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Population Growth and Economic Development in Ethiopia

**A Thesis Submitted to the Department of Economics in Partial Fulfillment of
the Requirement for the Degree of Master of Science in Economics
(Development Economics)**

By

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June, 2018

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ACKNOWLEDGEMENT

First of all, I would like to thank Badassa Wolteji (PhD), my thesis advisor, and Tesfaye Etensa (MSc) my thesis co-advisor for their valuable guidance, constructive comment and encouragement which was very important input to conduct this study

I would like to extend my gratitude to my families especially my wife Senya Temam and my brother Abdel Kerim Nejmu without whose moral support my achievement was not possible.

Moreover, I would like to thank National Bank of Ethiopia and Central Statistical Agency for their devotion and support during data collection process.

Finally, I want to say thank you all to my relatives and colleagues who have helped me while I was writing this thesis. .

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ABBREVIATIONS AND ACRONYM

ACF	Auto Correction Function
ADF	Augmented Dick-Fuller
AIC	Akaike Information Criterion
CSA	Central Statistical Agency
DCs	Developed Country
DF	Dick –Fuller
FPI	Final Perdition Error
GDP	Gross Domestic Product
LDCs	Developing Countries
MDG	Millennium Development Goal
MoFEC	Ministry of Finance and Economic Cooperation
NBE	National Bank of Ethiopia
OLS	Ordinary List Square
PP	Phillips Perron
RGDP	Real Gross Domestic Product
VAR	Vector Auto Regression
VEC	Vector Error Correction
WBI	World Bank Indicator

ABSTRACT

The debate on the relationship between population growth and economic growth has been undergoing over a long period of time and yet it is inconceivable developing countries in generally and Ethiopia particularly. Hence, this study aimed to analyze the impact of population growth on economic development of Ethiopia using time series data from 1974/75 to 2015/16 by employing Johansen co-integration test, Granger causality test, VAR and VECM. The study found that population growth had a significant negative impact both in the short run and in the long run on economic development. While government education expenditure as percentage of RGDP is positive and statistically significant relationship with economic development. The results of causality test shows that there exists unidirectional relationship running from economic development to population growth in long run. Lastly the study recommends that the government as well as the concerned body should exert their effort to balance the population growth and economic development.

Key words: Economic Development, Granger Causality, Population Growth, VECM, VAR, Ethiopia

CHAPTER ONE

INTRODUCTION

1.1 Back Ground of the Study

There are two instructs of thoughts regarding the association between population growth economic development. For the developed countries (DCs); population growth has helped changing their economies because they are already wealthy, have abundant capital and scare labor force. So a high growth rate of population has led to a rapid increase in productivity. This implies that increase in population has resulted in faster growth of GDP. Therefore, they has enough food to eat, they are literate and live in good health (Todaro,2012).On the other side developing countries usually less developed countries (LDCs) are quite different from these developed countries economies. Their economies are poor in performance, scare in capital but have abundant labor, Todaro and Smith(2012) argued that the people of less developed countries live in low level of living standards which are manifested qualitatively and quantitatively in the forms of low incomes in adequate housing and poor health, limited or no education ,high infant mortality ,low life expectance.

Rapid population growth adversely affects LDCs economic development precisely every increase in population has led to more problem than benefit. Some of the negative effects of population growth include; high population growth requires massive investment in social infrastructure. Due to the shortage of investment funds, social infrastructure like education, health, transport and housing is likely to decrease. This results in overcrowding and declining quality of services (Hlihet et al, 2015)

Demographic trends have a substantial impact on countries economic development. The declining fertility rate in developed countries have been caused labor shortages and put strain on the pension systems. Developing nations have been experiencing high birth rate which is sometimes considered demographic dividend. However, high population growths are a greater burden on economy and also the population growth may be blamed as a major reason to their economic backwardness (Fumitaka, 2014).

The continent of Africa is characterized by highly rapid population growth and poor economic performance compared with other less developed continent. Especially sub-Saharan Africa is recognized by the highest rate of population growth while poverty is also a very important problem .In 1800; the world population was about a billion and increased to 2.5billion in 1950. In the year 2013.the population of the world was 7.1 billion and projected to rise to 9.2 billion by 2050 with large percentage of the growth to occur in developing regions. Current population of Ethiopia is estimated as 99.3 million people which are the second populous country in Africa and 14th in the world (WB, 2015).

