

# The Dynamic Relation between Population and Economic Development; a Systematic Analysis Review Considering Developing Countries' Empirical Evidence

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## Abstract

**Background:** The debate on the relation between population growth and economic development has increased during the last decades and it has been going on in both of developing, developed and transition economies. Many studies show positive relationships between the two variables but others show negative relationship between them. Some recent researches proved that there is no casual relation between population growth rate and economic growth rate either in the short run or in the long run as that relation depends on other factors in an economy such as other resources of nations, region, quality of education and training to population, and technological changes. These different points of view will be summarized and analysed in the current study.

**Objective:** The main objective of the study is to explore the inter-relationship between population growth and economic growth/development by conducting an exhaustive review of the literature in that topic with more focus on countries' evidences which support each of the different views. So, the main question of this study is: How does population growth affect economic growth and what are the main factors determine the relation between the two variables.

**Methodology:** To answer the question of the study, a broad-spectrum literature search was conducted from different resources. Many selected articles have been finalized as they are more related with the research question. Deductive approach was employed to analyse conceptual approaches used for understanding the relation between the research variables, summarizing the methods used in the selected studies and discussing the findings and evidence.

**Conclusion:** It has been concluded that population growth is an important factor affecting economic growth, and hence economic development but the strength and the trend of that relation varies between countries depending on many factors and can be well-oriented using adequate policies. So, many policy recommendation were developed as this systematic review is supposed to be helpful for policy makers, specifically in developing countries, to design appropriate population policies in consistence to economic development targets.

**Keywords:** Population Growth, Economic Development, Economic Growth, Gross Domestic Product (GDP).

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## I. Introduction

The relationship between population growth and economic development has been studied extensively. Many analysts believe that economic growth in high-income countries is likely to be relatively slow in coming years in part because population growth in these countries is predicted to slow considerably (Baker, Delong & Krugman, 2005). Others argue that population growth has been and will continue to be problematic as more people inevitably use more of the finite resources available on earth, thereby reducing long-term potential growth (Linden, 2017).

Population growth affects many phenomena such as the age structure of a country's population, international migration, economic inequality, and the size of a country's work force. These factors both affect and are affected by overall economic growth (E. Wesley F. Peterson, 2017).

There is an extensive literature on these relationships but little consensus on the actual effects of population on economic growth (Heady & Hodge, 2009). Some authors offer theoretical arguments and empirical evidence to show that high population growth enhances economic growth while others find evidence to support the opposite conclusion. Still others find that the effects vary with the level of a country's development, the source or nature of the population growth, or other factors that lead to non-identical impacts. Heady and Hodge (2009) point to wide variation in empirical analyses of the link between population growth and growth in per capita income due to different methods, control variables, and other factors.

We can also consider the effect of economic development on population growth. In a country, that has not yet attained satisfactory economic development, the birth and death rates will be rather high. The birth rates will be steep due to a number of factors such as the early marriage of women, more home centred role with fewer working women due to social beliefs and customs, and the expectation that the children will generate an income for their families someday. At the same time, the death rate will also be high due to the consumption of less nutritious food, poor sanitary conditions and non-availability of advanced medical facilities. Nevertheless, when a country enters an era of sound economic development, more food will be consumed by the people and advanced medical care will improve the life expectancy of the people. Due to the medical advances, sufficient supply of food items, and better sanitation brought forth by economic development there will be a sharp drop in the death rate. As a result of all the comforts made accessible by the economy, the birth rate will continue to remain at a high level. The combined effect of all this will be that the growth of population will speed up and there will be a less manageable situation caused by the sharp rise in the number of people. (H.R. Anulawathie Menike, 2018).

