Strathmore
UNIVERSITY

Relationship between Population Growth and Economic Development in Developing East African Countries

Mwai Jane Wangari ADM 098218

Submitted in partial fulfillment of the requirements for the Degree of [Bachelor of Business Science in Actuarial Science] at Strathmore University

[Strathmore Institute of Mathematical Sciences]
Strathmore University
Nairobi, Kenya

[February 2021]

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

Mwai Jane Wangari

.....

23rd February 2021

This Research Project has been submitted for examination with my approval as the Supervisor.

Dr Godfrey Madigu

.....

23rd February 2021

Strathmore Institute of Mathematical Sciences

Strathmore University

Table of Contents

Chapter One

Introduction

Chapter 2

Literature Review

Chapter 3

Methodology

Chapter 4

Results and Discussions

Chapter 5

Conclusion

LIST OF TABLES

ABBREVIATIONS

EAC: East African Community

GDP: Gross Domestic Product

LDCs: Less Developed Countries

UNECA: United Nations Economic Commission for Africa

AIC: Akaike's information criterion

ADF: Augmented Dickey Fuller

USA: United States of America

Relationship between Population Growth and Economic Development in Developing East African Countries

Abstract

The relationship between population growth and economic development has been a complex issue for decades and is yet to find a clear-cut solution. Some researchers have found a negative relationship, others a positive relationship while others found no relation at all in both developing and high-income countries. This study uses historical data to draw conclusions as to whether there exists a relationship, and what type of relation exist if any, between population growth and economic growth for the East African Community countries in the period 1986 to 2018. The findings of this study indicate mixed results with the existence of long run cointegration, positive causal unidirectional relationship in the countries. However, from the findings there seems to be no long run relationship for majority of the East African Community countries. This means that population growth has positive impacts on per capita GDP growth and thus economic growth for some of the countries and not in others.

CHAPTER 1: INTRODUCTION

1.1 Background Information

The relationship between population growth and economic development has been deemed complex and controversial (Thirwall, 1994) and has therefore sparked extensive studies and research across the globe such as studies done by Thornton (2001) in Latin America, Fumitaka (2009) in Thailand and Klasen and Lawson (2007) in Uganda. These studies have varying findings and conclusions ranging from positive to negative to no relationships at all between population growth and economic development. Therefore, the contribution of the rise in population is not defined and thus we cannot conclude with certainty to whether the rise has positive, negative or no effects at all on the economic development (Peterson, 2017).

The relationship between the two variables has always been thought to be of paramount importance in enhancing our understanding of the less developed countries (LDCs) as was claimed by Dawson and Tiffin (1998) and how the growing population can foster growth in the LDCs and bridge the gap between the developed and less developed states.

It is, therefore, important to critically analyze the relationship between population growth and per capita GDP as the measure of economic development specifically for the East African Countries which usually record a higher growth rates compared to other countries around the world with an average annual growth rate of 6.2% according to the UNECA estimates.

We can argue that growth in population is one of the most important factors contributing to the economic development because an increase in population in a given year increases the human capital available which enlarges the amount of labour force available, therefore, increasing economic growth (Meier, 1995). A rise in population may also trigger competition among various existing firms as well as business activities. A rise in population is also associated with expansion of a country`s domestic market as the level of consumption and demand increases as population grows. As a result, many entrepreneurs will be motivated to set up new businesses with an aim of satisfying the increased demand from the now larger market which leads to economic growth in the long run.

Glaeser and Murphy (1999) observed that the high density, which is as a result of increased population, coupled with greater urbanization results in better specialization, greater investment in human capital as well as rapid accumulation of new knowledge especially in the modern urban economies which have small agricultural sectors and natural resources sector. The increased returns which are a consequence of better specialization and the new knowledge accumulated would in turn raise per capita income. It is therefore evident that human beings are the most crucial and indispensable elements for economic development (Simon, 1996).

