

## Study of Population Growth Impact on Economic Growth during (2003-2017) in Afghanistan

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### ABSTRACT

Achieving high economic growth is one of the significant purposes, which all countries seek to achieve, and achieving it requires a realistic analysis of country's economy and a better understanding of the principles and rules of economic growth. Meanwhile, demographic changes over time, as one of the most important issues impacting different parts of societies gaining special importance so that demographic changes can be tangible in investment, saving, and overly in economic growth. The relationship between population growth and economic development has been analyzed theoretically and empirically over time by different economists. Some economists believe which fast population growth prevents economic growth; while others believe, that population growth leads to economic growth due to increased demand, level of production and national income. The aim of this study was to investigate impact of population growth on economic growth during (2003-2017) in Afghanistan. In this study, it has been used the data which provided by World Development Index (WDI) Central statistics, books, journals, scientific and research journals and other related articles. For measuring the GDP growth and simple model squares estimation method from programs such as Excel, Eviews and Pass have been used indeed. Economic growth as a dependent variable, population growth, unemployment average, and foreign direct investment as an explanatory (independent) have been implemented.

The outcomes showcase that population growth has a positive effect on economic growth (1%) increase in population growth which causes economic development in order to increase 2.4%. On the other hand, according to obtained results from model summary; gained determination is 0.921. It means the dependent variable of economic growth is elaborated almost 92% by independent variables of population growth, unemployment, and foreign direct investment. This demonstrates strong population growth impact on economic growth and its correlation intensity is almost 1.

**Keywords-** Population, Economic Growth.

### I. INTRODUCTION

Achieving economic growth is one of the important goals of economics. In this regard, study of nature, causes and obstacles of development is truly significant. Impacts of population growth on economic

development have been paid special attention by many economists throughout the globe. Population changes have had far-reaching potential impact on many aspects of human's life, such as economic, social, market, educational and other structures. Finding the relationship between population and economic growth can display an important role in country basic planning. (4:8)

Today, population amount and related characteristics of that are the pillar and the infrastructure of any plan or policy. In fact, population is an important economic and social component in every economic and social component in every society, which affects the economic and social performance of community and also impacts economic plus social policies.

Population growth is recognized as one of the most effective and major factors in reducing per capita income and, consequently, reducing standard living and public welfare. Even though, unfavorable population growth under normal circumstances causes' poverty, as input growth and economic prosperity, provided that to take profit of the negative factors, in a measured desirable policy and can utilize from interior and outgoing concepts at all. Otherwise, unfavorable population growth will reduce welfare and increase public poverty. (38:4)

Our beloved country Afghanistan population is facing with population increase. In most regions in Afghanistan, due to unawareness and dominance of tribal traditions, there is no any specific program to control the population, however in many cases it is considered as an innovation and tradition and struggle for that. Early marriage, non-compliance of distances among births and having multiple spouses, provided the grounds for uncontrolled growth population. (2:110)

According to ministry of public health, if country's population goes in this way, Afghanistan's population double in the next 30 years. For responding the needs of this growing population, it is necessary to identify the factors and element, which impact on necessity points in order to accurate the measure relationship between population growth and other variables plan accordingly. On other hand, increase or decrease of population is considered desirable only when it is evaluated and approved in the framework of development plans, using which the path to goals can be determined. (2:7)

## **II. CONCEPT EXPLANATION**

Over last 150 years, economists were invested on population concept. Population concept has manifested itself in different ways of time and condition. Accordingly, it may be possible to increase number of males to re-build the wartime, likewise, it may cause in terms of fear, which increase of population be more than food. (5:145)

According to figures from the US information and statistics have released in June 2010, the world's population growth will increase from 6 billion in 1999 to 9 billion in 2042, and it illustrates a 50% of increase over 45 years. And it has a considerable impact on various aspects of life such as, market, environment, education, employment and ultimately economic growth. For instance, its reduction in many developed countries which were facing with lack of labor and other parts have had a very special impact. (1-13)

Furthermore, the importance between population growth and economic growth has been emphasized by many development economists. Of course, there is still no agreement on whether population growth has a positive effect on economy or is harassment to economic growth. They are ambiguous. In developing countries, the relationship between population and economic performance can be assumed to be positive. Considering that, economic development increases level of competition in business activities, market potential, market promotion, encourages entrepreneurship and commencing new business. (6:8)

The relationship between population growth and a country's economy operation may be negative. That is why population growth can be seen as an obstacle to country's economy development, and this is because population growth increases independence (increasing number of population that is not considering economically productive). Like elders and children. Therefore, relationship between birth, population and economic growth has led to many studies and researches so far.