### **Conceptual Framework**

Empirical work on the effects of population growth on economic growth in particular countries has generated contradictory results. Sethy and Sahoo (2015) and Tumwebaze and Ijjo (2015) found that population growth has a positive impact on per capita economic growth in India and the Eastern and Southern Africa region. In contrast, Yao, Kinugasa, and Hamori (2013) and Banerjee (2012) concluded that there is a negative relationship between population and per capita GDP growth in China and Australia. Huang and Xie (2013) found that current population growth has a negative effect on economic growth while lagged population growth has a positive effect so that there is no long-term relationship between these variables. Such contradictory findings have led several analysts to consider the possibility that the impact of population growth on per capita output growth may not be uniform but, rather, varies with particular circumstances. For example, Becker et al. (1999) suggest that population growth in low-income, agricultural societies slows growth in per capita income due to diminishing returns to the growing labor force making more intensive use of a fixed resource base. On contrast, a growing population in high-income, urban economies may give rise to greater income growth because of increasing returns from greater specialization and growth in investments in human capital. Bucci (2015), points to positive effects of population growth on productivity due to greater specialization but suggests that larger populations give rise to more complex production processes that offset these effects.

Kelley and Schmidt (2001) and Mierau and Turnovsky (2014) argued that population growth stemming from declining mortality rates stimulates economic growth while population growth resulting from fertility increases will tend to slow it. The reason for these contrasting effects is that declines in mortality provide incentives for people to save more which stimulates growth while increases in fertility have a negative impact on aggregate savings (Mierau & Turnovsky, 2014). In a meta-analysis of studies of economic growth and population growth, Heady and Hodge (2009) found that declining population growth rates in high-income countries slow economic growth while high population growth rates in low-income countries lower their economic growth.

Many authors emphasize the importance of age structure for economic development. High population growth rates mean that the average age of a population will be young and there will be high dependency rates. Forty-three percent of the population in Sub-Saharan Africa, where population is growing 2.7% per year, is under the age of 15 while only 3% is over 65. In Japan, where population growth is negative, 13% of the population is under age 15 with 26% over 65 (World Bank, 2017). As dependents, the large number of children in Sub-Saharan Africa will slow growth but once they enter the labor force, these countries can expect to reap a "demographic dividend" that will enhance economic growth. This dividend could be diminished if countries in Sub-Saharan Africa do not complete the demographic transition to lower population growth rates in coming years.

There appears to be some agreement in the literature that population growth and growth in per capita output are dependent and the most likely nature of the relationship between them seems to be that it depends very much on the particular circumstances, notably the age structure of the population, in the various countries and regions. The aging population in countries like Japan means that a relatively smaller cohort of working age people will be called upon to support growing numbers of retirees slowing economic growth unless there is a substantial rise in productivity and per capita output. A different type of dependency problem exists in many African countries where relatively small working-age populations are required to support the very large number of children who have important educational and health needs. In the future, these children will enter the labor force and economic growth should increase. Paths of population growth do not tend to include large and dramatic turning points so it is unlikely that the population trends in various parts of the world can be significantly altered in the short run by policy changes. As a result, the effect of population growth on per capita economic growth will probably remain highly country specific although population policies may have some longer-term effects on population growth and age structure (H.R. Anulawathie Menike, 2018).

The population in one way constitutes a source of labor that could be utilized to boost the country's production. On the other hand, it could also be seen as a consumer group that uses and exhausts a large quantity of the country's resources. For example, Japan can be cited as a country with a high population but it managed to achieve a high living standard by developing the economy. Nevertheless, when we consider some countries like India, it is clear that the growing population is a big problem that affects the economic development of that country. In this case, the steadily growing population seems to be a hindrance to the country's economic development (E. Wesley F. Peterson, 2017).

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## **II. Methodology**

Abroad- spectrum literature research has been carried out from different libraries and scholarly platforms. Specifically, Medline, ERIC, PubMed, Wiley Online Library, ScienceDirect, Taylor and Francis Online, Sage Publishing, Emerald and Google Scholar have been explored to retrieve quality studies, which have discussed the relation between population growth and economic development. Many related studies have been read fully together in-depth analysis before selecting the articles that are more significant to be used for the systematic review analysis. The aim was to provide a complete, exhaustive summary of current literature relevant to the research question: How do population growth rates affect economic growth rates and what are the main factors determine the relation between the two variables.

