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Impact of Population on Economic Growth: A Case Study of Pakistan

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Abstract
The study analyzed the effects of population on economic growth in case of Pakistan. In some years the population has a real problem for all over the world. The study examines the impacts of population and the problems due to population increased and its influence on economic growth. We take the time series data with the sample size from 1981 to 2010. The study used the Unit root test of ADF, co integration and Auto-regressive distributed lags test to analyze the results. The study used economic growth as dependent variable and independent variables are population, investment, fertility rate, employment rate and education expenditure. The study concluded that population creates negative impacts on economic growth of Pakistan and create lot of problems adding more in unemployed population of the country. The study suggested that awareness programs about population control can be effective in controlling the increasing population of the country. Moreover, the Government of Pakistan should take some solid steps towards the overpopulation problem to maintain its economic pace.

Keywords: Economic Growth, Population growth, Investment, Education
JEL Codes: F43, P23

I. Introduction

At the early 21st century, the world population spread around 6 billion and increase continuously in recent years. In every year around 75 million people were added in the world population. Pakistan being six most heavily populated countries in the world. Pakistan's population is 191.71 million in current year however population was 188.0 million in 2014. Population Growth Rate has decreased from 1.95 percent in 2014 to 1.92 percent in 2015. In total population there is 80% share of developing nations and largest part of Asian countries. In developed and developing countries population scenario is totally different. In developed sector population is well controlled because they better utilize our labor force. China is the best example that utilize her labor force properly and increase our productivity. On the other hand, developing economies are trying to manage the basic needs and not paying any attention on population growth sides, policy and strategy side. Because in these developing countries high population influences on the resources under a country. Mostly in Asian countries problem of high population exist. The population and economic growth always consider a close relationship with each other. Because high population growth creates effect on the economic growth (GDP) in a country. There are generally two views about impact of population growth on economic growth. First is population growth is an actual problem, according to this view population growth is one of the important public, economic and governmental serious problems. In most of the developing country face this problem. Second is the population are desirable not a problem. High population growth means high labor supply that leads to economic growth. High population growth also enhances to the labor supply that can be used for productive resolves and provides prospective for large markets for goods and service.

In case of Pakistan, population is one of those problems which affected its economic, social and political system. In past year population increase was not that high but this economy faced a reactively high population growth in recent times. At the phase of sovereignty, Pakistan was the 13th supreme crowded country in the overall world with a population of 32.5 million but in 1996 it was 7th with a populace of 140 million. Now-a-days Pakistan is ranked at 6th among the countries with high population. In last century many governments tried to control population and its impacts but not succeed due to less awareness among people about it. According to economic survey of (2013-2014), the population growth is 1.95 percent that is highest in Asia and due to this Pakistan lagging behind when compare to the other developing countries. Population of Pakistan reached at alarming position and creating hurdles in its economic welfare path. It is projected that population of Pakistan will spread to 210.13 million by 2020. According to world report Pakistan maintain six position in 2050 with expected 363 million population. Pakistan population increase more than four times since freedom. From the time of freedom Pakistan added only one million in a year. Now days every three month, the one million population add in Pakistan. In this situation no development plan can bear such a population growth rate. High population growth not only puts a country's economic assets under stress, but also increase dependency ratio of young people and thus limit the production growth in the economy. Afzal (2009) studied impacts of population on economic growth in Pakistan. He analyzed the negative impacts of population on growth. In which he used the country-wise data and he find out that population create negative impacts on economic growth of Pakistan. Mushtaq (2006) adopted that the relationship between population growth and per capita income in long time period in case of Pakistan. He analyzed that population growth not influenced the per capita income in long run. He used data that starts from 1960 and ends at 2001 as a sample.

This study is beneficial for both government and non-governmental agencies, concerned with controlling population growth, to implement their plans and get promising results. Another major contribution of the work is that, through this, the general public will be made aware of the ways to reduce population. It is because some people already try to have less children but their ignorance does not let them succeed in it. Favorable population growth will also result in the decrease in unemployment. This study related with the economic development and population for the time period that starts from 1981 and ends at 2010. The study of the population has a big scope in all over the world. This study has main focus only the population and not more discuss the other dimensions of the population. The further search on the population and its dimensions also effect on the economic development of Pakistan.

II. Literature Review

Velasco et al (2016) examined the relationship between population growth and economic growth in case of maxico. Study used the Cointegration analysis and in addition granger causality test also to analyze the result. Study used the time series data from 1960 to 2014. In the short run, result shows that economic growth has a negative effect on population growth and long run, result shows that population has a positive effect on per capita GDP and that per capita GDP positively affects population. Moreover, a Granger causality test indicated that per capita GDP is Granger-caused by population and population is Granger-caused by per capita GDP. Essien (2016) surveyed the role of population growth in economic growth in Nigeria. He used time series data from the period 1981-2013. He used

Augmented Cobb-Douglass Production Function, Johansen Cointegration Test, and Adf test to analyze the result. Population growth has the abilities of raising economic growth in Nigeria. Result shows positive impact that population growth exerts on the growth performance of the Nigerian. Ali et al (2015) examine the relationship between population growth have a vital impact on economic growth in Bangladesh. He analyzed that rapid population growth is a real problem in Bangladesh because it contributes to lower investment growth and diminishes the savings rate. He used the multivariate analysis from 1981 to 2014. He applied the LM test, JB test, HS test. He used real GDP growth as a dependent variable and independent variable were population growth, real gross domestic investment growth, real foreign investment growth, exports growth, consumption. He concludes that cross country evidence on the population growth and economic growth relationship is not consistent. Study suggested that Strategy creators can address these serious economic concerns of rapid population growth by spending in family planning services. Development of independent media and liberal education in educational institutions will in time also help by encouraging a smaller family size ideal.

