rate is a dependent variable, as a proxy for economic growth. Explanatory variables are rate of inflation, unemployment, population growth rate, foreign direct investment and government expenditure. The empirical findings from the study show that inflation rates and unemployment both show a negative relationship with economic growth and are significant statistically. The research concludes that The population growth rate has a positive and statistically significant impact on economic growth for Pakistan.

H3: Inflation rate has a significant impact on GDP growth rate

RESEARCH METHODOLOGY

In this section the Approach of research is explained. A Quantitative Approach is being used that will process data by statistical Tools, through which we can analyze the relationship variables hold.

Nature of Study

A Scientific Quantitative study into the variables of Economics that help us construct the Econometric Model, that we are inclined to analyze through empirical investigation. This Research depends on collection and analysis of Secondary Data.

Method of Data Analysis

A time series data analysis is conducted using Eviews that Provided Simple Regression analysis to study the Proposed Model. Through Eviews we analyzed the data set by running certain statistical Tests. T-statistics, R-Square and F-statistics help us analyze if our Regression Model is a good Fit or not. Sample data consists of Secondary Data. Main Primary Source for data is the World Bank data. Statistical Tests are employed to diagnose and analyze the sample data set. Interpretation of the tests is provided to observe the impact independent variables have on the dependent Variable. Tests to check the validity and reliability of the data

Research Model

Independent Variables   **Dependent Variable**
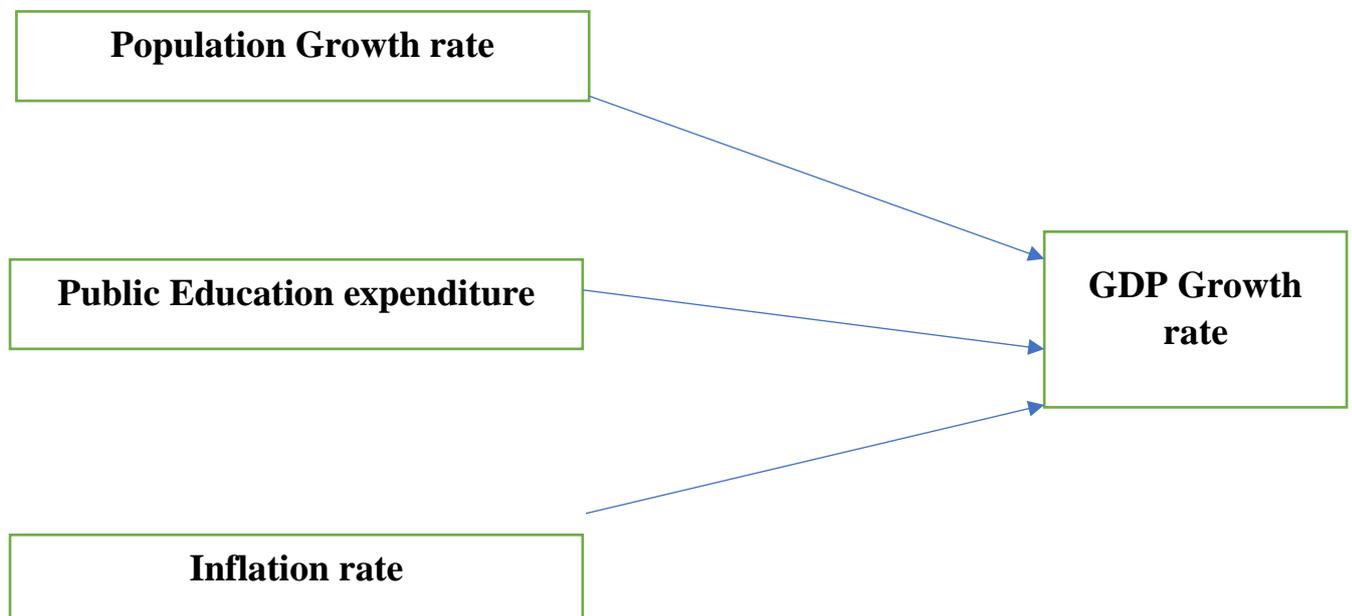
Econometric Model

Econometric Model used to measure the theoretical Model. It is helpful in explaining the relationship among variables.

In this research Econometric Model is used to quantify the relationship between the dependent and explanatory variable. This Model explains how Population growth rate, public education expenditure and inflation rate affect or impact the Economic Growth Rate.