The study reviews contemporary researches that were peer-reviewed and published in academic journals, conference papers, books, book chapters, and working papers, between 2008 and 2019. After analyzing and combining the collected data from the mentioned data sources, findings and evidence will be discussed to summarize the impact of population growth on economic development and the reverse impact of economic growth on population growth. Finally, the qualitative systematic review will provide many important recommendations that help policy makers, specifically in developing countries, to employ the accumulated evidence from selected researches to improve the appropriate strategies to maximize the positive impacts and minimize the negative impacts of high population growth rate on economic development targets.

## **III. Results & Discussion**

A study by Bilal Savas (2008), *The Relationship Between Population and Economic Growth; Empirical Evidence from the Central Asian Economies*, investigated the causal relationship between population and per capita economic growth in the Central Asian Economies (CAEs). Using the ARDL approach to co-integration, the research proved a long-run relationship between population and real per capita income and provided strong support for the hypothesis that population is driving growth. The relationship between population and economic growth is strong and positive in the CAEs over the period of the analysis and it was concluded that the decline of the rate of growth of population is more connected to the political and economic turmoil, which followed the dismantling of the Soviet system. The results of causality tests used in the research suggested a bi-directional causality when causality is assumed to run from population to real GNI per capita or vice versa in the long term for all countries, while there are no feedback effects from real income to population in the short run only for Turkmenistan and Uzbekistan. The feedback effect does not come from population to real income in the short run only for Turkmenistan. The various pieces of legislation introduced to control the relatively high growth rate of population in the selected countries showed that population still tends to respond to factors outside the direct control of the authorities.

Another study by Akinwande A. Atanda et al. (2012), *The role of population on economic growth and development: evidence from developing countries*, examined the comparative trend review of population growth determinants between developing countries (Bangladesh, Ethiopia, Indonesia, Mexico and Nigeria) and developed nations (Germany and United States). The trend analysis revealed that fertility rate, crude death rate, birth rate, mortality rate, and life expectancy are the major determinants of rapid population growth rate, while youth dependency ratio of young people below age 15 has also been attributed as one of the leading causes of population growth and growth threat in developing countries. The analysis further indicated that excluding Mexico from the Upper Middle Income group, developed economies (United State and Germany) with

large population size have a higher real economic well-being as measured by the real GNI per capita, compared with selected developing economies in the world.

Selected developing economies for the comparative analysis of the considered study were Nigeria and Ethiopia in Sub-Saharan Africa, Bangladesh in South Asia, Indonesia in East Asia and Pacific, Mexico in Latin America and Caribbean. It was indicated that despite the rapid population growth of the economic active group in developing countries, there is still less that engages in productive activities because of high unemployment level, low industrial investment and low human capital investments. Likewise, majority of the developing countries have less proportion of old age (65 and above) population group compared to developed nations (Germany and United States) that recorded over 12% of its population within the old age bracket in the last three decades. Also, It was shown that in the last three decades Bangladesh, Ethiopia, Indonesia, Mexico, and Nigeria respectively have 3.9%, 3.0%, 4.3%, 4.9%, and 3.2% of its total population within the old age group in relative to United States and Germany as developed and higher income economies that recorded 12.3% and 16.4% respectively over the last three decades. Finally, the study proffered the need for population control framework and provision of essential infrastructures for the rapid growing population size in developing countries in order to enhance their welfare.