Developing countries in general and Ethiopia in particular is characterized by high level of young population and low level of old population due to low life expectancy, low living standard, and poor economic privacy, economically active people who are pillar of the country (15-65 age) and economically inactive population who are put burden on country development activity that include children (0-15 age) consists of 46.3% and elder (>65 ages) is about 2.7% the dependency ratio for our country is 95.9% which means for 95 dependents need supports from a signal active working people (CSA, 2016).

1.2 Statement of the Problem

The issue of population growth has got attention in less developing countries in general and Ethiopia in particular. This is due to rapid population growth with unbalanced level of economic development results serious socio economic development such as low living standard, low income, and poor health care, poor education. The problem of population growth is not a problem of number rather it is a problem of human welfare and development. If development entails the improvement in people's levels of living-their income, health, education and general well-being and it also encompasses their self-esteem, respect, dignity, and freedom to choose from this respect it is important to consider population situation in many least developing countries can contribute to or detached from their chances of realizing the goal of development not only current generation but also for future generation Todaro and Smith (2012).

A high rate of population growth not only has an adverse impact on improvement in food supplies, but also intensifies the constraints on development of savings, foreign exchange, and

human resources. Also, too dense a population aggravates the problem of improving the health of the population and intensifies pressure on employment and the amount of investment available per labor market entrant Martin (2009).

According to Amjod (2013) there are two strands of views about the impact of population growth on economic development, one view is favor of population growth while the other view is opposing that population growth. The view opposing the population growth started with the Malthusian theory of population growth is deteriorating the economic development and considers it is a real problem the followers of this view argue population growth reduces capital-labor ratio and saving, It increases the dependency ratio, putting a strain on the health, education as well as food supply. The second view argues that population growth is desirable for economic development. It is the real power and strength of a country high population growth stimulates consumer demand high labor supply at cheap rate and more division of labor. According to this argument rapid population growth rates results in additional demand for clothing, food, shelter, social services like education, health and growing employment opportunities.

The study by Hassen (2012) conducted on between demographic factors and economic development in Ethiopia by applying vector error correction method. The authors tries to account the effect demographic variables on economic development by introducing some variables such as population growth, total employment. The result of the study shows that negative and long run relationship between per capital income and population growth. A high rate of population growth not only has an adverse impact on improvement in food supplies but also intensifies the constraints on development of savings, foreign exchange and human resources. Rapid population growth tends to depress savings per capital and retards growth of physical capital per worker. The need for social infrastructure is also broadened and public expenditures must be absorbed in providing the need for a larger population rather than in providing directly productive assets. The rapid increase in school age population and the expanding number of labor force entrants puts ever greater pressure on educational and training facilities and retards improvement in the quality of education which is a problem of improving the health of the population and intensifies pressure on employment (Biswas, 2013).

Population growth is a key factor to the growth and development of any country. And with continued divergence of opinions regarding the consequences of population growth on economic development, this study thus serve as a necessary contribution to knowledge offering information

regarding its impact population growth in economic development of Ethiopia. The study also serves as a resource material to policy makers and scholars by providing the relevant information regarding the issue. The research conducted on this related issue in Ethiopia only focus on impacts of population growth on agricultural sector, the environment, as a cause to land fragmentation and change in livelihood strategies without giving great attention to service sector of economic development indicator. Therefore, this study going to fill these gaps by incorporating the impacts of population growth on service sector such as, in the share of education, health shortly. Furthermore, this study is an attempt to evaluate to what extent population growth will affect economic development of the country.

1.3 Research Question

- What is the long run relationship between population growth and economic development in Ethiopia?
- What is the short run relationship between population growth and economic development in Ethiopia?
- What is the direction of causality between the population growth and economic development in Ethiopia?

1.4 Objective of the Study

The overall objective of the study is to examine the impact of population growth on economic development and their causality in the Ethiopia.

1.4.1 The Specific Objectives of the Study are:

- To investigate the long run relationship between population growth and economic development in Ethiopia.
- To investigate the short run relationship between population growth and economic development in Ethiopia.
- To test the direction of causality between the population growth and economic development in Ethiopia.