The general model is

GDP Growth rate =Y= population Growth rate, Public Education expenditure and Inflation rate.

The specific form of our model is

Y=α0+α1(POPG)+ α2 (Edu exp) + α3 (INF) +μ

In this equation:

Y = GDP Growth rate

 POPG = Population rate

EDUExp = Public Education expenditure

INF = Inflation rate

μ = Error Term

In this model the Dependent variable is Economic Growth Rate. While Population growth rate, public expenditure on education (as a percentage to GDP) and inflation rate are the independent variables.

RESULTS

In this section we check the impact of the independent variables on economic growth. In this study we used the GDP Growth Rate, Population growth rate, public expenditure on education (as a percentage to GDP) and inflation rate as variables. We used economic growth as a dependent variable and other variables are as independent. Now we explain our independent variables individually according to the results.

Table 1. Regression Analysis

Variable	Coefficient	t-Statistic
C	3.342289	0.552510
POPG	-0.782007	-2.283636
INF	-0.127104	-1.731920
D(EDU)	3.921413	2.918936

R-squared = 0.517

F-statistic = 5.72

 *Significant at the 5 percent level

Our estimation results show that Population growth rate have negative relationship with economic growth. It has a negative sign with its coefficient -0.782007. Inflation rate has a negative sign with its coefficient -0.127 thus it shows that Inflation rate have negative relationship with economic growth. While for public expenditure on education the co efficient is positive thus depicts a positive relationship with economic growth.

Simply the relationship can be explained in the following statements. When Population growth rate increases by one unit then GDP Growth Rate decreases by 0.78 units. When Inflation rate increases by one unit then GDP Growth Rate decreases by 0.127 units. When public expenditure on education increases by one unit then GDP Growth Rate increases by 3.92 units.

For t-statistic values within a range is accepted, the value either is greater than +2 or less than – 2. The confidence in the coefficient as a predictor is greater if the t-value is higher, similarly if the t-value is low it indicates low reliability of the predictive power for that variable.

Population growth rate is negative -2.283 thus is **inversely** Proportional to GDP Growth Rate. Inflation rate is negative -1.731920 thus is **inversely** Proportional to GDP Growth Rate. Public expenditure on Education is **significant** at the level of 5% because t-stat value is greater than the 2.

r-squared Shows how well the regression model explains observed data. R-squared is a goodness-of-fit test. The regression analysis reveals that 51.7% of the variability observed in the independent variable is explained by the regression model.

4.2 Auto-correlation

Auto-correlation also known as serial correlation is a statistical concept that refers to the degree of correlation of the same variables between two successive time intervals. It indicates how the lagged version (previous point in time) of the value of a variable is related to the original version of it in a time series. Breusch-Godfrey Serial Correlation LM Test is used for this analysis.

Table 2. Tests for checking Auto-correlation

LM Test:			
F-statistic	0.172109	**Prob. F(1,15)**	0.6841
Obs*R-squared	0.226876	**Prob. Chi-Square(1)**	0.6339

The analyses reveal that Auto-correlation does not exist. Statistically significant indicators are Best Linear Unbiased Estimation (BLUE).

Descriptive statistics shows the distribution and normality of data. Descriptive statistics table show the mean median maximum minimum standard deviation skewness kurtosis jarque-bera and probability results.

Table 3: Descriptive Statistics

	GDP	POPG	INF	EDU
Mean	4.010524	2.218595	9.368762	2.301587
Median	4.396000	2.197000	7.331000	2.395510
Maximum	7.547000	2.647400	38.51200	3.002920
Minimum	-0.935000	1.978300	0.400000	1.547954
Std. Dev.	2.059501	0.169360	8.375066	0.426908
Skewness	-0.534612	0.852318	2.218169	-0.173738
Kurtosis	2.855756	3.262706	8.134140	1.834982
Jarque-Bera	1.018541	2.602948	40.28542	1.293256
Probability	0.600934	0.272130	0.000000	0.523809

First of all, table tells us the Mean values of all variables. Mean is sum of the observation values divided by the number of observation. It is the average value of whole data. All variables have its mean value. The mean value of GDP growth rate is 4.01. The mean value of Population growth rate is 2.22. The mean value of public expenditure on education is 2.3. The mean value of inflation rate is 9.37.