Tsangyao Chang & Others (2014), have developed a statistical analysis in their study, *The Relationship between Population Growth and Economic Growth Over 1870-2013: Evidence from a Bootstrapped Panel-Granger Causality Test*. The study applied the Bootstrap Panel Causality Test proposed by Kónya (2006), which accounts for both dependency and heterogeneity across countries, to test the causal link between population growth and economic growth in 21 countries over the period of 1870-2013. Concerning the direction of population growth-economic growth nexus, it was found that one-way Granger causality running from population growth to economic growth for Finland, France, Portugal, and Sweden. One-way Granger causality running from economic growth to population growth for Canada, Germany, Japan, Norway and Switzerland, and no causal relationship between population growth and economic growth is found in Belgium, Brazil, Denmark, Netherlands, New Zealand, Spain, Sri Lanka, the UK, the USA and Uruguay. In addition, there was feedback between population growth and economic growth for Austria and Italy. Dividing the sample into two subsamples due to a structural break yielded different results in that for the first period of 1871-1951. The study proved that population growth caused economic growth only for Finland and France. Economic growth caused population growth for Denmark, Japan, and Norway and that there is bidirectional causality between population growth and economic growth for both Austria and Italy. For the period of 1952-2013, it was concluded that population growth caused economic growth only for Sri Lanka, economic growth caused population growth for Belgium, Denmark, France, Germany, New Zealand, Spain, Switzerland, and Uruguay and that found bidirectional causality between population growth and economic growth only for Japan. The empirical results of the study have important policy implications for the directions of causality tend to differ across countries and depending on the period under question.

In a study titled, *"Econometric Model on Population Growth and Economic Development in India: An Empirical Analysis"*, Musa Abba Mahmud (2015) developed an econometric model taking India as a case study using time series data from 1980 to 2013. The study aimed at providing additional evidence to the debate about the relation between the two variables, by employing Johansen Co-integration Test and Vector Error Correction Model to find out whether the relationship between population growth and economic growth is positive, negative or neutral, and whether the relationship is short run or long run relationship. The study further used Granger Causality Test to find out the direction of causality between the variables. During these periods, the study found that the relationship between population growth and economic growth is positive and there exist a unidirectional relation, running from economic growth to population growth. The policy implications of the outcome suggest among other things that, government should take population as virtue by investing more resources in human capital development through quality education, infrastructures as well as encouraging small and medium scale industries to achieve the long run economic growth.

A study by E. Wesley F. Peterson (2017), *The Role of Population in Economic Growth*, has been drawn on historical data to chart the links between population growth, growth in per capita output, and overall economic growth over the past 200 years. The study proved that low population growth in high-income countries is likely to create social and economic problems while high population growth in low-income countries may slow their development. The study showed also that international migration could help to adjust these imbalances. Drawing on economic analyses of inequality, the study indicated that lower population growth and limited migration might contribute to increased national and global economic inequality. Depending on a statistical analysis for the world as a whole, over the period 1990 to 2015, the correlation between population growth and real per capita GDP growth, based on World Bank (2017) data, was -0.1849 suggesting that these two variables were uncorrelated during that period. However, simple correlation tells us very little about the actual relationship between these variables.

Therefore, theoretical arguments have been developed to support both the idea that population growth slows growth in per capita output and the opposite idea that population growth stimulates greater

economic growth. According to the empirical evidences of the study, population growth has a positive impact on per capita economic growth in India and the Eastern and Southern Africa region while there is a negative relationship between population and per capita GDP growth in China and Australia. Some evidences found that current population growth has a negative effect on economic growth while lagged population growth has a positive effect so that there is no long-term relationship between these variables. Such contradictory findings have led several analysts to consider the possibility that the impact of population growth on per capita output growth may not be uniform but, rather, varies with particular circumstances.

From a Dynamic prospect, a study on *“Population Growth and Transitional Dynamics of Egypt”* was developed by Ghada & Morrison (2017). The study applied the logic of the basic exogenous growth models and empirically controls for all other demographic factors that believed in their intertwined effects on the economic growth rate. The results showed an evidence of the short run effect but the impact of the population growth rate on the time path of the economic growth rate was vanishing over time. The study gave a clear indication to policy makers in Egypt to modify their public policy toward the population growth and to adopt different approaches for resources balance rather than damping the population growth.