Tartiyus et al (2015) examine the impact of population growth on economic growth in Nigeria (1980-2010). He used the three method Augmented- Dickey Fuller (ADF) Unit root test, Granger causality Test and Ordinary least squares method to analyze the result. He used real GDP as dependent variable and population growth, real gross domestic investment growth, real foreign investment growth, export growth, private consumption a percentage of GDP. The conclusion that there is a positive relationship between population growth and economic growth in Nigeria compares with the experience of the advanced countries. He suggests that average rate of fertility in Nigeria should be maintained and recommended that policies to enhance export should be accepted to encourage export growth.

Shah et al (2015) examined the relationship between economic growth and population growth in Bangladesh. Study used data from 1980 to 2005 by employing multiple linear regression model. Study used gdp growth measure as annual percentage as dependent variable and Population as annual percentage growth, growth in exports of goods and services, Foreign Direct Investment (FDI) have been included as a percentage of GDP (Gross Domestic Product) and Gross National Income (GNI) per capita as independent variable. The result indicates that economic growth and population are both negatively correlated and that an increase in population will have a negative impact on the economic growth of Bangladesh. Study suggest government can focus on family planning programs to overcome the negative consequences of rapidly increasing population.

Chang et al (2014) examined the relationship between population growth and economic growth in 21 countries. Study analyzed that population growth has negative impact on economic growth. Study used the Bootstrap Panel Granger Causality Test to analyze the result**.** Thy used the time series data from 1871 to 2013.Serious economic concerns of rapid population growth by spending in family planning services. Development of free media and liberal education in educational institutions will in time also help by encouraging a smaller family size. Technological development is a concern of population growth which leads to an increase of labor productivity, per capita income and progress in living standards. Study suggest that this study helps between population growth and economic growth, not only for demographers and economists but also help for policy makers to control population.

Alemu et al (2014) studied relationship between population growth and economic growth in Mexico. Study used the cointegration analysis test and in addition granger causality test to estimate the model. Study used the time series data from 1960 to 2014.result shows in the short run, it was found that economic growth has a negative effect on population growth. In the long run, it was found that population has a positive effect on per capita GDP and that per capita GDP positively affects population. Additionally, the Granger causality test indicated that per capita GDP is Granger caused by population and population is Granger-caused by per capita GDP.

Ali et al (2013) examined the relationship between impacts of population growth on economic growth in Pakistan. Study claims that population growth have positive impact on economic growth. Study analyzed that high number of labor force stimulate the economic growth. Study used the thirty four year annually data. Study used the ARDL co-integration technique. He used real gross domestic product as a dependent variable and independent variable were population growth, unemployment rate, human resource development and trade openness. At the end study analyzed that population growth is not a real problem, problem of Pakistan is unemployment and development policy that are not effective. Study suggested that government of Pakistan should take into account the problem and unemployment and development policy HRD. When once the country has got tremendous growth, reduced unemployment and developed human capital the population growth will be correct of itself.

Almadi et al (2013) used that the impacts of population and their relationship with economic growth in case of Kenya. Study analyzed that the rapid population growth creates the positive and good impact on the growth of Kenya. Study take the Robert Malthus ideas about the population growth. Study take the time series data 1963 to 2009 as a sample. Study applied the techniques of Vector Auto Regression and concluded the results by using the population and gross domestic product as a variable. Study conclude that the influence of population on economic development in case of Kenya positive and stronger in both long and short time period. Study suggested that take good polices about the population growth and provide health, education and jobs facilities. Study also recommended that government play our role in better way and provide all basic facilities because these improve the living standard and development for any country.

Manan et al 2013 examined that domestic saving and literacy have the long run relationship with population except FDI, unemployment. Study analyzed that population and literacy has negative effect and Population is positively related to the unemployment and fdi in the Pakistan. Study used the Co integration approach to analyze the result. Study used the time series data of fourty years. Study used the population growth as dependent variable and independent variable were literacy, fdi, domestic saving, and unemployment. Study concluded that Population pressure lower the economic growth rate. Lack of awareness, Scarcity, Gender discrimination, Government mismanagement are main reason of lower growth. Study suggest that provide information and understanding of the main situation of population growth and create awareness between the population problems, social and economic phenomena among the people.

Mamingi et al (2013) examine the relationship between population growth and economic development in a small developing country, Barbados, in the period 1980-2010. Study analyzed that population growth positively and significantly affect economic growth. Net international migration negatively and significantly impacts population growth. Natural increase rate positively and significantly affects population growth. Study applied two methods to analyze the results ARDL, Cointegration test. Study used population growth as dependent variable and real GDP per capita growth, population growth lagged once, NRI is the natural increase rate, lagged NRI is a series of lagged, RGG is a series of lagged real GDP per capita growth, TR is a trend used as a proxy to net international migration. Study suggest that if government consumption expenditure negatively and significantly influences economic growth. Personal consumption negatively and significantly impacts economic growth. Domestic investment positively and significantly affects economic growth. The less risky the country is, the larger the economic growth.

Dao (2012) examined that the relationship between population and growth in developing countries. He used the data of forty three developing countries as a sample. He used the Least Square Method to analyze the results. Study used the capita income growth rate as a dependent variable and independent variable were population rate, urban population rate, working age population, fertility rate, mortality rate, old population and some dummy variables. He concludes that impact of population on per capita gross domestic product is negative in under developing countries. This Study also conclude that old dependency ratio has negative impact and young dependency has positive impact on economic growth in the case of developing countries.

Adewole (2012) examines the effect of population on economic development in Nigeria. He used ordinary least square method of investigation. He analyzed that population growth has positive and major impact on economic sustainability changes as real gross domestic product and Per Capita Income. He used data from 1981 to 2007. He used the economic growth as dependent variable and Per Capita Income and Real Gross Domestic Product as independent variable. Study concluded that there are negative relationship between per capita income and population. He suggested that create policies to effect the rate of growth of their population and to accept politically and virtuously. Governments at several stages are advised to extend to women and men the independence and mean to determine the number of children in each family and the knowledge which will help them workout responsible guardianship.