Achieving a high and sustainable economic growth rate requires an answer to question on which, factors determine the economic growth rate or how the economic growth is affected various factors and policies? What is the impact of various factors such as, human being, business policy institutions, religions, regions, population, democracy and natural sources abundance on economic growth?

The classics have sought to answer these questions. Adam Smith sought nature and causes of the wealth of nations. Other classical economists have offered useful theories, however a new study of subject began in 1950s with Solo and Swan in neoclassical growth theory framework. Emphasizing the importance of technical progress as a major part of economic growth since mid-1980s. It has become one of the most dynamic branches of economics. Lucas and Romer, with their

emphasis on economics ideas and human capital, turned their attention back to growth within endogenous framework theory. Using new advances in theory of imperfect competition, Romer introduced macroeconomics into economic technology. On the other hand, some economists have completed the neoclassical growth theory in 1990s to begin a new round of development theories and test growth of experimental theories. In 1990s empirical studies of interstate growth following these theoretical advances, the dissemination of interstate data for the empirical evaluation and testing of growth theories began. Since then, both theoretical and experimental fields have been considered simultaneously, and economists have examined economic growth from different perspectives. (5:15)

## **III. RESEARCH OBJECTIVE**

Measuring quantify impact of population growth on economic growth in Afghanistan. Unprecedented population growth is a most bottleneck issue in developing countries social economic. Figures in 1994 showcase which population growth in these countries will increase in its average point during 36 upcoming years. While in developed countries it takes 264 years to reach at that point. Such population growth in developing countries causes' reduction of investment, national saving, besides reduce necessary investments on infrastructure of these countries.

Economic growth could be a threat in Afghanistan. Population demand for public goods and services, widespread unemployment, educational and health needs, overuse of soil due to more use, ecosystem and environment, lack of appropriate grounds for cultivation, migration and urbanization growth, unbeneficial and unhealthy labor, lacking in individual skills, being unfamiliar with lifestyle and other challenges would be numerous obstacle for country. On the other hand, due to not having obvious vision from social circumstances, economic, psychological factor and economics problems, barrier in raising, social being structure like technical problems are considered as population growth problem. Therefore, considering implementations to prevent population growth or controlling that regarding to accurate comprehension and logical analysis of how the population grows and emphasized on how manage have been considered.

## **IV. RESEARCH QUESTION**

What effect does population growth have on a country's economic growth?

## **V. RESEARCH HYPOTHESIS**

Research main hypothesis: population growth has a negative impact on Afghanistan's economic growth.

**Zero hypothesis 1:** Population growth does not have a significant impact on Afghanistan's economic growth.

**Zero hypothesis 2:** Population growth has a positive impact on economic growth in Afghanistan.

**Zero hypothesis 3:** There is no long-term relationship between population growth and Afghanistan's economic growth.

## VI. RESEARCH BACKGROUND

The following research has been done on the impact of population growth on economic growth; In 1994 Drewick and Brender used the inter-country data panel to examine the effects of population growth, births, and economic growth across countries. Using data from 107 countries between 1960 and 1985, they calculated that birth rates in which economic growth and investment have been reduced. However, low birth rates have a strong positive effect on per capita income growth via labor supply. (8: 102)

Ellen Kelly in 1995 examined the correlation between total population and economic growth. In this study, physical capital, labor, human capital, natural sources and technology as variable and independent concept of GDP have been considered. Consequences have shown in 1960 there was a negative relationship between population and economic growth among 89 countries there were six million population growth. (8: 102)

Darat and Elyosef examined the long-run relationship between population and economic growth in 20 developing countries between 1994 and 1950. They used the Granger causality method in order to investigate the long-term relationship. This study outcomes show that the more countries are in the early development stages the population increase leads per capita income into poverty, while in sophisticated steps it causes in increasing of per capita income plus economic welfare. (8:102)

Kigrow, Powell, Alandi have studied the effects of population change on Kenya's economic growth. This study results show a long-term relationship between population and economic growth in Kenya, as well as show a strong and a positive relationship between them at all. (16: 58)

Stephen Klassen, David Lawsen have studied impact of population growth on economic growth and poverty reduction in Uganda in 2007.