1.5 Significance of the Study

Assessing the impact of population growth on Ethiopian economy creates awareness about the impact of population growth on the Ethiopian economic development to the economic agents (i.e. firm's government and house hold), it create initiation for policy makers regarding population in order to reduce the gap between high population growth and low productivity through planned reduction of population growth and increased economic returns.

This paper give a clue for further investigation on this area or this study will thus serve as a necessary contribution to knowledge offering information regarding population growth and economic development in Ethiopia.

1.6 Scope and Limitations of the Study

The study was cover the period of 1974/75 to 2015/16. The paper is focus on impact of population growth on economic development of Ethiopia rather than social and political scenario.

The population growth has many influences on Ethiopian economy. But, due to time and financial constraint the study limit only on the economic effect of population growth even though it has political and social effect. In addition lack of adequate data within scope estimated. Despite these limitations; the study exerts a maximum effort, to show the effect of population growth on economic development of Ethiopia.

1.7 Organization of Study

The research paper would contain six chapters. The first chapter briefly outlines the introduction part which contains background, statement of problem, objective, significance scope and organization of the study. The second chapter would deals with review literature which includes different theory and concept that is related in line with population growth and economic development would be presented. The third chapter would contain methodology. The fourth chapter could contain the over view of population growth and economic development. The fifth chapter contain data interpretation and data analysis. Finally the sixth chapter would explain the conclusion drawn from the study and suggests possible recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and Concepts

2.1.1 Population Growth

In terms of human biology the encyclopedia Britannica, population growth is defined as a whole number of people occupying an area (such as a country or the world) continually being modified by increase (births and immigration) and loss (deaths and emigration).

On the other hand, population growth as put by international encyclopedia for the social science, is the number of persons living in a given area at given moment of time. But the growth is not necessarily positive or monotonic; it is the sum of natural increase (births minus deaths) and net migration (immigrants minus emigrants). But each of these balances and their sum can be negative. Apparently, population growth equals natural increase only where net migration is nil or negligible World Book (2001).

2.1.2 Economic Development

There are two major ways of defining economic development: - traditional view of economic development implies growth together with structural changes in the economy and it also defined as sustained increase in output and institutional arrangement by which it is produced. Modern view of economic development refers to the sustainable increased in per capita income along with decrease in unemployment, poverty and inequality in the economy. Amartya Sen (1999) argued that the concept of economic development consist of enlargement opportunities for people and freedom of human choices. Economic development includes policy and processes by which a nation improves economic political and social prosperity. This includes adjustments in a variety of indicators such as educational level, indicators of life expectancy, poverty rates, and environmental conditions etc. Economic development attaches importance GDP per capita taking in to consideration other indicators that show about the quality of life such as: access to education, access to health care, income distribution, environmental quality.

2.2 Theoretical Literature

Key conceptual consideration in economic development is the recognition that population is central in development issues and hence population concerns would be treated as an integral part of the broader socioeconomic system. The framework for integrating population in the development planning process requires an appreciation of the relationship between socio-economic and demographic issue.

Substantial disagreements, have been observed between economics concerning to whether population booms should be viewed as a serious problem or not. These individuals are classified under the pessimistic view and optimistic view.

2.2.1 Pessimistic View on Population Growth

The proponents of this view argue that, population growth is liability for LDC than assets. They said that population growth not only has an adverse effect on improvement in food supply but also intensifies the constraint development of savings, foreign exchange and human resources. To them population growth is undesirable, because of the entire social and economic consequences that excess population may result (Ray, 1998).

This group argues that economic growth cannot continue as it is now that is, there is limit to economic growth. They also tell that economic system collapse in the future. According to them the limit to growth is that several resources are fixed. But the demand for these resources grows exponentially. This makes resources to be exhausted and growth without these resources is impossible.