It is logical to assume that population growth may be detrimental to the economy as it is to assume it as an important aspect in the economic development. Therefore, it is possible that then interplay of economic growth with population elements can lead a country into a poverty trap (Bloom and Canning, 2001) specifically because the more the population grows the higher the demand for savings since faster population growth will always absorb resources which would otherwise be invested consequently, reducing capital per person. As Malthus (1798) claimed, population growth rate tends to surpass the production growth rate which can be explained by the fact that population and production increases in different dimensions, population geometrically and production arithmetically. Therefore, if not closely monitored, an out of proportion population growth could undeniably drive a nation into outright poverty (Tsen and Furuoka, 2005).

A large population could also impose food constraints where the growth in population is higher than the food supply as well as add constrains to the expansion of foreign exchange and human resources hence hindering economic development (Meier,1995). Moreover, population growth tends to lower the average income over time. Thomas (1993) in his model implied that a high population growth will always drive down the average incomes to a level that it is just enough for subsistence of the population. From the above effects of population growth on the economy, it is possible that a relationship exists between the two variables.

Despite the above statements on the detriments and blessings associated with population growth, previous studies show mixed findings, where some find positive, others negative while others find no relationships at all as shown below;

John Thornton (2001) in his work found no correlation hence no relationship between population growth and per capita GDP in Latin America which is a high-income country. In contrast, Tsen and Furuoka (2005) found a positive relationship between the two variables in China which is an equally developed country.

According to Meir (1995), most of these developed countries were able to achieve an increase in per capita GDP while experiencing an increase in population. These nations have maintained their positions as the top largest world economies as well as among the most populated regions in the world. This shows that there might be a positive relationship between population growth and economic development.

However, for developing countries, a research conducted in Uganda (Klasen and Lawson, 2007) showed that increase in population has a negative impact on the economy, hence a negative relationship. Fumitaka conducted a study on population growth and economic development in Thailand, a developing country, and found that an increase in population led to economic growth.

From the statements above, we can see the variations in the findings and conclusions. There is no clarity as to whether the relationship between the two variables is positive or negative.

In this paper we use historical data to draw conclusions (which we cannot do as of now due to the contradictory nature of the previous studies) on the nature of the relationship between population growth and economic growth in the East African Community and its implications on the future economy of these developing countries.

1.2 Problem Statement

In the last decade, USA has been the largest world economy followed by China and lastly India (World GDP Ranking,2020). Recently, PWC in the world in 2050 report (Hawksworth and Chan, 2015), made projections for the world economy in 2050 which revealed a shift in the global economic power, with China in the lead, followed by India and lastly USA. Coincidentally, the population ranking in the next twenty years mirrors

this economic rank. We can therefore assume that the population growth in these twenty years will have a significant contribution in the per capita GDP growth in India.

This could only happen if there is a relationship between population growth and economic development, specifically a positive one.

If this holds true, it would be expected that as the population growth rate increases, the per capita GDP growth rate (the measure of economic development) will increase as well.

According to the law, infants between the age of 0 and 14 years are considered as unproductive members of society (International Labour Organization, 2017). Therefore, removing the proportion of infants in this age bracket could depict a clear contribution of the increase in productive population towards the productivity of a country in a given year.

However, there have been conflicting opinions on whether the relationship between population growth and per capita GDP is positive, negative or neutral. The debate on the same is still ongoing (Gideon, 2013) and there is yet to be an agreement.

Therefore, due to the conflicting nature of the previous studies, we cannot conclude with certainty as to the nature of the relationship between these variables and its implications on the future of our economy without further analyses. It is therefore hard for the government to put in place policies to control the future consequences of the rapidly growing population based on the previous findings.

1.3 Research objective

From the above statements, it is not clear what the implications of population growth are for the future economic growth (Darrat and Yousif, 1999).

Therefore, the main objectives of this research are;

1. To determine the nature of the relationship between population growth and economic development for the East African region based on the cointegration and causal relationship between the two variables.
2. To draw-from the findings, the implications of the rapidly growing population on the future economic growth of each of the East African countries.

1.4 Significance of the research

The findings of this study are an important indicator of the contribution of the rapidly growing population to the future economy of the East African Community and therefore useful for policy formulation by national governments.