Dr. Arab Mazar & Keshvari Shad, studied structure changes on population at economic growth on their research in 2005. This study has done for Iran during (1959-2002). This research model estimation is in ARDL method. Outcomes show a percent of increase rather than 15-64 aged years' population to the total population causes a (1.27) in economic growth. Also, if the employed labor to the total population aged 15-64 increases by one percent, per capita GDP will increase by 1.89 percent. (8: 104)

Bilal, Sawas in 2008 wrote an article entitled the relationship between population and economic growth with Empirical Evidence from Central Asian Economies. The data of this study were examined during 1989-2007 in Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan. Granger causality results show that there is a two-way causality from population to real per capita income, while in the long run for all countries. In addition, it isn't existed in short-term in Turkmenistan and Uzbekistan. Sawas generally concluded that there is a strong correlation between variables. (4: 8)

Maestas, Nicole, Mullen Kathleen, and others, have conducted these studies on the impact of elderly population on economic growth and labor productivity. Gained Consequences showcase, ten percent increase in population growth of over 60 years will decrease 5.5% per capita income of GDP. (15: 10)

Lu, Lipping have conducted population and economic growth in Indonesia using a simple model method of least squares. In this study population has shown a positive relationship with Indonesia economic growth. In which 1% investment growth causes to promote GDP in 0.565 percent. Additionally, a one percent increase in the labor force will increase GDP by 2,578. (14: 8)

Chang, Tsangyu conducted research on the relationship between population growth and economic growth through data panel and Granger causality method during 1870-2013. The outcomes show that there was a causal relationship between economic growth and population growth in 21 century. Regarding to Granger method, there is a one-way relationship between economic growth and population growth right in Finland, France, Portugal and Sweden, while there is no causal relationship in Canada, Germany, Norway, Japan and Switzerland. (11: 15)

## VII. RESEARCH METHODOLOGY

As research can be based on field research and library research methods. The analysis of this research is based linear model squares. Its theoretical foundations are based on library methods such as books, journals, related journals and scientific researches all approaches help to make strong the library method. In this study data which have been provided by World Development Index (WDI), the World Bank, the Central Statistics, the International Monetary fund and World Bank are used to measure economic growth from GDP index.

$$\text{rGDP} = F(\text{POP}) \text{----- 1}$$
$$\text{rGDPt} = \beta_0 + \beta_1 * \text{POPt} + \beta_2 * \text{Unemployment} + \beta_3 * \text{FDI} + \mu_1$$

----- 2

Where, rGDP = Real Gross Domestic Product, POP = population,  $\beta_1$  = Slope Coefficient,  $\mu_1$  = Stochastic error term  $\beta_0$  = intercept,  $\beta_2$  = Unemployment,  $\beta_3$  = Foreign Direct Investment

## VIII. ANALYSIS OF RESEARCH FINDINGS

World Development Index (WDI), which is worldwide guaranteed. Which truly used by researchers and scientists as a reliable source.

There is a variety of information about data on population growth and economic growth. Here is data of

**Table1: Table of population growth, economic growth, unemployment rate and Foreign direct investments during 2002-2017 in Afghanistan**

Year	Population growth in percentage	GDP Growth in percentage	Labor Unemployment rate based on percentage	Foreign direct investments to GDP
2003	4.818	8.444	8.90	1.261
2004	4.469	1.055	10.00	3.536
2005	3.870	11.175	8.50	4.319
2006	3.229	5.554	9.10	3.372
2007	2.755	13.740	7.80	1.917
2008	2.513	3.611	8.80	0.452
2009	2.569	21.021	6.70	1.582
2010	2.813	8.433	7.80	0.340
2011	3.095	6.114	8.20	0.321
2012	3.273	14.435	7.90	0.230
2013	3.315	3.901	8.50	0.188
2014	3.183	2.691	8.70	0.217
2015	2.943	1.310	8.90	0.828
2016	2.689	2.367	8.80	0.508
2017	2.600	2.596	8.80	0.561

Source: World Development Indicator (WDI)

### 8.1 Data Normality Tests

For data normality, Kolmogorov-Smirnov test and Shapiro-Wilk test are used, both of which are used effectively in distribution of data normality. According

to Shapiro-Wilk test, if  $(p < 0.001)$  indicates outrage of normality and if its significance become 0.001 it shows a closeness and normality.