Second Measure the Descriptive Statistics tables shows the median of all variable. Median value of dependent variable GDP Growth Rate is 4.39. Median value of Population growth rate is 2.19. Median value of inflation rate is 7.33. Median value of expenditure on education is 2.39.

Next the Descriptive Statistics table give maximum value of variables. The maximum value of GDP Growth Rate is 7.54. The maximum value of Population growth rate is 2.64. The maximum value of inflation rate is 38.51. The maximum value of expenditure on education is 3.00.

The Descriptive Statistics table also gives the minimum value of variables. The minimum value of GDP Growth Rate is-0.93. The minimum value of Population growth rate is 1.97.

The minimum value of inflation rate is 0.40. The minimum value of expenditure on education is 1.54.

Standard deviation is a measure of dispersion from the mean. Low standard deviation of GDP Growth rate (2.05) means data is clustered around the mean, while high standard deviation of Inflation Rate (8.37) indicates data is more spread out. A standard deviation close to zero such as for Population Growth rate and Public education expenditure variables indicates that data points are close to the mean, whereas a high or low standard deviation indicates data set is above or below the mean estimates.

The Jarque-Bera test is a test to check normality of data. It determines if the data set have a normal distribution or not. It determines if sample data have skewness and kurtosis that matches a normal distribution or not. A positive number is always the test statistic of the Jarque-Bera test. If, it indicates that the sample data do not have a normal distribution If the test statistic of the Jarque-Bera test is far from zero.

As for Skewness Less distance of largest value from median than the distance of smallest value observed to the median shows left skewed data (for right skewed vice versa) in other words the mean is less than the median. While zero value observed for skewness shows the normal distribution of variables. Inflation rate is highly skewed as greater than 1 and the value of Skewness is also positive. GDP Growth Rate and expenditure on education left skewed and value of Skewness is negative. Population growth rate is right skewed and the value of Skewness is also positive.

Cusum Tests

In a multiple linear regression model Cusum tests are used to examine the significance (stability) of coefficients **α** as in our regression model.

Graph 1. Stability Test
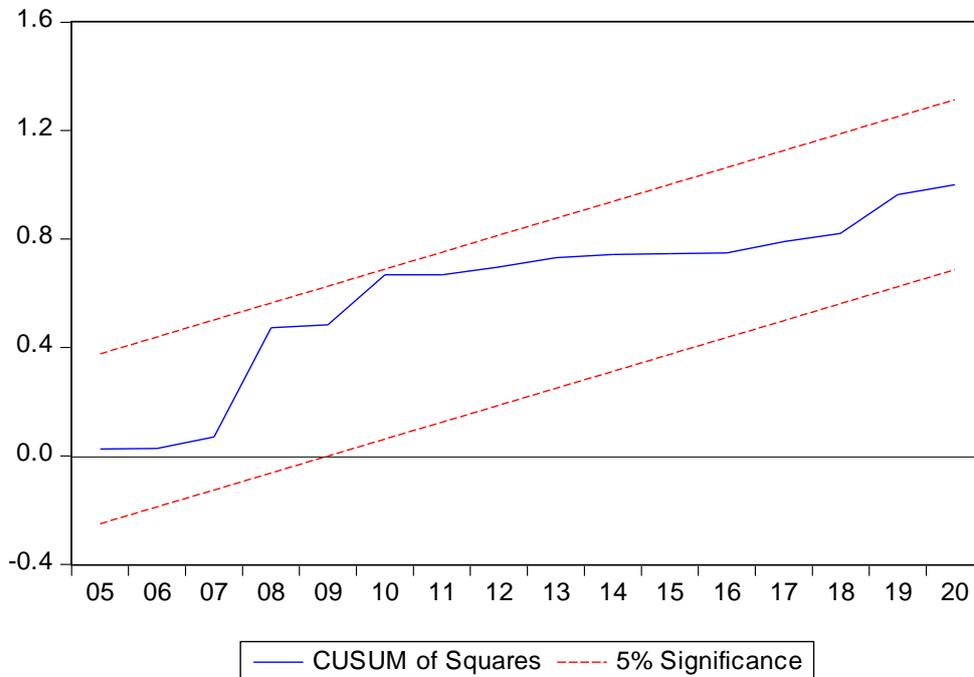
This Graph shows that its stable as the 5% significance line remains inside the CUSUM of Squares region.