Atanda et al (2012) examined that the relationship between the population growth and economic development of development as well as developing countries. Study studied that the population have a positive impact on economic growth in developed nations and it has negative impact in developing countries. Study took the data of different developing countries as sample which starts from 1980 and ends at 2010. Study take economic growth as dependent variable and birth rate, crude death rate, mortality rate, fertility rate and life expectancy as independent variable. Study conclude that the impact of high population on economic growth is positive in developed countries and impact of high population on economic growth in developing is negative. Study also suggest that the developing countries should

increase the aggregate level of investment and provide education and health facilities to people to achieve higher levels of growth.

Jaffri et al (2012) examine the impact of population growth on current account balance of Pakistan. Study applying Autoregressive Distributive Lag (ARDL) approach of co-integration method to analyze the result. Study used the time series data from the period 1984 to 2010.Current Account Balance to GDP ratio as a dependent variable and Population Growth and Dummy variable are independent variables. Study shows population growth degrades current account balance GDP in the long run. Study suggest provincial governments should pay special to bring Pakistan's TFR from 3.5 per woman to regional targets. Further, female labor force participation should be especially increased by skill enhancement programs, financial empowerment and creating social acceptability for female workers.

Abiodun and Iyiola (2011) investigated that the impacts of education on economic growth in case of Nigeria. Study analyzed that the education important factor that influence the economic growth. Study used the time series data and take sample size 1980 to 2008 years in Nigeria. Study applied the Ordinary Least Squares method to findings the results of our estimated model. Study conclude that the education has direct impact on the economic growth of Nigeria. Study suggested that the government increased the level of education and also increase the funding on education. Because study significant for the economy of Nigerian.

Schramm (2011) examine how family planning policies in China (explicitly the so-called One-Child-Policy) have affected economic growth. He used the time series data from 1979 to 2005. He used Solow model to help understand the effect of family-planning-policies. The One-Child-Policy affected deeply the last 32 years of China's economic development but the result of this paper shows the impact changes from a positive one to a negative one. China has to expect a negative impact on economic growth because of demographic dynamics.

Furuoka (2010) analyzed that the relationship between the population and economic growth in case of Philippines. He studied that the long time period equilibrium relationship exists between the population and economic growth in the Philippines. He used time series data that starts from 1950 and ends at 2007. He applied three tests to find out the analyses results that the ADF unit root test (Dickey and Fuller), the Johansen Co-integration test; and the Granger Causality test. First the ADF result shows that the population and GDP per capita in Philippines relationship exist between the population and GDP. The Granger Causality test analyzed that the economic development in Philippines had a positive influence on the increasing population. He concludes that the population and growth rate positively related. He suggested that further methods applied to analyze the relationships in Philippines that help to determine the economic growth in case of Philippines.

Afzal (2009) has examined that the impacts of the population on economic growth in case study of Pakistan. He studied that population growth and economic growth creates the negative relationship with each other. He analyzed that population growth created problem because study decreased the investment and saving rate. He used the cross sectional data of 75 countries and also used the multivariate analysis which take data that starts from 1981 to 2005. Study used the Least Square Method. He used real gross domestic product as a dependent variable and independent variable were population growth, investment growth, foreign investment growth, export growth and consumption. At the end he analyzed that population has reached alarming position in Pakistan. He suggested that effects of the population decreased by family planning exists educational institutions, independent media because these steps helped to decrease the population rate and made such mind in which small family idealized in Pakistan.

Ozgur et al (2009) examine the relationship between population and per capita economic growth in turkey. He used the ARDL approach to Cointegration. He used time series data from 1924 to 2006. He analyzed that there is long run relationship between per capita and population. Study analyzed that relationship between population and economic growth is strong and positive in Turkey over the period of the analysis. This result may suggest the several portions of rule introduced to control the comparatively high growth rate of population in Turkey have not been totally successful, as population quiet tends to react to factors outside the direct control of the authorities.

Klasen et al (2007) examined that the relationship between population, economic growth and poverty in case of Uganda. In this study used the cross section and panel data for checked the impact of population on economic growth and poverty reduction. By using Harrod-Domer model and Solow model study checked the impact of population growth and economic growth which showed that positive impact of population growth on economic growth but population growth had negative impact on per capita economic growth. Study used the economic growth as a

dependent variable and population, poverty and household size as independent variables. Study suggested that to reduce the fertility rate and improve the education sector and health sector in Uganda.

Mushtaq (2006) adopted that the relationship between population growth and per capita income in long time period in case of Pakistan. He analyzed that population growth not influenced the per capita income in long run. He used the data that starts from 1960 and ends at 2001 as a sample. He applied the Co integration analyses unit root test and Augmented Dickey Fuller test. He used two variables population and per capita income. He concludes that no relationship exists between population and income in long run. Due population growth no effect creates long run in case of Pakistan. So population not causes the problem in long run of a country.

Albatel (2005) analyzed the effect of population growth on economic development in Saudi Arabia. Study analyzed that rapid increase in population has negative impact on both savings and economic growth. Rapid population due to increased fertility rate and a rise in life expectancy. He used the time series data from 1964 to 2000.He applied two tests to find out the analyses results that the stationarity tests and multivariate co-integration tests. He takes financial saving, total saving as dependent variable and total investment, Population, and savings as independent variable. He concludes that reducing population growth may raise the saving rate and, hence, the rate of growth in per capita income. He suggests that make ways and policies that both reduce fertility and increase productivity of the population and enhance economic growth. Population growth may stimulate innovation in technology and in turned hence economic growth.

Alam et al (2003) analyzed the dynamics between fertility, family planning programmes and female schooling for Pakistan over the period 1965- 1998. Study applied three test co-integration, granger causality and unit root test. Study used total fertility rate, as dependent variable and infant mortality rate, female secondary enrolment ratio, female labor force participation rate, sterilization, and real GDP as independent variable. The results are found to be reliable with theoretic statements that maintain that although in the long run the adequate condition for fertility decline may be the result of complex energetic relations with planned family planning and significant socio-economic structural changes. A different study showed for the economy of Ghana and found that population growth has negative impact on the four key variables like Education, Health, environment and economic sector.