Furthermore, the study will bring more insights, from the East African region, on the continued arguments regarding the relationship between these variables in the developing countries.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In the recent years, the relationship between population and economic growth has sparked a large number of factual studies, with exceptionally varying results (Yousif and Darrat, 1999). This is because many believe that an increase in population is entirely detrimental to the economy, especially for the economies of developing countries, since in can lead to absolute poverty (Bloom and Canning, 2001). However, for countries such as China, Thailand and South Africa population seems to affect growth positively.

2.2 Theoretical and Empirical Framework

Bucci (2003) investigated the movement between population growth and per capita income which he used as a measure of economic development. He specifically wanted to analyze the nature of the relationship between these variables. His focus was drawn to human capital as well as physical capital as the reproducible inputs. The findings from this study were that population growth negatively affects economic growth especially when human and physical capital are each other's substitutes. This is because, for a given level of per capita physical capital, an increased population results in a rise in physical capital. Therefore, if an increase in physical capital (which is as a result of increase in population) reduces the demand hence supply of human capital, the per capita level of skills declines consequently lowering per capita income growth. In contrast, if human and physical capital were complimentary, then this would result to positive effects of population growth.

Similarly, Thirlwal (1973) conducted a study concerning the relationship between population growth and economic development specifically in developing countries. This study found the relationship between the two variables to be complex mainly with regard to what is the cause and what is the effect. This is because as much as there are many ways through which an increase in population could stimulate economic progress, this rapid growth still lowers per capita income growth especially for the LDCs. The study drew conclusions on the complexity of the subject basing it on the fact that economic

progress is a multifaceted concept. In this study I conclude that the diversion of uses (which range from consumption to those that raise future output) through which resources are put is what determines the pace of a nation's economic development. Generally, the study implies that a population with a high proportion of dependents on producers usually consumes an amount of the output that is higher than that devoted to investment. Therefore, a rise in population which is as a result of high fertility increases dependency which in turn promote consumption at the expense of investment.

Simon (1977) conducted a research on the economies of population growth. He investigated the long run benefits associated with growth in population. The study claims that as much as population growth is detrimental to living standards in the short run, mostly due to diminishing returns brought about by the increased population, it has positive effects on the living standards in the long run. He argues that this is because of advancement in knowledge since as time goes by, a growing population tends to accumulate new knowledge, which eventually increases productivity as well as output at a rate that is higher than that of population growth. However, the more resources a country sacrifices and allocates to the future and the more a country is willing to have a short run decline in living standards, the better it will be for that country to successfully pursue the moderate population growth policy. He employed a simulation model in his study and found out that moderate population growth improves the living standards in the long run in developed countries as well as the less developed countries.

With an aim of finding whether there exists a long-run relationship between population growth and per capita GDP, which he used as a measure of economic growth, Thornton (2001) conducted a research in Latin America which focuses on two schools of thought. One is that population growth has negative effects because there is a possibility of the largest component of a nation`s domestic saving, which is household savings, to decrease if there is high dependency that is usually brought about by a high population growth. This especially the case if consumption rises and per capita savings falls for a given level of output per worker. Thus, the relationship between these two variables tends to be negative. The other one is that there may be no link whatsoever between the variables hence, no relationship at all, for example where monetized savings in the early stages of

development are as a result of the well of families who have few children. Therefore, the savings of these few wealthy families will not be affected by the burden of their children. Also, poor families may have savings accumulated in the form of other assets such as land and gold. It is therefore unlikely for their savings to appear in the national accounts. The study uses integration, and the Granger-type causality tests and finds that a long run relationship between the two variables does not exist.

According to Fumitaka (2009), there is a distinct relationship between the two variables which is fundamental to the understanding of less developed countries (LCDs). His argument is that population growth has positive effects because it encourages competition in business activities and also increases the size of the potential domestic market. He also argues that the increase in population may have negative effects on economic growth. This is because a rapid population growth may lead to over-population, which in turn, increases dependency burden due to increase in the number of people who are generally economically unproductive, for example children. He conducts a research in Thailand, a developing country, to analyze the long-run relationship between population growth and per capita GDP which he uses as a measure of economic development. He uses the bound test cointegration and the Granger causality test to investigate the long run movement hence the relationship between these variable. The study found that there exists a long run cointegrating relationship between population growth and per capita GDP.