These results support a study by Dobronogov & Iqbal (2005), titled, *“Economic Growth in Egypt; Constrains and Determinants”*, which analyzed key determinants of economic growth in Egypt by combining the growth diagnostics framework with econometric time series analysis and relating the findings to the literature on the theory and empirics of economic growth. The study concluded that demographic developments affected growth after 1990 as the share of the working-age population in Egypt began to rise sharply causing a “demographic transition”. According to the study, the increase in the share of the working age population (if not offset by increase in the unemployment rate or fall in the labor force participation rate or by large shifts in relative productivity of labor and capital) makes GDP per capita grow faster than output per worker, and may also positively affect savings and investment, both in physical and human capital. It is also likely to be accompanied by a fall in the number of dependents per worker thus increasing the savings rate of the average households. Further, a fall in the youth dependency ratio permits an increase in per capita investment in human capital, contributing to future economic growth. Therefore, the study concluded that economic growth has been affected by the growth rate of the share of the working age population positively during the period of the study.

An empirical study about the relation between the two variables in Nigeria by Jonathan E., Godwin C., Fidelio N. (2018), was titled *“Population Growth and Economic Development in Nigeria”*. Nigeria ranks as the seventh most populous country in the world. The study used annual time series data for the period 1980 to 2016 and adopted the ordinary least square (OLS) regression technique to indicate that population growth retards economic development in Nigeria. The study recommendations were to control escalating population; ensure that the existing population becomes more productive; and deepen the availability of credits for the private sector will enhance economic development in Nigeria. The results here were in consistence with the findings of another study examined the same relationship in Nigeria by Nwosu, C., Dike, A. O and Okwara, K. K. (2014). That study investigated the time series role of population growth on economic growth in Nigeria and how was economic growth affected by population growth. The study employed a linear model to analyze economic growth fluctuations Vis a Vis population growth using annual secondary observation from 1960 to 2008.

The empirical results were based on Augmented Dickey-Fuller (ADF) stationarity test combined with Granger Causality and Co-integration tests. Empirical results support that population growth has a significant impact on economic growth. The study also found that there is a sustainable long run equilibrium relationship between economic growth and population growth. There is also the evidence of unidirectional causality between population growth and economic growth

A recent empirical study on *“Non-Renewable Resources and the Possibility of Sustainable Economic Development in a Positive or Negative Population Growth Economy”*, was developed by (Hiroaki Sasaki, 2019). The study examined the effect of population decline and the effect of depletion of natural resources on economic growth. The results showed that irrespective of whether the population growth rate is positive or negative, the long-run growth rate of per capita output could be positive depending on conditions. This result suggests that even an economy with nonrenewable resources and declining population can obtain sustainable economic growth.