III. Model Specification

The general model is

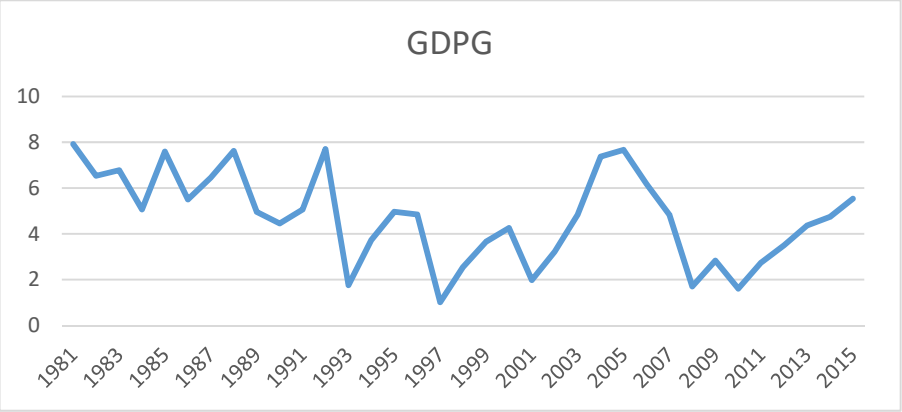
Y= population, fertility rate, investment, employment rate, Education.

The specific form of our model is

$$Y_g = \alpha_\circ + \alpha_1 pop + \alpha_2 FRT + \alpha_3 EDU_{\exp} + \alpha_4 EMP + \alpha_5 INV + \mu$$

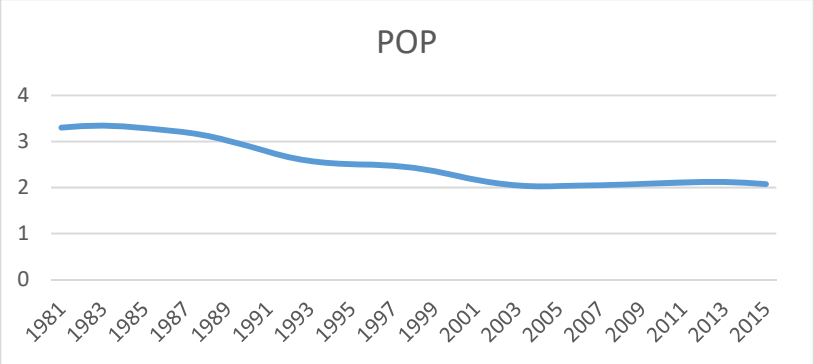
- Y= Growth rate
- Pop= Population rate
- Frt= Fertility rate
- Eduexp= Education expenditure
- EMP= Employment rate
- Inv = Investment rate
- μ = error term

In this study the dependent variable is economic growth. The economic growth is that process in which production increased of a country at the specific time duration. This growth increase due to use of latest technology and new innovation. It is very important concern for the development of any country. In Pakistan the growth rate is low as compare the other developed countries. The reasons are no properly use of resources, old method of production and lack of technology. Due low level of production income low that influences the economic growth. The real GDP increased 5.53% in 2015 as compare 4.73% in previous years of 2014 the economic growth is very low due the low level of production and income.



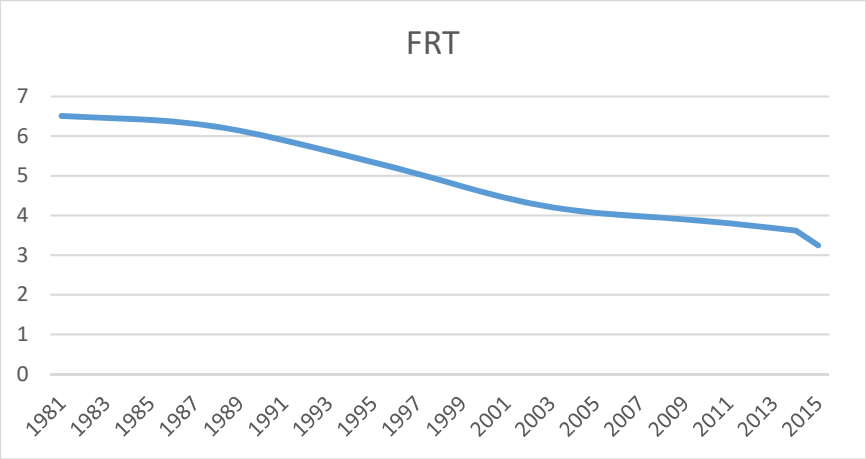
The above graph shows the GDP (Per capita income) growth of Pakistan. The graph trends shows that gdp growth change over the period of time. Highest growth rate in 2005. Overall graph trend shows that growth increased with the decreasing rate in this time period

In this paper the independent variables are population growth, fertility rate, investment, unemployment rate, and that influence the economic growth of Pakistan. Now we discuss and check all variables impacts on economic growth of Pakistan. "Population is that where group of people are living together in a state or a country." Population is very important variable that influence the growth rate of any country. The relationship between the economic growth and population is positive and also negative. But in case of Pakistan population and economic growth occurs negative relationship. The situation of population in Pakistan reached at dangerous position and increase day by day very quickly. Today Pakistan is the 6th largest country of the world that population is 191.71 million. The different survey reports estimated that population of Pakistan more increase and doubled in coming years. According to economic survey report Population of Pakistan is estimated 210.13 million in the year 2020. Population Growth Rate that is 1.92 percent in 2015 and 1.95 percent in the year of 2014.