Countries with higher population growth rates have experienced faster conservation of land to agricultural uses, putting additional pressure on land and natural habitual. For instance, in many places (Ethiopia, southern Malawi, Eastern Nigeria, and sera Leon) farming is being intensified through shorter fallow periods rather than through the use of better inputs or techniques. Repaid population growth in these areas has led to the depletion of soil resources and stagnating or declining yields. In some circumstance, especially in rural Africa, population growth has been too rapid that traditional practices have been unable to adopt means to prevent degradation. The

result is thus, deforestation, depletion of natural resources (like water resources, loss of natural habitat, etc.) they have their own implication on economic development (Tientenberg, 2003).

2.2.2 Malthus's Population View

Thomas Malthus (1798) was present the law of population. That is when population is unchecked increases geometrically: subsistence increase at best only arithmetically. That is, population tends to increase at the rate of 1,2,4,8,16,32 and so forth whereas the rate of increase of subsistence is best only 1,2,3,4,5,6. He pointed out that rapid population growth in America to proof his propositions.

Malthus also proposed two method of controlling population growth. The first is a preventive check like moral restraints including late marriage, celibacy refraining from sexual intercourse and artificial restraints which include all methods of contraceptive and these preventive checks refer to the steps adopted by man himself.

The second method he recognized is positive check to population, these that increase the death rate. These were famine, misery, plague, and war, Malthus elevated these to the position of natural phenomenon or laws; they were unfortunate evils required to limit population. These positive checks represent punishment for people who had not practiced moral restraint. Based on Malthus view, mill also suggested the negative effect of population. He was conscious of the evil effects of a rapid increase population. He looked the problem both in terms of its economic consequences ad social and moral generation. The economic effect of population growth is it's ever use of natural resources whereas its moral effect is the overcrowding of family (Gills et al, 1996

2.2.3 The Theoretical Argument View

The population poverty cycle theory is the main argument advanced by economists who hold that too rapid population growth yields negative economic consequences and thus should be real concern for developing countries. Advocates start from the basic proposition that population growth intensifies the economic, social, and psychological problems associated with the prospects for that better life for the already born by reducing savings rate at the household and

national levels. It also severely draws down limited government revenues simply to provide the most rudimentary economic, health and social services to the additional people. This in turn further reduces the prospects for any improvement in the levels of living of the existing generation and helps transmit poverty to future generations of low income families. Widespread absolute poverty and low levels of living are seen as a major cause of larger family size, and large families retard economic growth, it follows that more egalitarian economic and social development is a necessary condition for bringing about an eventual slowing or cessation of population growth at low levels of fertility and mortality (Ray, 1998).

2.2.4 The Pessimistic Views: Three Conclusions

The first suggest that within a time span of less than 100 years with no major change in physical economic; of social relationships that have traditionally governed world development society will turn out of the non-renewable resource on which the industrial basic depends. Were the resource have been depleted, precipitous collapse of economic system will result manifested in massive unemployment, decreased food production and a decline in population as the death rates soars, there is no smooth, no gradual showing down of activity; rather the economic system consumes successively large amount of resource until they are gone. The characteristic behavior of the system is overshoot and collapse.

The second conclusion of the study is that piecemeal approaches to saving the individual problems will not be successful. To demonstrate this point, the author arbitrarily double their estimates of the resource base and allow the mode to trace out an alternative vision based on this new higher level of resources. In this alternative vision the collapse still occurs, but this time it is caused by excessive population generated by the increased place of industrialization permitted by the greater availability of food would become the binding constraint.

The third and final conclusion, the study suggests that overshoot and collapse and can be avoided by an immediate limit on population and pollutions, as well as cessation of economic growth. The portrait pointed shows only two possible outcomes: The termination of growth by self-restraint and conscious policy an approach that avoids the collapse or the termination of growth

by a collision with natural limits, resulting in the social collapse. Thus, according to this study, one way or the other, growth will cease (Tietenberg, 2003).

Bucci (2003) investigated whether there is a long-run relationship between population (size and growth) and per-capita income focusing on human and physical capital as reproducible inputs. The study found out that population growth exerts a negative effect on economic growth. However, when individuals choose endogenously how much to save, population growth can also have a neutral influence on economic growth. The study also extended its analysis to the case where physical and human capital can interact with each other in the production of new human capital. When the two types of capital are substitutes for each other in the education sector, the effect of population growth on per-capita income growth is always negative. Instead, if human and physical capital is complementary for each other, the impact of population change on real per-capita income growth becomes ambiguous.