**Table 2: Normality Chart of Population Distribution Test and Economic Growth**

	Kolmogorov-Simonov(a)			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Population	.239	15	0.021	0.847	15	0.016
Economic growth	0.176	15	0.200	0.883	15	0.053
Unemployment	0.170	15	0.200	0.930	15	0.273
FDI	0.240	15	0.020	0.788	15	0.003

Source: Research Findings

Considering obtained data from data analysis related to population growth and economic growth, significant level of population growth can be clearly seen by Shapiro-Wilk method which is  $p > 0.001$ . (Related figures of 0.016 show normality of distribution). Additionally, analysis results also indicate significance of GDP growth in normality pattern. As

well as, the GDP growth of 0.001 show 0.053 point equal and normal distribution on it.

### 8. 2 Alignment Test Relationship of Variables.

For understanding the interaction of independent variables, function of that, the independence of that should be evaluated. Here it has been used tolerance parameter method, due to independence effects

of independent variables. Tolerance parameter value is from 0 to 1, and the lower values of the tolerance parameter indicate which there stronger relationships among them all are. If the tolerance parameter size be

from 0 to 40, there would be some concern, and if it's from 0 to 10 it causes problem. The more tolerance parameter size be closer to 1 it indicates less alignment parts in it.

**Table 3: Tolerance parameters**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	VIF
		B	Std. Error	Beta			Tolerance	
1	(Constant)	67.980	5.673		11.98	.000		
	Population	2.409	0.897	0.286	2.685	.021	<b>.630</b>	1.586
	<b>Unemployment</b>	-8.287	0.754	-1.075	-10.98	.000	<b>.745</b>	1.342
	FDI	1.351	0.405	.320	3.335	.007	<b>.774</b>	1.293

Source: Research Findings

**Results:** According to provided chart, tolerance parameter results column show the alignment degree of independent variables. Regarding to gained results, the tolerance parameter among the three independent variables is greater than 0.40 and minimum tolerance parameter is equal to 0.630. Achieved outcomes showcase that the degree of alignment between the independent variables is not a concern. This means that about 63% of the variance of population growth variable is not elaborated by other independent variables at all.

### 8.3 Data Description Analysis

#### 8.3.1 Center Tendency Indexes

One way to summarize the figures is to use center-oriented indicators. Center-to-center index means any numerical criterion of a data set; to center indexes represent the concentration of data in a variable distribution. Average and mode are important indicators of tendency towards the center.

**Table 4: Center Tendency Indexes**

		Unemp	Growth	Population	FDI
N	Valid	15	15	15	15
Mean		8.4933	7.0965	3.2089	1.3087
Median		8.7000	5.5540	3.0950	0.5600
Mode		8.80	1.06	2.51	0.19

A Multiple modes exist, the smallest value is shown Source: Research Findings

**Results:** Obtained output by SPSS program has differentiated the mean, median for two variables of population growth in the above, in Afghanistan the average population growth over 15 years has been 3.2 percent, while the GDP growth during this period was 7.09 percent. The median of population figures for this period is 3.09 percent, indicating that Afghanistan has experienced a population growth of more than 3.09 percent for seven years likewise, experienced 3.09 percent less growth in the same years. Based on this, GDP growth in Afghanistan during seven years was 5.55 percent likewise, in seven last years it was less than 5.55

percent. The Population highest growth rate during these fifteen repeated years was 2.51 percent and GDP growth has been experienced 1.06 percent.

#### 8.3.2 Dispersion indexes

Dispersion indexes portray the degree of dispersion changes around the variables. When we summarize the data into a single size in the center orientation indicators, part of details and information will naturally be omitted. Therefore, we should be looking forward to indicating in order to measure items in a variable to know scattered data which are changed around.