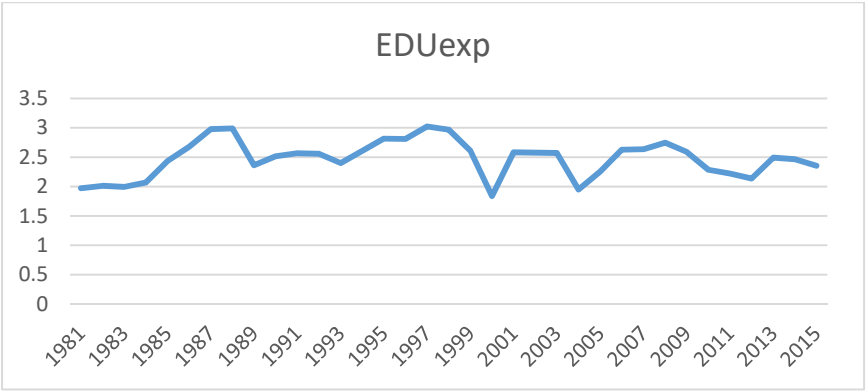
The above graph shows that the population growth trend of Pakistan. The graph trend shows that continuously decreasing trend of population growth in Pakistan. Because in Pakistan ratio of population decrease in some recent years.

Fertility rate is that part of population in which average number of children that born by a woman at her lifetime. They may increase the labor force but due negative impacts create in a country. In Pakistan due to lack of better planning they create negative impacts the economic growth. The total fertility rate is reported 3.4 percent children per women in 2011-2012 and as compare 2010-2011 are 3.4. In coming years more attention given to decline the fertility rate by adopting the different polices and plans of Government.



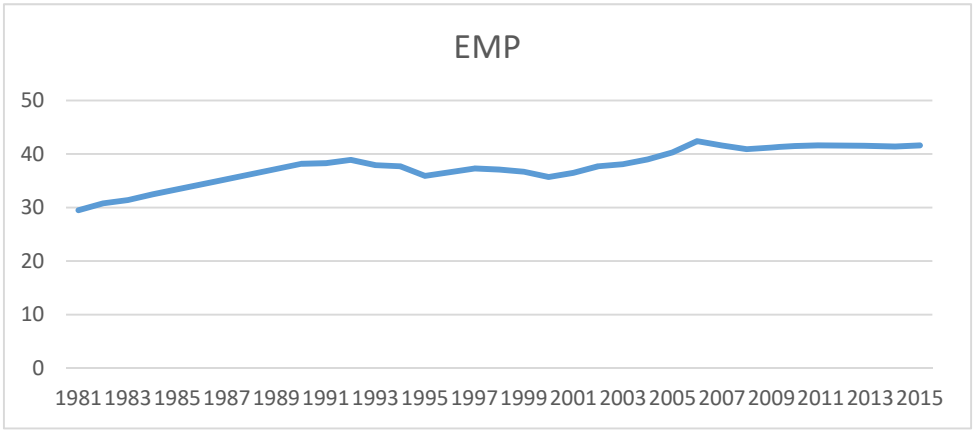
The above graph shows that the fertility trends in Pakistan. The graph shows that some starting year's fertility rate increased and after that they decrease. After the years of 1995 they decrease persistently at the same ratio.

Education and economic growth has positive relationship with each other. Education is one of another variable that effect on the economic growth. They play important role to increase or decline the growth rate. As level of education increase more people educate that increase the working population who contribute more in economic growth. In Pakistan the situation of education is very poor low investment and spending of this important factor. The overall ratio is only 46% that is very low. The situation is more critical in rural areas where the ratio of education very poor. The overall spending of GDP is only 2% that is very low as compare the other countries. According to the Pakistan Social and Living Standard Measurement (PSLM) Survey the education 58% in 2010-2011 as compare 57% in 2008-2009. In urban areas education rate increased as compare the rural areas. In recent years Government of Pakistan tries to increase the level and ratio of education.



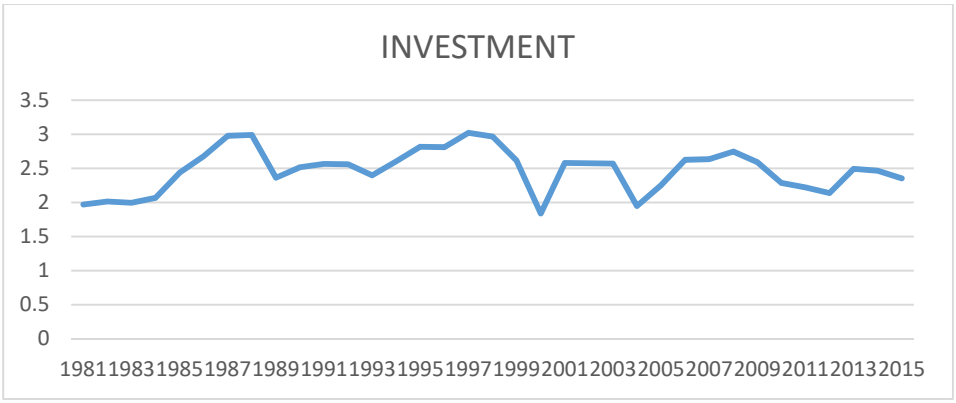
The above graph shows that the education expenditure (%) trends in Pakistan. In starting years they show that the increasing trends and after they show the decreasing trends. In 1995 to 1998 years they increased and after they again decreased. In 2005 to 2007 shows that the increasing trend and in last year's 2009 and 2010 they decreased.

Employment is that situation in which people of a country able and willing to get job and they find the opportunities of jobs. The relationship between economic growth and employment is positive because as employment increases the economic growth increases. In Pakistan jobs opportunities is very low due unemployment rate high that creates bad impacts and they decrease the economic growth of Pakistan. Because the population ratio is very high that not cover in under jobs opportunities due many people's that are willing to job not get the jobs and create the employment. In recent years the employment constant due over population and lack of resources utilization. The highest employment rate in Sindh as compare to the other provinces of the Pakistan.



The employment graph shows the different trend in under the years. The graph shows that in 1991-1995 they decrease. After that it again decreases in 1999-2000. The increasing trend shows in last year's they again increase with same ratio.

"Investment is that process in which adding the stock of real productive assets" (Economic dictionary). Investment is also another important factor that affects the growth rate of the Pakistan. The relationship between economic growth and investment is positive. Because due investment positive impacts create on economic growth. As investment increased more GDP generate and if low invest than low income that causes the low GDP growth. Pakistan is a developing country and its income and savings very low due investment ratio low in Pakistan. Because investment depends on the savings as investment increase savings also increase. According to the economic survey report the investment 15.3% in 2016 as compare the 15.11 in 2015. Investment influences economic growth in positive way. But in Pakistan due high population income are very low that causes the low savings. Due low savings they invest low that causes the low economic growth in case of Pakistan.