2.2.5 Optimistic View on Population Growth

In contrast to the proponents of pessimistic view, optimists argue that large population enhances resource development. The propagators of such idea argued that there is no limit to growth. All what is needed is better human institutions. They posited virtually unlimited potential for the expansion of material resource necessary to support a growing population. Thus, to them the sole constraint on the environment was the shackling effect of social relation of production, geared to the needs either of a renter or a capitalist class. Once these social relations were changed to the account of the needs of the majority then the elasticity of economic development become unlimited (Brecht in et al, 1993).

2.2.6 Mercantilist View

The desire for a large population intensified in the 17th century in Europe under the influence of mercantilism. They suggested that not only would a sizable industrious population provide an abundance of soldiers and sailors ready to fight for the glory and wealth of the nation, but it would keep labor supply high and wages therefore low. The advantage of these low wages would

enable lower prices on exports, thereby increasing the inflow of gold and reduce idleness and promote greater participation in the labor force.

The central aim of this view was to increase power and wealth of nation. It was thought that population growth would contribute greatly to existence of all forms of life on the planet is jeopardized by population growth. In the provocatively titled book “the population bomb”. Mercantilist as argued that population is not merely an important problem but in ensuring long-term survival of the species Tietenberg (2003).

2.2.7 Boserup Model of Population Growth

Boserup (1965) found out that population growth is an autonomous factor, which affects agricultural productivity rather than being affected by it, as suggested by the Malthusian school. The study claimed that Malthus' assumption of diminishing returns to labor needs not hold in the long run, as higher population may lead to a more efficient division of labor as well as to improved agricultural practices (signalled by the frequency of cropping). The study concluded that soil fertility should not be viewed as fixed and given by nature, but instead can be improved by substituting the agricultural technology to a better one, which is likely to be a result of an increase in population. Primitive communities with higher population growth rates are more likely to experience economic development, provided that the necessary investment in agriculture is undertaken.

2.2.8 Simon's Theory of Population Growth

Simon (1977) investigated the long run benefits of population growth. Whereas population growth has a negative effect on living standards in the short run due to diminishing returns and the temporary burden it poses on society, it has positive effects on living standards in the long run due to knowledge advances and economies of scale. Employing a simulation model, the study found out that in the long run (after 30 to 100 years) and when compared to constant-size population, moderate population growth improves standards of livings both in more developed and in less developed countries. In the long run, a growing population tends to advance knowledge, which, in turn, increases productivity and output at a higher rate than that of

population growth. Nevertheless, a country's optimal policy regarding population growth depends on the weight given to future periods relative to the present. The more weight a country gives to future generations and the more willing a country is for the short run decline in standards of living, the better it is for that country to pursue a policy of moderate population growth. The long run benefits of population growth that links to economic development of poor countries are on the positive balance, contrary to conventional wisdom.

Generally, unlike pessimistic views, that suggested excessive population growth leads to underdevelopment. The optimists argued that population growth leads to technological innovations that increase productivity and hence improve the economic development. As this statement indicates, Marx held that poverty was entirely consequence of unemployed or underdevelopment conditions due to the inability of the capitalistic system to provide jobs for all regardless of the speed with which population increase.

2.2.9 Solow-Swan Economic Growth Model

The Solow-Swan economic growth model with exogenous saving rates to determine the relationship between population growth and economic growth. The model assumed that both the saving rate and the consumption rate are given. Taking a household owns the input and manages the technology. The production technology is assumed to take the form

$$Y = F(K, L) \dots \dots \dots (2.1)$$

Where Y is total output,

K is total physical capital,

And L is the size of the labour input

The production function exhibits positive and diminishing marginal products with respect to each input and also exhibits constant returns to scale. The economy is assumed to be a one-sector economy, where output can be either consumed or invested and capital depreciates at a constant positive rate (δ). The growth rate of population is exogenous. The model further assumes that

this growth rate is a constant (n) and that labour supply per person is given. Normalizing the population size at time zero and the work intensity to one yield the following is the labour input.