**Table 5: Dispersion Indexes**

		Growth	Population	UnEmp	FDI
N	Valid	15	15	15	15
Std. Deviation		5.79308	.68722	.75163	1.37368

Variance	33.560	.472	.565	1.887
Range	19.97	2.31	3.30	4.13
Minimum	1.06	2.51	6.70	.19
Maximum	21.02	4.82	10.00	4.32

**Source: Research Findings**

**Results:** the output shows that the standard deviation of the population growth rate during these fifteen years is about 0.68%, the GDP growth rate of 5.79% the standard deviation of unemployment is 0.75% and standard deviation of foreign direct investment is 1.37%. This indicates that deviation rate, in which the distribution scores have their average. Likewise, population growth deviates from its average annual growth is by 0.68 percent and the GDP growth average rate is about 5.79 percent. Unemployment average on every year is 0.75 and foreign direct investment annual average rate is 1.37 percent. The more standard deviation is great, the more average numbers would be greater. The variance of these four variables is 33.56%, 0.42%, 0.56% and 1.88% respectively. Changes or suffering amplitude show

disputes, in which the biggest and smallest data are clear, as well as it demonstrates that the data on population growth rate is 2.35% and the amplitude of changes in GDP figures is approximately 20, the unemployment rate is 3.3 and the foreign direct investment changes are 4.13. Afghanistan experience in highest rate of population growth during fifteen years is 4.82 and lowest rate is 2.51 and the highest rate of GDP is 21 percent and lowest rate of population growth 1.06 that Afghanistan experienced during these years. Likewise, the highest unemployment rate over fifteen years is 10% and lowest rate of that is 6.7 percent. Moreover, the highest rate of foreign direct investment during these fifteen years is 4.32% and the lowest rate is 0.19%.

**Table 6: Inferential figures analysis based on population growth in Afghanistan (Model Summary)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.960(a)	.921	.900	1.83146

A predictors: (Constant), FDI, Unemployment, population Source: Research Findings

The above table shows the value of multiple dependence coefficients (R) and its determination R<sup>2</sup>. The multiple dependence coefficient value is equal to 0.960 and shows a stronger dependence between the actual values and the dependent variables. Determined coefficient for this is 0.921 and the dependent variable of economic growth is almost 92% elaborated by

independent variables. This portrays the strong impact of population growth on economic growth and its correlation is 1.

Adjusted R square is 0.90%, which means that the predictive variables of the model have been available to predict 90% of variance share resulting economic growth variable.

**Table 7: ANOVA**

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	432.940	3	144.313	43.024	.000(a)
	Residual	36.897	11	3.354		
	Total	469.836	14			

A predictors: (Constant), FDI, Unemployment, population. Source: Research Findings

B dependent variable: growth

**Results:** The following chart presents the result of analysis of variance, in which significance of the entire model will be evaluated. Since the significant level is less than 0.05, it's considered meaningful. The significance analysis of variance test (f quantity) illustrates that the predictor variables have been able to

predicate dependent variable changes. According to achieved meanings, it can be said that the level of two gained variables of economic growth and population (0.000) is smaller than 0.05, so independent population growth changes truly effect economic growth and can observe economic changes, too.

**Table 8: Regression coefficient**

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std. Error	Beta		
1	(constant)	67.980	5.673		11.983	.000
	Population	2.409	.897	.286	2.685	.021
	Unemployment	-8.287	.754	-1.075	-10.984	.000
	FDI	1.351	.405	.320	3.335	.007

A dependent variable: growth Source: Research Findings

**Results:** The purpose of OLS model is to estimate the coefficient of OLS model (beta) which is called an equation at all. This equation acts out as a regression model, providing a predictive relationship between two variables. Using OLS model equation, we can predict the impact of each independent variable on the dependent one. This equation allows us to predict the dependent variable by understanding the digits of the independent ones.

$$\beta_0 = 67.980$$

$$\beta_1 = 2.409$$

$$\beta_2 = -8.287$$

$$\beta_3 = 1.351$$

$$rGDP = \beta_0 + \beta_1 * pop + \beta_2 * Unemployment + \beta_3 * FDI$$

$$rGDP = 67.980 + 2.409 * pop - 8.287 * Unemployment + 1.351 * FDI$$

## IX. RESEARCH OUTCOMES

This research was to study population growth impact on economic growth during (2003-2017).