**Table 1: Systematic Review**

Ref #	Author and Year	Title of the Article	Methodology	Results	Conclusive Remarks
	Bilal Savas(2008)	The Relationship Between Population and Economic Growth; Empirical Evidence from the Central Asian Economics	Econometric Methodology Autoregressive Distributive Lag (ARDL)	The paper examined the population-growth nexus using causality testing within a multivariate cointegration and error correction framework for the CAEs. The empirical results proved that there is a direct relation between per capita income and population size, an increase in income per capita leads to an increase in the size of population and on the other hand higher population depressed economic growth through diminishing returns. The causality is assumed to run from population to per capita GDP as there is evidence of a stable long-run relationship between the variables for each of the countries while in the short run, when causality is assumed to run from per capita GDP to population, there is evidence of a stable short-run relationship between the variables. Overall, the causality results suggested that there is evidence of strong and positive causal relationship between per capita real GDP and population in all of the CAEs in the period of analysis. There appears to be bi-directional Granger causality both in the short and in long run in each of these selected countries.	There is a need to incorporate additional variables, such as fertility rates, age dependency ratios and labor force that help to illuminate the channels through which population causes growth (and vice versa).
	Akinwande A. Atanda et al (2012)	The Role of Population on Economic Growth and Development ; Evidence from Developing Countries	Research Review & Comparative Analysis	The trend review of the determinants of rapid population of selected developing countries (Bangladesh, Ethiopia, Indonesia, Mexico and Nigeria) compared to higher income economies or developed nations taken as Germany and United States has established that fertility rate, crude death rate, birth rate, mortality rate, and life expectancy are the major determinants of rapid population growth rate. The subsequent lead was taken by Indonesia and Nigeria for the share of United State and Germany economic status. Despite Mexico higher share of developed economies (United State and Germany) per capita, it has least share of United State and Germany population sizes. The Upper Middle Income country has a relative small average population of 36.1% of United States and a higher population size of 130.4% of Germany's size. Indonesia has the highest of share of United States and Germany population size but the country population is relatively higher than Germany, while Nigeria and Bangladesh have similar population share of United States and Germany's total population size. This indicates that Nigeria and Bangladesh have relatively close population size but wide economic wellbeing share of the developed economies (United State and Germany) between 2001 and 2010. Ethiopia was found to have the least population size of the developed economies (United State and Germany) and this however reflected in the country real GNI per capita that recorded the least share of the benchmark countries between 2001 and 2010. Excluding Mexico from the Upper Middle Income group, developed economies (United State and Germany) with large population size have a higher real economic well-being as measured by the Real GNI per capita in 2001-2010, compared to selected developing economies in the world.	The trend review has revealed the causes and consequences of rapid population growth rate in selected developing countries. So, there is need for developing nations to engage the higher economic active group in productive activities in order to foster growth that will cater for the dependent group of the nations. Also endeavor to investment more in human capital development, provide health and education infrastructure, and sensitize the population of the consequences of high population size on the present and future resources use.
	Tsangyao Chang & Others (2014)	The Relationship between Population Growth and Economic	Empirical Investigation using Bootstrapped Panel-Granger	It was concluded that there is one-way Granger causality running from population growth to economic growth for Finland, France, Portugal, and Sweden and one-way Granger causality running from economic growth to population growth	Due to the differences in the existence and direction of causality between countries and across time periods, the results of the study are