The above graph shows the investment in percentage of the Pakistan. The graph shows that the decreasing and the increasing both trends of the investment. In starting years investment increase with the decreasing trend. In 2004 and 2005 they increased persistently and in 2009 and 2010 they decreased.

IV. Theoretical background of Statistical Technique

In this study time series data used which starts from 1981 and ends at 2010 to check out the stationarity of data. So unit root test is applied to check the stationarity of the variables. A unit root test is that which is applied to determine the order of integration. There are many tests for check the stationarity of the data. The main and important test that is used Augmented Dickey Fuller (1979) test. These test used to analyze the structural breaks and trend in data. Unit root test are applied to check out the stationary of the data. We applied the Augmented Dickey Fuller (ADF) to stationarity of the variables. Augmented Dickey Fuller (ADF) has been applied at the level and first difference. In this study we used economic growth are dependent variable and population, fertility rate, employment, education and investment are independent variables. We checked the results of each variable by using the Augmented Dickey Fuller test. The Augmented Dickey Fuller (1979) is that test which is used for the stationarity testing. In this test the

stationarity of the dependent and independent variable is checked at level and first difference. Also check the tabulated and critical values on the 1%, 5% and 10% level. Several authors have point out the standard ADF test is suitable for variables. In this test we compare the tabulated value with their critical values with level and first difference. By the help of this test also check the trends and fluctuations under the data.

V. Empirical Results

In this part we analyzed the results of our study. Unit root test are applied to check out the stationary of the data. We applied the Augmented Dickey Fuller (ADF) to stationarity of the variables. Augmented Dickey Fuller (ADF) has been applied at the level and first difference. In this study we used economic growth are dependent variable and population, fertility rate, employment, education and investment are independent variables. We checked the results of each variable by using the Augmented Dickey Fuller test. Descriptive statistics shows that the essential characteristic of the data. They represent quantitative description in an accurate form and give manageable sketch about the data. Descriptive statistics show the data trends in different time periods.

Descriptive Results

	GDP	POP	FRT	EDU	EMP	INV
Mean	4.73105	2.52491	4.996257	2.47718	37.65476	17.7521
Median	4.84632	2.42901	4.892000	2.5594	37.70000	17.966
Maximum	7.92076	3.34413	6.508000	3.0223	42.40000	20.821
Minimum	1.0144	2.02781	3.247000	1.83782	29.50000	14.121
Std. Dev.	1.97825	0.48616	1.070012	0.31601	3.384004	1.65343
Skewness	-0.06	0.58243	0.101771	-0.221	-0.594307	-0.5197
Kurtosis	2.07643	1.78644	1.494225	2.35276	2.729057	2.43229
Jarque-Bera	1.2649	4.12655	3.366980	0.89593	2.167397	2.04569
Probability	0.53129	0.12704	0.185725	0.63893	0.338342	0.35957
Sum	165.587	88.3718	174.8690	86.7011	1317.917	621.324
Sum Sq. Dev.	133.058	8.0358	38.92746	3.39522	389.3503	92.9503
Observations	35	35	35	35	35	35

Descriptive statistics table show the mean median maximum minimum standard deviation skewness kurtosis jarque-bera probability sum and sum sq deviation results. First of all table tell 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 Gdpg is 4.73, mean value of Inv that is independent variable is 17.75, mean value of Eduexp is 2.47, Frt mean is 4.99, Pop mean is 2.52 and the last variable Emp mean is 37.65. Second table tell the median of all variable. Median value of dependent variable Gdpg is 4.84, median of Inv is 17.96, median value of Eduexp is 2.55, median value of Frt is 4.89, median value of Pop is 2.42, and median value of Emp is37.70. Third the table show the maximum value of variables. The maximum value of Gdpg is 7.92, maximum value of Inv is 20.82, maximum value of Eduexp is 3.02, maximum value of Frt is 6.50, maximum value of Pop is 3.34, and maximum value of Emp 42.40. Next the table give minimum value of variables. The minimum value of Gdpg is 1.01, minimum value of Inv is 14.12, minimum value of Eduexp is 1.83, minimum value of Frt is 3.24, minimum value of Pop is 2.02, and minimum value of Emp is 1.83. Zero (0) value of Skewness is shows the normal distribution of variables. Less distance of largest value from median than the distance of smallest value to the median shows left skewed and vice versa. Gdp growth, Investment, Education expenditure is left skewed and value of Skewness is negative. The remaining variables Fertility rate, Population, Employment are right skewed and the value of Skewness is also positive. While in kurtosis if value is three (3), it shows variables are normally distributed. Table Results shows that all variables are not normally distributed. Jarque-Bera test is a goodness-of-fit test that shows the normality of the variables in the series. Result shows that all variables are not normal.

In this table, GDP Growth rate is dependent variable and it is on the first difference. In this study, independent variables are Population, fertility rate, education expenditure, investment, and Employment. In this table the gdpg, and education expenditure are stationary at level. On the other hand, population, investment, fertility rate, and employment are stationary at 1st difference. Augmented Dickey Fuller (ADF) test results shows that some of the variables are stationary on level and others are stationary at 1st difference. As we analyzed after implementing Augmented Dickey Fuller (ADF) test the order of integration of the variables are not same. So, in this case we applied Johansen Co-integration test. And through also check the result.