The net increase in per capita capital is:

$$\dot{k} = sf(k) - (n + \delta)k \dots \dots \dots (2.2)$$

The first term on the right-hand side (RHS) is saving per capita out of output per capita and the second term is the effective depreciation per capita. Defining a steady state as a situation in which the quantities, such as capital, population, and output, grow at constant rates. In the Solow-Swan model a steady state exists if the net increase in per capita capital is equal to zero. Denoting steady state values with (*) an asterisk the steady state values are given by:

$$sf(k^*) = (n + \delta)k^*, y^* = f(k^*) \text{ and } c^* = (1 - s)f(k^*) \dots \dots \dots (2.3)$$

Since the per capita values are constant in steady state the levels of total output, total consumption, and total capital must grow at the same rate, which is the same as that of population growth (n). An increase in the rate of population growth in steady state does not affect the growth rate of the per capita variables, since these rates are equal to zero in steady state. However, an increase in fertility does lead to a decrease in the level of capital per capita and therefore to a decrease in output and consumption per capita. This is the capital dilution effect. An increase in the population growth rate leads to a decline in the growth rate of the per capita variables. For model with exogenous saving rates higher population growth leads to lower standard of living per capita measured either as consumption or in growth of consumption.

2.3 Empirical Literature

The study conduct by Fumitaka (2010), found a bilateral causality between population and economic development of Philippines. The study discovered that population growth has positive and significant impact on the real GDP. Fumitaka and Qaiser in a joined study (2011) found a bilateral causality between population growth and economic development in an island state of Singapore. The study result show that Singapore population growth did contribute to the nation's economic development, with in return stimulated population expansion in the country.

Adediran (2010), used ordinary least square method of analysis in examining the relationship between population growth and economy of Nigeria. The authors use some important variables such as: population growth, fertility rate, life expectancy at birth, crude death rate and export growth rate. The result of the study show that there is positive relationship between economic growth (proxies by GDP growth) and population growth, fertility rate and export growth rate; while negative relationship between GDP growth and life expectancy at birth, crude death rate.

Gidisa and H/Gebriel (2011) conducted research on impact of population growth and economic development in Ethiopia using a time series data. The authors try to account for the bi-causal relation between population growth and economic development (real GDP is used as proxy) by introducing only two variables such as real GDP and population growth. The finding of the study show that only long run causal relationship from economic development to population but no long run causal relationship exists from population to economic development.

Adewole (2012) investigated the effect of population on economic development in Nigeria 1981 to 2007 based on a quantitative assessment. The study used trend analysis of the study with the scope spanning between 1981 and 2007. The study adopted ordinary least square method of analysis in examining the time series properties using the Phillips-Perron (PP) non-parametric unit root test. The study revealed that population growth has positive and significant impact on economic sustainability proxied as Real Gross Domestic Product (RGDP) and Per Capita Income (PCI). The study concludes that population growth has brought about a vast increase in food requirement

The study conducted by Atand, and Aminu, (2012) that examined the comparative and review of population growth determinants between developing nations (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 threat in developing countries. However, the analysis further indicated that excluding Mexico from the upper middle income group developed economies (Germany and United States) with large population size have a higher real economic wellbeing as measured by the real GNI per capital compared with selected

developing economies in the world. Study then proffered the need for population control framework and provision of essential infrastructures of the rapid population size in developing countries in order to enhance their welfare.

Dao (2012) carried out a research on population and economic growth in 43 developing countries. He applied the least-squares estimation technique in a multivariate linear regression. Based on data from the World Bank he found that the growth rate of per capita GDP is linearly dependent upon population growth, both the young and old dependency ratios, and the mortality rate. He concludes that the effect of population growth on per capita GDP growth is linear and everywhere negative.

Nlandu and Justin (2013) study on the relationship between population growth and economic development in small developing countries by using autoregressive distributed lag approach to cointegration. The authors try to account for the effects of some variables on economic growth the variable such as population density, population growth, trade and net international migration. The study found that population growth and population density positively and significantly affect economic growth and net international migration negatively and significantly impacts on population growth. The authors imply that implementation of economic policies important to solve the related problem.