	Growth Over 1870-2013	Causality Test	for Canada, Germany, Japan, Norway, and Switzerland and no causal relationship between population growth and economic growth is found in Belgium, Brazil, Denmark, Netherlands, New Zealand, Spain, Sri Lanka, the UK, the USA and Uruguay. For the period of 1871-1951, it was found that population growth Granger cause economic growth for Finland and France and a relationship from economics growth to population growth exists for Denmark, Japan, and Norway and that there is bidirectional causality between population growth and economic growth present for both Austria and Italy while for the period of 1952-2013 we found that population growth Granger cause economic growth only for Sri Lanka and that economic growth Granger cause population growth for Belgium, Denmark, France, Germany, New Zealand, Spain, Switzerland, and Uruguay and bidirectional causality between population growth and economic growth only for Japan.	supposed to provide important policy implications for the 21 Countries included in the empirical research.
Nwosu, C., Dike, A. O and Okwara, K. K. (2014)	The Effects of Population Growth on Economic Growth in Nigeria	Econometric method The ordinary least square (OLS), single equation method	The study has reviewed and elaborated on the empirical issues pertaining to economic growth and the influence of population growth on the economy by modeling Real Gross Domestic Product (as a proxy for economic growth) against population growth. The results concluded that population growth has significant impact on economic growth and a sustainable long run relationship (steady-state path) between economic growth and population growth. There was also an evidence of unidirectional causality between population growth and economic growth.	For population growth to positively impact on economic growth, Savings rate should increase to invest in more research and new techniques. In addition, government should make concerted effort to check population growth rate.
Musa Abba Mahmud (2015)	Econometric Model on Population Growth and Economic Development in India	Empirical Analysis using Johansen Co-integration Test and Vector Error Correction Model	The study aimed to find empirical evidences on the relationship between population growth and economic growth as economists are perambulating between three theories. First, economic growth and population growth are negatively related, which means if population increases, economic growth decreases. Second, economic growth and population growth are positively related, which implies that when population increases economic growth also increases, and third, population growth is neutral to economic growth. The study established an econometric model under the framework of Solow growth model to test the relationship between population growth and economic growth in India. The result of the Johansen test of co-integration shows that the variables are co-integrated and the VECM shows the speed of adjustment toward the long run equilibrium from the deviation in the short run. The short run influence on the dependent variable (GDP) by the independent variables (population, rate of urbanization and employment) were tested using a Wald Test which indicated that each independent variable influence the dependent variable in the short run. The study also discovered a unidirectional causality running from GDP to Population growth.	the relationship between population growth and economic growth is found to be positive in this study. In other words, the variables are found to have long run positive relationship or equilibrium. This results coincides with outcome of other empirical work done by many researchers such as Tsangayoet'al (2014) in Finland, Portugal, and Sweden; Adediran (2012) in Nigeria; Gideon K. et'al (2010) in Kenya, which support the argument raised by optimistic economists.
E. Wesley F. Peterson (2017)	The Role of Population in Economic Growth	Empirical Investigation	It has been evaluated that in low-income countries, rapid population growth is likely to be detrimental in the short and medium term because it leads to large numbers of dependent children. In the longer run, there is likely to be a demographic dividend in these countries as these young people become productive adults. It has also been argued that population growth induced by high levels of fertility, as is often the case in low-income countries, can reduce general well-being in contrast to growth resulting from declines in mortality rates generally believed to have more benign impacts on savings and economic growth.	Because population growth plays an important role in overall economic growth, positively or negatively according to external variables, the evolution of world population will continue to be a major global concern.

			In high-income countries, population growth is low and in some cases negative giving rise to age structures with a high proportion of elderly people in the population. The burden of supporting a large number of retired people could be eased if population growth were higher in these countries but it does not appear likely that fertility rates will increase in the future or that mortality rates will fall much below current levels. As a result, the natural population growth rate is likely to be very low.	
Ghada Gomaa & Morrison Handley Schachler (2017)	Population Growth and Transitional Dynamics of Egypt; Theoretical Analysis & Time Series Analysis from 1981 to 2007	Theoretical & Time Series Analysis	The impact of the population growth rate on the time path of the economic growth rate of Egypt has been examined taking into consideration various demographic and economic variables. The results did not show evidence of a long run impact of the population growth rate on the economic growth rate of Egypt, which confirms the theoretical findings of the simple open economy versions of basic growth theories. The findings indicated that in the case of at least one country the impact of population growth rates on per capita income growth resulting from inward investment diminishes over time and eventually becomes insignificant compared with other factors. It does not necessarily indicate that per capita income recovers from the temporary loss of growth in the transitional stage of economic growth funded by foreign borrowing.	The study recommended that the Egyptian policy regarding population growth rate reduction is not that significant in improving the per capita economic growth rate for the long run as Egyptian decision makers should rather focus on increasing productivity in order to stimulate the long-run economic growth rate in the country.
Jonathan E. Ogbuabor, Godwin C. Udo, Fidelia N. Onu igbo (2018)	Population Growth and Economic Development in Nigeria	Empirical Study using the ordinary least square (OLS) regression technique	Using annual time series data for the period 1980 -2016 and adopting the OLS regression technique, it was indicated that population growth retards economic development in Nigeria, which is consistent with the bulk of the empirical literatures as well as the Malthusian Theory which claims that with a geometric increase in population growth, more mouths will have to be fed thus leaving little or nothing to be saved. This will in turn lead to a fall in productivity. Given the role of death rate, which has a negative effect on economic development in the short-run, and long run, the study makes a strong case government at all levels in Nigeria to evolve policies that will revitalize the health sector.	The result suggests that there is need for government policies not only to control the escalating population but also to ensure that the existing population becomes more productive.
Hiroaki Sasaki, (2019)	Non-Renewable Resources and the Possibility of Sustainable Economic Development in a Positive or Negative Population Growth Economy	The growth model Analysis	Using a simple economic growth model assumes that production exhibits increasing returns to scale, the study analyzed both the case of positive population growth and the case of negative population growth. The determinants of long-run growth rate of per capita output had been investigated when an economy is subject to non-renewable resource constraints and the population growth is negative by using a theoretical model. From this, the study examined the effect of population decline and the effect of depletion of natural resources on economic growth. The findings have investigated how population decline and depletion of natural resources, which actually occur in reality, affect economic growth.	It was concluded that even population rate is positive; the long-run growth rate of per capita output could be positive depending on conditions related to the positive externality effect of capital accumulation.