Augmented Dickey Fuller (ADF) Unit root

Variable	Level		First difference		Order of integration
	Intercept	Trend and intercept	Intercept	Trend and intercept	
	t-statistics	t-statistics	t-statistics	t-statistics	
GDPg	3.525040**	3.635318**	7.475822***	7.420809***	I(0)
POP	3.552306	3.933193	4.158657	4.739381***	I(1)
FRT	1.604225	-2.819110	-0.245379	-6.620318***	I(1)
EDUexp	-3.386500***	-3.317296*	-4.973528***	-5.169700***	I(0)
EMP	-1.928419	-2.369285	-3.097883**	-3.199815	I(1)
INV	1.441138	2.296396	5.783507***	5.725031***	I(1)

To estimate the long run coefficient and error correction model, first we have to test either long run relationship exists or not. For this motive Ordinary Least Square (OLS) method is used to find the value of Wald Statistic for the joint significance of the parameters of lagged variables like:

$$H_o : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$$

$$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$$

The null hypothesis shows that all parameters of lagged variables including in the above models are equal to zero which means that there is no long run relationship or cointegration. The alternative hypothesis shows that at least one of the para meter is not equal to zero which indicates the long run relationship or cointegration. This null hypothesis is tested against the alternative hypothesis through F-Statistic that is a non-standard distribution which only tells that what are the orders of integration the variables included in ARDL have. The calculated F is compared with the critical values developed by Pesaran et al. (1996). If F calculated is greater than upper bound critical value, we reject the null hypothesis means there is long run relationship or cointegration exists. If F calculated is less than lower bound critical value we accept the null hypothesis which implies that there is no long run relationship or cointegration. At the end of story if the value of F lies between upper and lower critical bound value, we can conclude nothing.

If the long run relationship exists, we can estimate long run and short run parameter by using following equations:

For long run parameters:

$$GDPG_t = a + \sum_{i=0}^{p_1} \eta_1 (\mathrm{POP})_{t-i} + \sum_{i=0}^{p_2} \eta_2 (\mathrm{FRT})_{t-i} + \sum_{i=0}^{p_3} \eta_3 (\mathrm{EDU}_{\exp})_{t-i} + \sum_{i=0}^{p_4} \eta_4 (\mathrm{EMP})_{t-i} + \sum_{i=0}^{p_5} \eta_5 (\mathrm{INV})_{t-i}$$

$$+ \varepsilon_t$$

For short run dynamics:

$$\Delta GDPG_t = a + \sum_{i=0}^{p_1} \lambda_1 \Delta(\mathrm{POP})_{t-i} + \sum_{i=0}^{p_2} \lambda_2 \Delta(\mathrm{FRT})_{t-i} + \sum_{i=0}^{p_3} \lambda_3 \Delta(\mathrm{EDU}_{\exp})_{t-i} + \sum_{i=0}^{p_4} \lambda_4 \Delta(\mathrm{EMP})_{t-i} + \sum_{i=0}^{p_5} \lambda_5 \Delta(\mathrm{INV})_{t-i}$$

$$+ \omega ECM_{t-1} + \varepsilon_t$$

In the above short run equations the parameters with summation signs show the short run parameters and the coefficient of ECM in above three equations ω represents the speed of adjustment to the long run equilibrium. This coefficient of ECM should be negative and significant for convergence to long run equilibrium. Value of F-statistic is 6.018363 which fall outside the critical value bounds at the 1 percent level of significance, which implies that we can reject the null hypothesis of no long run relationship among the variables.

Bound Test F-statistics value

Test Statistic	Value	K
F-statistic	27.88174	5
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The ARDL model for GDPG are given below which explain the relationship with population, fertility, employment, education expenditure and investment.

$$\Delta(\text{GDPG})_t = \alpha + \beta_1(\text{POP})_{t-1} + \beta_2(\text{MRT})_{t-1} + \beta_3(\text{EDU}_{\exp})_{t-1} + \beta_4(\text{UNEMP})_{t-1} + \beta_5(\text{INV})_{t-1}$$
$$+\sum_{i=1}^{p_1}\delta_1\Delta(\text{GDPG})_{t-i} + \sum_{i=0}^{p_2}\delta_2\Delta(\text{POP})_{t-i} + \sum_{i=0}^{p_3}\delta_3\Delta(\text{MRT})_{t-i} + \sum_{i=0}^{p_4}\delta_4\Delta(\text{EDU}_{\exp})_{t-i} + \sum_{i=0}^{p_5}\delta_5\Delta(\text{UNEMP})_{t-i}$$
$$+\sum_{i=0}^{p_6}\delta_6\Delta(\text{INV})_{t-i} + \varepsilon_t$$

In above models the parameter β_i are the long run multiplier and δ_i are the short run dynamic coefficients of ARDL models. ε_t Denotes the disturbances whereas $\square$ indicates the first difference.

Short Run Results

	Cointegrating Form			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GDPG(-1))	3.759107	0.52592	7.147679	0.019
D(GDPG(-2))	1.655328	0.250594	6.605619	0.0222
D(INV)	3.167505	0.714708	4.431885	0.0473
D(INV(-1))	-5.6204	1.599309	-3.51427	0.0723
D(INV(-2))	-4.03074	1.265055	-3.18622	0.086
D(EMPLOY)	3.701869	0.966544	3.830007	0.0619
D(EMPLOY(-1))	-1.04488	0.323614	-3.2288	0.084
D(EMPLOY(-2))	-1.56703	0.364051	-4.30443	0.05
D(FRT)	12.79085	7.138222	1.791882	0.215
D(FRT(-1))	1611.909	601.3287	2.68058	0.1155
D(FRT(-2))	91.8043	407.1495	0.225481	0.8425
D(FRT(-3))	-755.549	172.1983	-4.38767	0.0482
D(EDU)	11.0921	3.023833	3.668226	0.0669
D(EDU(-1))	-0.26469	0.682612	-0.38776	0.7356
D(POP)	-103.016	38.59592	-2.66909	0.1164
D(POP(-1))	-476.679	147.7405	-3.22646	0.0841
D(POP(-2))	749.6433	158.337	4.734478	0.0418
CointEq(-1)	-6.12375	0.645574	-9.48575	0.0109
R-Squared = 0.996361		**Durbin Watson test** = 3.445806		