Malthus (1993) came up with one of the most widely known and earliest theories regarding the effects that a rise in population brings on the economic growth of a nation. He believed that population grows at a rate higher than the rate at which food is produced, thus, there will always be a food shortage as population continues to grow. Therefore, reduction of population through the various types of misery will always be required to maintain a balance between the population size and the amount of food available. The study also implied that a high growth in population will always drive average incomes down to levels that are just enough for subsistence of the population. Therefore, increasing the income levels to raise the living standards and well-being of the poor would just be futile. This is because an increase in incomes would lead to an

increased population growth which would, in turn, bring the incomes down to the subsistence level.

Recently, E. Peterson (2017) conducted a research on the role of population on economic development. He especially found the relationship to be a controversial one. Applying historical data, he charts the links between population growth, growth in per capita output, and overall economic growth over the past 200 years. He observed that, for developed countries, low population growth is likely to bring down the economy and also create social problems. In contrast, for less developed countries, high population growth is likely to slow their development. Generally, the author implies that population growth could affect a country negatively or positively depending on the level of the national income.

From the study on Population Growth and Economic Development by George Zaidan (1969), the potential for economic growth is larger than the potential for population growth. However, the world has experienced high population growth rates over time which makes us question whether the present high rates of population growth are sustainable especially by developing countries. Zaidan claims that the prospects for development would be much better if these high rates could be reduced. He observed that over 65 per cent of total investments are devoted to maintaining per capita income at a constant level for developing or less developed countries, whereas the corresponding figure for a sample of developed countries was less than 25 per cent. To reduce this gap, he proposes that a developing country can either increase its national income and/or reduce its population.

Also, a recent publication by United Nations Population (World Population Prospects, 2019) implies that continued rapid population growth presents challenges for development, especially in the developing countries. Therefore, from the study we can see that there tends to be some type of relationship between population growth and economic development.

2.3 Research Gap

From the above review, we can see that varying methods and study areas have been used in different researches with an aim of finding a conclusion regarding the relationship between these variables. However, this has proven elusive as different studies have different findings with some finding a positive relationship as in the case of Fumitaka (2009), others a negative relationship as was found by Klasen and Lawson (2007) in Uganda while others find no relationship between these two variables as in the case of Thornton (2001).

Therefore, this study uses historical time series data with an aim of finding out which of these theories is supported by the data from the East African Community.

CHAPTER 3: DATA AND METHODOLOGY

3.1 Data

This paper tests the relationship between population growth and economic development in a sample of five East African Community (EAC) countries namely Kenya, Uganda, Tanzania, Rwanda and Burundi. These countries are a suitable sample due to their difference in population levels as well as in their levels of development measured by their current GDP as indicated by the African Development Bank. Also, there is consistent data on population growth as well as per capita GDP on these countries which makes them more suitable. These countries also record high population growth rates (United Nations Economic Commission for Africa, 2019) making it more reasonable to use them to test the implications of the high population growth rates on their future economy.

This study employs annual time series data over the period from 1986 to 2018. The population data is obtained from the World Bank's database specifically the World Development Indicators, as well as the data on the per capita real GDP. The population data is adjusted by capping the population of infants aged 0 to 14 years. All data on population and per capita GDP are transformed into logarithm form before their applications and denoted by POP and GDP, respectively.

Source: (https://data.worldbank.org/)

3.2 Methodology

The empirical analysis applied in this study consists of a three steps procedure as used by Fumitaka (2009). In the first step, the stationarity of the time series data used in this study is examined using the Augmented Dickey Fuller (ADF) unit root test. This is because it is always fundamental for the variables to be stationary when analyzing the cointegration relationship between two variables. Also, the Granger-causality test requires the time series to be stationary because using non-stationary variables in any model could lead to spurious regression as was claimed by Granger and Newbold (1974) and Phillips (1986). Similarly, in presence of non-stationary variables, the usual test statistics such as t-statistic and F statistics will not possess standard distributions (Stock and Watson, 1989). Therefore, checking for stationarity of the time series data is necessary before performing

the test. The Akaike Information Criterion (AIC) is used to obtain the lag length, n, which is used in the ADF test.