#### **IV. Conclusion**

Using a systematic review, the research aimed to provide a complete, exhaustive summary of contemporary literature relevant to the research-structured question: How do population growth rates affect economic growth rates and what are the main factors determine the relation between the two variables. The answer of that question explored the growing body of evidence regarding the interrelation between economic growth and population growth.

The relationship between population and economic growth is complex and the empirical evidence is ambiguous, particularly concerning the causes and impacts. It can be demonstrated in a theoretical model that a large population growth could have both negative and positive impacts on productivity. A large population may reduce productivity because of diminishing returns to more intensive use of land and other natural resources. Conversely, a large population could encourage greater specialization, and a large market increases returns to human capital and knowledge. Thus, the net relationship between population growth and economic growth depends on whether the inducements to human capital and expansion of knowledge are stronger than diminishing returns to natural resources.

In addition, the empirical evidence showed that growth in the young population is the main drag on economic growth, while the effects of adult population growth are more varied and dependent upon such other factors as institutions and policies, especially with regard to labor, health, and education. The results also identify some mechanisms through which population growth influences economic growth. These findings should prompt policymakers to reconsider the importance of population growth as a main determinant of economic growth. Although, there is considerable awareness of the impact of population growth rate on economic growth, but there is a lack of appropriate policies and actions which are needed to re-orient this relation in the way that achieve high economic development rates, particularly in developing countries.

#### **Policy Recommendations**

This study contributes to the knowledge base by providing adequate understanding of the significant relation between economic growth and population growth. Based on our analysis and research findings, we recommend the following policy guidelines:

1. To minimize the problems of large population growth in the short run and maximize its benefits in the long run, more funds should be allocated for the provision of education, health care, transportations, communications etc.
2. Small and medium scale industries should be given more consideration to reduce unemployment rate to eliminate the negative effect of population growth on labor market.
3. There is empirical evidence that growth in the young population is the main drag on economic growth, while the effects of adult population growth are more varied and dependent upon other factors as institutions and policies, especially with regard to labor, health, and education. Therefore, there is a critical need for some mechanisms through which population growth influences economic growth, such as resource dilution and controlling for investment or savings to reduce the negative effects of population growth on economic growth.
4. For population growth to affect economic growth positively, per capital technology must increase to better resource utilization in the economy. Moreover, Savings rate should increase, as this will be used to invest in more research and new techniques to provide more value added services to the production.

#### **Future researches**

As the evidence from reviews keeps on accumulating, new knowledge is regularly needed to identify trends, gaps, and areas for future research. Extended systematic review of these reviews will provide an adequate understanding of the linkage between population growth and economic development. Further research is also required to examine the impact of population growth on other factors relating to economic growth. Researchers should explore the complex means by which population growth influences development outcomes over longer periods.

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#### **Conflict of Interest**

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