In this research for investigating population growth impact on economic growth a simple model and the squares method have been used, and for better and accurate analyzing of how the population growth impact on economic growth from other variables such as, unemployment rate and foreign direct investment along with population growth have been used. The figures and information used in this issue have obtained from reputable domestic, foreign sources and organizations such as, Central Statistics, Da Afghanistan Bank, International Monetary Fund, World Bank Development Indicators and so on. Due to existence of war, insecurity and differences in figures, firstly these figures have been examined in terms of accuracy, validity and content value. Later, the gathered data and information through various statistical methods such as, central orientation indexes, normality testing of variables distribution correlation between the studied ones, have been analyzed. And consequently, it's clear from season five findings.

In an average Afghanistan's population growth rate over fifteen years was 3.2 percent, and during this period it was 7.09 percent. Over the last 15 years, the highest population growth rate is 4.81 percent and the lowest rate is 2.51 percent, in like manner Afghanistan

has experienced the highest GDP growth of 21 percent and the lowest one is 1.06 percent. In addition, the highest unemployment rate during 15 years is 10 percent, and its lowest one is 6.7%. And the highest amount of foreign direct investment during these fifteen years is 4.32% and lowest point is 0.19 have considered.

The p value of population achieved 0.021% p value is less than 0.05, Illustrates population variable importance and the t-test of that is 2.685 larger than two theoretical values and shows it meaning. According to obtained model summary results, the gained coefficient is 0.921, it means that the dependent variable of economic growth is pointed out approximately 92 percent by the independent variables of population growth, unemployment rate, and foreign direct investment. This shows a strong impact of population growth on economic growth, and its correlation intensity is 1.

- When population growth is at zero, the birth and death rate is equal together in the country, then GDP increases by 67.980 units. There is a positive and direct correlation between population and economic growth. That is, the explanatory impact of population growth on economic growth is positive. Any increase in population growth will increase economic growth. This indicates, which with a 1% increase in population we can achieve 2.4% economic growth.
- The results impacted by unemployment and economic growth show a negative and indirect relationship. Moreover, there is a negative relationship between them. 8.28% increase in economic growth will reduce unemployment by 1 unit.
- There is a positive relationship between foreign direct investment and economic growth, if foreign direct investment increase the economic growth also increases by its own. On the other words, whenever the foreign direct investment amount increases by 1 unit, it causes economic growth to increase by 1.35 percent.

## X. CONCLUSION

Considering population growth rate importance in policies and macroeconomics formulations, social and political policies and planning, decision-making in correlation and gaining proper understanding of it is

necessary in country's futurity. The relationship between population growth and economic growth has long been analyzed theoretically and empirically by different economists. As well as there have been statements about whether population growth is causing or hindering economic growth. It is not definite that there is a negative relationship between population growth and economic growth in developing countries. Even though, its relationship depends on the circumstances and capacities of those countries that how much population they need in-deed.

Today, the reasons for the lack of economic growth and development in developing countries are not only due to population growth, but its due to of unpopular, back warded government, foreign interferences and crisis-making which take place in these countries that cause to have such things. However, what is important is accurate management of that in economic direction activities, and its preparation in terms of quantity, quality, and consumption of its population structure. Furthermore, the low population growth does not point out the potential. And its reduction has not paved the ground for economic growth, more than that it is a prerequisite for particular organization and training. If we do not apply to how it grows, it can have some negative impacts on the economy, society, and government policies, also it prevents us achieving economic growths and leads country in a wrong direction. In current situation its incorrect analysis can lead us into some mismanagement ideas that the existed population is surplus at all. Though, along with efficient and measured management and comprehensive understanding of its negative impacts, it can be turned into positive and ideal impacts.

The current research outcomes indicates that there is a positive relationship between population growth and economic growth in Afghanistan and portrays the increasing effects of population growth on economic growth. According, whenever the population rate increases by 1%, economic growth increases by 2.4%. These results prove the rejection of the research hypothesis (H1) with 95 percent correctness and level of confirmation of research hypothesis (Ho). Furthermore, using the Granger causality test, there was a causal relationship between economic growth and population growth which was determined.

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