In the second step, this paper employs the bounds test for cointegration to examine the co-movement between population growth and per capita GDP in the long run. To test for this movement, the following VEC Model of order n is estimated in the presence of cointegration, (Fumitaka, 2009);

$$\Delta GDP_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 POP_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_i \Delta POP_{t-i} + \varepsilon_t \text{ (i)}$$

and the ARDL Model in the absence of cointegration;

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^{n} \gamma_i \Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_i \Delta POP_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots \text{ (ii)}$$

Where β_0 is the drift component, β_1, β_2, γ, δ are slope coefficient, n is the number of lag length, and εt is an error term.

To test for the significance of the lagged levels of the variables, the standard F-statistic and t- statistic are used by testing two null hypotheses. The test begins by applying the F-statistic which tests for the joint significance of the coefficients of the lagged levels using the first null hypothesis. Secondly, the t-statistic is applied is to test for significance of the coefficient of the lagged dependent variable which is now based on the second null hypothesis as follows;

First null hypothesis;

H0 (1): $\beta_1 = \beta_2 = 0$

Second null hypothesis;

H0 (2): $\beta_1 = 0$

The combination of these two hypotheses gives a joint hypothesis which is given by the intersect of the two hypothesis in accordance with Pesaran et al (1999) as shown below;

H0= H0 (1) $\cap$ H0 (2)

The critical values that are used to test the joint null hypothesis which states that there exists no level relationship between the variables are obtained from Pesaran et al (1999).

Under this method provided by Pesaran et al (1999), the joint hypothesis would only be rejected if the F-statistic value and/or t-statistic value fall outside the 99% upper bound of the critical values.

In the last step, this study uses Granger causality test (Granger, 1969) as well as Wald Test to analyze the causality between these variables in each of these five countries. The null hypothesis is that POP does not Granger-cause GDP for the first equation while the null hypothesis states that GDP does not Granger-cause POP for the second equation. If the null hypothesis is rejected, then this could be an indication of the causal relationship between population growth and per capita GDP. This test could be based on these equations (Fumitaka, 2009);

$$GDP_t = c_1 + \alpha_1 GDP_{t-1} + \cdots + \alpha_n GDP_{t-n} + \beta_1 POP_{t-1} + \cdots + \beta_n POP_{t-n} + \varepsilon_1 \quad \text{(iii)}$$

$$POP_t = c_2 + \alpha_1 POP_{t-1} + \cdots + \alpha_n POP_{t-n} + \beta_1 GDP_{t-1} + \cdots + \beta_n GDP_{t-n} + \varepsilon_2 \quad \text{(iv)}$$

Where c_1 and c_2 are constants, $\alpha_1 \ldots \alpha_n$ and $\beta_1 \ldots\ldots \beta_n$ are slope coefficients.

According to Fumitaka (2009), there are three possible types of causal relationship that could be obtained from this study. The first one is an independent relationship where there is no causality between the two variables. This occurs if and only if the set of estimated coefficients is not statistically significant for both lagged POP_t and lagged GDP_t in the first and second equation, respectively.

The second type of causal relationship is where population growth causes economic growth but not the other way. This can be referred to as population-driven economic growth. This happens only if the set of estimated coefficients is statistically significant for the lagged POP_t in the first equation (1) but not for the lagged GDP_t in the second equation (2).

The last possibility is a bidirectional causality where there is one-way causality from population growth to economic growth as well as from economic growth to population growth. This will only happen when both sets of estimated coefficients on the lagged POP_t in the first equation (1) and on the lagged GDP_t in equation (2) are statistically significant.