As the CUSUM of Squares line remain in the 5% significance region it shows us that the theoretical Form or Theoretical Model is accurate and significant.

Correlation Matrix shows the strength and direction of the relationship between the variables. This may be perfect positive, perfect negative, partial correlation or no correlation between the variables.

Table 4. Matrix of Correlation

	GDP	POPG	INF	EDU
GDP	1			
POPG	0.208415	1		
INF	-0.250796	0.462696	1	
EDU	0.176966	-0.495893	-0.222022	1

In a Correlation Matrix Each cell in the table shows the correlation between two specific variables. Values near 1 indicate Strong Positive Correlation while Values near -1 indicate Strong Negative Correlation.

In our Research Model Correlation between Population growth rate and GDP Growth Rate is 0.21. Correlation between inflation rate and GDP Growth Rate is -0.25. Correlation between inflation rate and Population growth rate is 0.46. Correlation between public expenditure on education and GDP Growth Rate is 0.177. Correlation between public expenditure on education and Population growth rate is -0.496. Correlation between public expenditure on education and inflation rate is -0.22.

CONCLUSION

In this section we conclude our Research and findings. The study investigated the impact of Macro-economic variables of Pakistan such as Inflation Rate, Population Growth Rate and Public Education Expenditure on the Economic Growth of Pakistan in terms of GDP Growth rate. In Chapter of literature Review of the study we identified the different views of how economists studied and observed the variables to be in relation with each other internationally (other countries) and in the specific case of Pakistan. In the Methodology we explained the Econometric Model, the nature of study (secondary data) and the Statistical Tests we analyzed the data through Eviews to get the desired Results. As our research is Empirical in Nature the Empirical Results of the Statistical Tests helped us reach a consensus on the impact of relationship that exists among the independent variables and the dependent variable.

Research used time series data of time period 25 years from 1995 to 2020. Thus the sample size of study is 25 years. The study concluded its results by applying the different econometric techniques and statistical Tests. The simple Regression of the linear Regression model revealed that 51.7% (R-square) of the variability observed in the independent variable is explained by the regression model. Population growth rate is inversely Proportional to GDP Growth Rate. Public expenditure on Education t-statistic value is observed to be significant at 5% level of significance because t-statistic observation for Public expenditure is observed to be > than 2. Public Education expenditure is significant at the level of significance of 5% and is Directly Proportional to GDP Growth Rate. Inflation rate is inversely Proportional to GDP Growth Rate.

LM Test is employed for the checking of Serial Auto-correlation and the result reveal auto-correlation does not exist. Descriptive stats analysis provides a concise interpretation of the sample data under study such that it highlights the statistics tests like mean and median. Other

tests like kurtosis, standard deviation and skewness, help us analyze the observations. As for the CUSUM Tests show us that the theoretical Form or Theoretical Model is accurate.

The empirical Research and Results Have Revealed that with the increase in Population Growth rate and Inflation rate, the response variable of our model GDP Growth Rate falls while with increase in Public expenditure on Education (as a percentage of GDP) the GDP Growth Rate increases. Thus to attain sustainable Economic Growth we need curtail Rapid Population Growth and Inflation Rate. Along with the need to expand our Public expenditure on Education (as a percentage of GDP) as it is observed to help increase the GDP Growth Rate.

The current figures for Population growth rate (2.0%) are high especially in our region of south Asia other Countries like India (1%) and Bangladesh (1%) have lower Population growth rate. Inflation Rates all over the world are rising due to the COVID Crises and more recently due to the Ukraine War yet Pakistan needs to counter the Inflation Rate so saving and investment rates can rise to provide better economic conditions to businesses. Inflation Rate of Pakistan (9.5%) while for Bangladesh (5.5%) and India (5.59%). As for in Public Education expenditure Pakistan is spending much less than the international benchmark of allocation of 15-20 % of the total budget and 4% as a percentage of GDP. Even in the region of south Asia other Countries like Bangladesh and Nepal are observed to spend more on Education.

The current dismal figures of these variables should prompt the authorities to take concrete continuous steps and plan long term strategies to overcome the Macro-economic factors contributing to lower Economic Growth. The Planning should include Awareness and educating

Campaigns to let the Public know how Education and planned Population can contribute to better living standards and overall Economic Growth for Pakistan

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