In this table we check the impact of population on economic growth. In this study we used the population, economic growth, fertility rate, education, investment, employment as variables. We used economic growth as a dependent variable and other variables are as independent. Now we explain our independent variables are individually according to the results. According to hypothesis the population has a negative impact on economic growth. But after the analysis of population results show that the null hypotheses is rejected and alternative is accepted in the current years and it creates negative impact on growth. Resources are subdivided due to high population. Per capita income also decreases due to increase the population. Population significant at the level of 5% because t-stat value is greater than the 2 and probability value is equals the 0.05 level shows the significant results. After taking the lag value results changed that shows the positive impact on growth. In this case, null hypothesis is accepted and alternative hypothesis is rejected. According to hypothesis the investment had a positive impact on economic growth. But after the analysis of population results show that the null hypothesis is rejected and it creates positive impacts on growth. Investment is significant because t-stat value is greater than 2 and probability value high than the 1%. After taking the lag value of investment results changed that show the significant value of 10% level probability that is 0.08. According to hypothesis the fertility has positive impact on economic growth. But after the analysis results shows that the null hypothesis is

accepted and alternative is rejected. Fertility rate is insignificant at the level of 10% because t-stat value is not greater than the 2 and probability value is 0.21 that shows the insignificant results. After taking the lag value results changed that show negative impact on growth because fertility rate was increased and no planning was adopted to control the fertility rate. According to hypothesis education have positive impact on economic growth. But after the analysis results show that the null hypothesis is rejected and alternative is accepted because in these years much attention was given to education and improved the level of education. Education is significant because t-stat value is high than the 2 and probability value is 0.06. And after taking the lag value results changed that show negative impact on growth. According to hypothesis employment have positive impact on economic growth. But after the analysis result shows that the null hypothesis is rejected and alternative is accepted because employment creates negative impact on growth. Employment result is significant because t-stat value is high than the 2 and probability value is 0.06. And after taking the lag value results changed that show negative impact on economic growth. The results of economic growth model are reported in table which tells that our model executed good in terms of F-statistics. According to the model all the variables all the variables are together significant, the results of all variables tells that our model is highly significant. The value of R^2 showed about 99% variations are described by the explanatory variables in our model. Durbin Watson test is 3.44 which show that there is miner autocorrelation in the model.

ARDL Model Long-run Results

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
INV	3.002243	0.611887	4.906535	0.0391
EMPLOY	1.268197	0.206654	6.136819	0.0255
FRT	-28.9808	5.730018	-5.05772	0.0369
EDU	0.164943	0.514598	0.320528	0.779
POP	69.26741	12.67685	5.464087	0.0319
C	-136.951	23.19028	-5.90552	0.0275

Our estimation results show that investment have positive relationship with economic growth. It has a positive sign with its coefficient 3.002243. The reason behind this is that when investment increased production increased employment increased and economic growth increased. Next variable that we have used in our model is employment rate. Our estimation results show that employment rate has a positive impact on the economic growth. The positive relationship between these two variables is due to the reason behind that when there is efficient use of domestic resources and production increased and employment increased which increased economic growth. Our estimation results show that fertility rate have negative relationship with economic growth. Fertility means increase number of children less than 5 years which are not included in labor force. Reason behind that when there is low fertility rate there is less expenditures. Less expenditures on family means more saving and investment with the increase of investment production and economic growth increased. Next variable that we have used in our model is education expenditure. Our estimation results suggested that they have positive relationship with economic growth. The reason behind is that when there is more peoples are educated in the country they used efficient technology which reduced the expenditures on production increased employment and more educated people have new ideas to increased production so the economic growth increased. Next variable that we have used in our model is Population. Our estimation results show that Population have positive relationship with economic growth. Population involved all the people which are employed when employment increased, population increased. With the increase in population number of labor increased which increased production cause increase of economic growth.

VI. Conclusions

This part concludes the main findings of the study. The study checks the impacts of population on the economic growth in case of Pakistan. Population of Pakistan has reached at the alarming stage and increasing day by day. A population of 191.71 million people is a great problem for the country like Pakistan with low economic growth and less capital to labor ratio. Moreover, a common person of Pakistan does not know the effects of population on the economic growth of Pakistan due to some of cultural, religious and social reasons. In this study by using the economic growth, population, investment, fertility rate, employment. The GDP growth rate as dependent variable and other are independent variables. The study finds out all the independent variables do affect the dependent variable economic growth in the Pakistan situation. The study used the time series data that starts from 1981 and ends at the year of 2015. The sample size that used in this study is 35 years. By applying the different econometric techniques, the study concluded its results. First we applying the unit root test of (ADF) that results shows the mix order of integration I(0)

and I(1).The second test that apply is auto regressive distributed lag test that results show the relationship between the variables with their lag value, In which most of our hypothesis is accepted. The main Hypothesis is accepted that shows that the population creates negative impacts on the economic growth of Pakistan. Moreover, in current year's fertility create negative impacts. The investment shows a positive impact on economic growth and employment shows positive impacts on economic growth. Overall the results of the study are indorsing the hypothesis. Further the model results are good fit. Overall study concludes that the population has a great hindrance in way of economic growth of Pakistan. If not control than it can be very harmful for our economy. Mostly in developing countries the condition of population remains very critical in during the past years. Pakistan is one of the countries where the situation of population reached at alarming position in recent years. Moreover, the people of Pakistan are not educated they do not know the consequences of large family size and its cost. The government of Pakistan is also not taking effective policies to control the overpopulation problems. Positive and extremely major investment coefficient Implies that investment increase will significantly add to economic growth which in turn depends on high saving rate. Poverty can be taken care of if the economy prospers in achieve a highly observed economic growth of more than 6%. Plans to decrease population growth over the years do not look to have succeed. Therefore, population growth has developed into a serious issue that dejects economic development in Pakistan. If provide the technical and open minded education in education institutions and persuade small family size than we must manage the overpopulation in Pakistan. Need to take some actions and adopt some polices and plans to control the population. Provide the facilities of education because when people more educate than they it take steps to control the population like by adopting the family planning. Media also play our role to give the knowledge about this problem and also tells population impacts on the economy. Further government invest on the population provides the basic necessities and also give the jobs opportunities. So through they increase our standard of living and contribute on the growth of our country**.**

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