4) EMPIRICAL RESULTS AND DISCUSSIONS

4.1 DISCUSSIONS

Table 1 outlines the optimal lag length used in the ADF Test as obtained from the Akaike Information Criterion with the maximum length set at 4.

Table 2 presents results as obtained from the ADF Test which was used to test for stationarity in the time series. For GDP, the test can reject the null hypothesis of non-stationarity/unit root in level for Kenya Uganda and Rwanda. However, the test fails to reject the null hypothesis in level for Tanzania and Burundi but rejects the null hypothesis of unit root in first difference. Therefore, GDP is integrated of order (0) in Kenya, Uganda and Rwanda and therefore stationary. On the other hand, it is integrated of order (1) in Tanzania and Burundi which attain stationarity after the first difference. For population, the test can reject the null hypothesis of unit root in level for Tanzania Rwanda and Burundi which are stationary in level/order (0). However, the test cannot reject the null hypothesis of unit root in level for Kenya and Uganda which attain stationarity after the first difference/order (1). Based on the results, we cannot use the Johansen Cointegration test because it requires the variables to be integrated of the same order. Therefore, this study uses the Bounds Test for cointegration to examine the long run movement between the two variables.

Table 3 shows results obtained from the Bound Test, which was used to examine the long run cointegration movement between population growth and GDP growth. The critical values applied in this test were obtained from Pesaran *et al*, 2001. Based on the results, the F-statistics for Kenya and Tanzania fall below the 95% lower bound. Also, the t-statistics are greater than the 95% and 99% lower bounds. Therefore, the null hypotheses of no cointegration can be accepted at the1% and 5% level of significance. However, the F-statistics for Uganda, Rwanda and Burundi fall outside the 99% upper bound. Also, their t-statistics are lower than the 99% upper bounds. Therefore, the null hypotheses of no cointegration can be rejected at the 1% confidence interval. We can therefore conclude

that there was a long run cointegrating relationship between population and GDP over the period 1986-2018 in Uganda, Rwanda and Burundi but not in Kenya and Tanzania.

Finally, the causal relationship between the two variables is examined using the Granger causality and Wald tests. Based on the results presented in Table 4, the null hypothesis that population does not Granger-cause GDP could be accepted, for all the countries except Uganda, whose P-value is significant at the 5% level of significance. This indicates that population growth did not cause per capita real GDP growth in the four EAC countries, except Uganda, over the period 1986-2018. Similarly, the null hypothesis that GDP does not Granger-cause population could not be rejected for Kenya, Uganda, Tanzania and Burundi as their P-values are not significant at the 5% level of significance. However, the null hypothesis that GDP does not Granger cause population could be rejected, for Rwanda, at the 5% level of significance. This means that per capita GDP growth caused population growth in Rwanda but not Kenya, Uganda, Tanzania and Burundi over the period 1986-2018. In other words, there exists no causal relationship between population growth and per capita GDP growth in the majority of EAC except in Rwanda and Uganda where there seems to exist a unidirectional long run causality from GDP to Population and Population to GDP, respectively. This indicates an economic driven population for Rwanda and population driven economy for Uganda.

4.2 EMPRICAL RESULTS

Table 1

a) GDP Level -AIC lags used in the ADF Test.

	Akaike Information Criterion (AIC)				
Lag length	Kenya	Tanzania	Uganda	Rwanda	Burundi
0	4.6797	4.29776	4.45831*	7.87157	5.42877
1	4.44437*	3.69017*	4.46913	7.85057	5.28065*
2	4.51129	3.74887	4.53373	7.82466*	5.34941
3	4.5282	3.79688	4.59453	7.87609	5.41767
4	4.58453	3.85546	4.66136	7.94481	5.48548

b) POP Level -AIC lags used in ADF Test.

	Akaike Information Criterion (AIC)				
Lag length	Kenya	Tanzania	Uganda	Rwanda	Burundi
0	1.47361	.749848	.660588	6.00101	2.66567
1	-.440212	-.454705	-1.23755*	4.74596	.912933*
2	-.472155*	-.633915	-1.18941	3.26987*	.946799
3	-.423074	-.633998*	-1.15056	3.33879	.978456
4	-.393228	-.57194	-1.10631	3.3759	.999609

c) POP 1st Difference – AIC lags used in ADF Test.

	Akaike Information Criterion (AIC)				
Lag length	Kenya	Tanzania	Uganda	Rwanda	Burundi
0	.00176*	1.49274*	1.69537*	4.71435	2.10458*
1	.017449	1.52211	1.75847	3.99953	2.1614
2	.079595	1.59018	1.82196	3.76622	2.22084
3	.107405	1.64988	1.86534	3.62211*	2.2833
4	.175995	1.71522	1.86675	3.66653	2.35111

(*) Represents optimal lag length chosen by AIC, maximum lag length is 4.

Table 2.

The ADF Test

	Level	1st Difference	Level	1st Difference
Country	GDP	GDP	POP	POP
Kenya	-3.791(1) **	-3.736(2)	-1.843(2)	-3.000 (0) *
Tanzania	-2.420(1)	-6.348(0) *	-2.496(3) *	-1.036 (0)
Uganda	-4.767(0) *	-4.690 (2)	-1.698(1)	-10.370(0) **
Rwanda	-4.880(2) *	-5.072(4)	-4.321(2) *	-3.347(3)
Burundi	-2.850 (1)	-5.074(1) *	-1.595(1) ***	-2.347 (0)

Note; The digits in parenthesis represent the number of lag length while the rest are the ADF t-statistics.

H0: Presence of unit roots

Values with the asterisk indicate stationarity.

- * indicates significance at 1% level.
- ** indicates significance at 5% level.
- *** indicates significance at 10% level.

Table 3

BOUND TEST

Country		95% Lower Bound	95% Upper Bound	99% Lower Bound	99% Lower Bound
Kenya					
F-statistic	4.581	4.94	5.73	6.84	7.84
t-statistic	-2.828	-2.86	-3.22	-3.43	-3.82
Tanzania					
F-statistic	4.486	4.94	5.73	6.84	7.84
t-statistic	-2.430	-2.86	-3.22	-3.43	-3.82
Uganda					
F-statistic	12.436	4.94	5.73	6.84	7.84
t-statistic	-4.946	-2.86	-3.22	-3.43	-3.82
Rwanda					
F-statistic	32.205	4.94	5.73	6.84	7.84
t-statistic	-7.812	-2.86	-3.22	-3.43	-3.82
Burundi					
F-statistic	7.843	4.94	5.73	6.84	7.84
t-statistic	-3.763	-2.86	-3.22	-3.43	-3.82

Notes: critical values are obtained from Pesaran et al. (1999)

H0: No relationship between POP and GDP

Table 4

Granger/ Wald test Causality

		Lags	Interval:	1 to 2	
POP to GDP	Kenya	Tanzania	Uganda	Rwanda	Burundi
Chi-square statistic	4.1692	4.5663	4.90	1.13	0.15
P-value	0.124	0.206	0.0268	0.2871	0.7009
GDP to POP					
Chi-square statistic	2.1485	3.6904	0.95	51.65	1.17
P-value	0.342	0.297	0.3287	0.010	0.2787

H0: POP does not cause GDP (POP to GDP)

H0: GDP does not cause POP (GDP to POP)

5. CONCLUSION

This study attempted to extensively analyze the relationship between Population growth and per capita GDP growth in the East African Community (EAC) over the period 1986-2018 by employing bound test for cointegration and Granger causality/Wald Test. Specifically, the study aimed at finding whether the rapid population growth being experienced in the East African Community could lead to future economic growth.

The findings from this study indicated no causal relationship from population growth to per capita GDP growth (used as a measure of economic development) in all of the EAC countries except in Uganda. This implies that population expansion does not impact the economic growth of most of the EAC countries despite the positive outcomes associated with population growth. Therefore, the hypothesis of population-driven economic growth which claims that population growth ultimately leads to economic growth did not apply for most of the countries except for Uganda. Excluding Uganda, we can conclude that there exists no causal relationship between population growth and economic development among the developing East African Countries.

This study focused solely on the quantity aspects of the population in the East African Community countries. Incorporating the quality of population aspect, such as education level and gender, into empirical analysis could possibly report findings that differ from those reported in this study. Therefore, future studies on this topic could incorporate the characteristic of the population while analyzing the relationship between population expansion and economic growth.

References

Becker, G., Glaeser, E. L., & Murphy, M. K. (1999). Population and Economic Growth. *American Economic Review Papers and Proceedings 89*, (pp. 2:145-49).

Bucci, A. (2003). *Population Growth in a Model of Economic Growth with Human Cpital Accumulation and Horizontal R&D.* Milan: University of Milan.

Darrat, A. F., & Al-Yousif , Y. K. (1999). On the Long-Run Relationship between Population and Economic Growth: Some Time Series. *Eastern Economic Journal, Vol 25.*

Dawson, P., & Richard, T. (1998). Is There A Long-Run Relationship Between Population Growth and Living Standards? The Case of India. *The Journal of Development Studies*, 34:149-56.

Dickey, D., & FULLER, W. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association 74.*

Fumitaka, F. (2009). Population Growth and Economic Development: New Empirical Evidence from Thailand. *Economic Bulletin* Vol. 29 no.1 pp. 1-14.

Granger, C. (1969). *Investigating Causal Relationship by Econometric Models and Cross Spectral Methods,* Econometrica 37.

Hawksworth, J., & Chan, D. (2015). *The World in 2050 PWC Repor*t: Will the shift in global power continue?

Klasen, S., & Lawson, D. (2007). The Impact of Population Growth on Economic Growth and Poverty Reduction in Uganda. *Departmental Working Paper number 133.*

Malthus, T. (1798). *An Essay on the Principle of Population and a Summary View of the Principles of Population.* London: Pickering.

Malthus, T. R. (1993). *An essay on the Principle of Population* . New York: Oxford Press.

Meier, G. M. (1995). *Leading Issues in Economic Development 6th Edition.* New York: Oxford University Press.

Pesaran, M. H., Shin, Y., & Smith , R. J. (2001). Bounds Testing Approach to the Analysis of Long-run Relationship. *Journal of Apllied Econometrics.*

Peseran, M. H., Shin, Y., & Smith, R. J. (1999). Bounds testing to the analysis of long-run relationship. *The Edinburgh School of Economics Discussion Paper number 46.*

Peterson, E. W. (2017). The Role of Population in Economic Growth.

Simon, J. L. (1977). *The Economics of Population Grwoth* . Princeton New Jersey: Princeton University Press.

Simon, J. L. (1996). *The Ultimate Resource.* Princeton New Jersey: Princeton University Press.

Stock, J. H., & Watson , M. W. (2001). Vector Autoregressions. *Journal of Economic Perspectives.*

Thirlwall, A. P. (1994). *A Cross-section Study of Population Grwoth and the Grwoth of Output and Per Capita Income in production function framework,* University of Kent.

Thirwal, A. P. (1993). *Growth and Development with Special References to Developing Economies.* Canterbury: University of Kent .

Thornton, J. (2001). Population Grwoth and Economic Growth: Long-Run Evidence from Latin America. *Southern Economic Journal, Vol 68.*

Tsen, W. H., & Furuoka, F. (2005). *The Relationship between Population and Economic Grwoth in Asian Economies.* Yusof Ishak Institute.

Zaidan, G. C. (1969). Population Growth and Economic Development. *Studies in Family Planning.*

Source of Data.

World Bank Group, World Development Indicators.

https://data.worldbank.org/

Appendix

Key Concepts

Population growth: This is the average annual growth of change of population size during a specified period (World Population Policies, 2005)

Economic growth: This is the sustainable increase in a nation`s per capita product (Shearer, 1961). This study uses per capita GDP as a measure of economic growth.

Per capita Gross Domestic Product (per capita GDP): This is a metric that breaks down a country`s GDP per person. It is a universal measure for gauging the prosperity of a nation (Chappelow, 2019)