Sher et al (2013) study the impact of population growth and economic development of Pakistan by using autoregressive distributed lag approach to cointegration for the period of 1975 to 2008. The result of the study shows that the impact of population growth is positive and significant but the problem associated with huge population growth is the food of newly produce work force, its management and providing different facilities even basic needs become a challenge of government and policy makers and also the study incorporated unemployment rate and government expenditure on health and education to the model in order to investigate the impact of population growth directly and indirectly on economic growth in Pakistan. The authors recommends that government should utilize this additional work force efficiently as to achieve high and desired level of growth.

The research conducted by Kassahun (2014) on the impact of population growth on economic performance of Ethiopia. The researcher uses only two variables such as population growth and economic growth. The result of study shows that population growth has a significant negative impact in the short run but a positive impact in the long run on the economic performance of a country.

Tsangyao et al. (2014) conducted a research on the relationship between population growth and economic growth by applies the bootstrap panel causality between population growth and economic growth .Which accounts for both dependency and heterogeneity across a countries to test the causal link between population growth economic growth in 21 countries over the period of 1870 to 2013. The study found that population growth Granger cause economic growth only for Finland and France, economic growth Granger cause population growth for Denmark, Japan and Norway and that there is bidirectional causality between population growth and economic growth only for Japan .The study show that the directions of causality tend to differ across countries and depend on time period. A research done in India Biswas and saha (2014) during the period 1980/81 to 2010/11, total employment was used as proxy of labor force jointly with other macro-economic variables to analyze determinants' of economic growth. The result suggests that gross domestic capital formation, employment export, and foreign direct investment have positive effect on India's GDP growth where as inflation and fiscal deficit has negative effect

Idoown (2014) study the impact of health on economic growth in Nigeria by using co integration and Granger causality technique were used in analyzing quarterly time series data of Nigeria for the period of 1995-2009. The study finds that GDP is positively influenced by health indicators in the long run. It reveals that health indicators have along run impact on economic growth. The policy implication of the study is that a high level of economic growth can be achieved by improving health status.

The research conduct by Jude Eggoh (2015) the relationship between human capital (measured by education and health related variables) and economic growth for a large sample of 49 African countries over the period from 1996 to 2010. Using traditional cross-section and dynamic panel techniques. From the analysis the researcher concludes public expenditures on education and

health have a negative impact on economic growth, where as human capital stock indicators have a slight positive effect. Public investment in education and health should be jointly increasing and their efficiency in order to expect positive impact of human capital on growth in Africa countries.

The study conducted by Jhahjahan et al. (2015) use to estimate a simple model to examine empirically the relationship between population growth and economic development in Bangladesh. Specification and diagnostic tests supported the statistical appropriateness of the model highly significant and negative coefficient of population growth demonstrates that population is a real problem in Bangladesh b/c it is adversely affects the economic growth. The study show that Bangladesh has the highest dependent population that hinders economic growth because this population encompasses nonproductive number of society. Therefore, population growth has become a critical issue that discourages economic development and must be addressed seriously in order that the country has respectable economic growth.

Tewodrose (2015) study on the determinants of economic growth in Ethiopia during the period 1974-2013. He use Autoregressive Distribution Lag Approach and error correction model are applied in order to investigate the long run and short run relationship between the dependent variable (real GDP) and its determinants. The finding of the bounds test shows that there is a stable long run relationship between real GDP, physical capital, human capital and inflation and also both physical and human capital are found to have positive impact on economic growth while debt affects economic growth negatively and statically significant at 1 percent.

A research done in India Biswas and Saha (2014) during the period 1980/81 to 2010/11 total employment was used as proxy of labor force (human capital) jointly with other macro-economic variables to analyze determinants of economic growth. The result suggests that gross domestic capital formation, employment, export, foreign direct investment and money supply have positive effect on India's GDP growth where as inflation and fiscal deficit have negative effect.

Musa (2015), conduct research on the relationship between population growth economic development .The researcher use both Johansen co integration test and Vector Error correction model to capture the two way causality between population growth and economic growth. The

study discovered that the relationship between population growth and economic growth is positive and there exist a unidirectional relation from economic growth to population growth. The study suggest that the government should take more resource in human capital development through quality education, infrastructure as well as encouraging small and medium scale industries to achieve the long run economic growth.

Mohammed (2015) study conduct the impact of population growth on economic growth of Pakistan by using time series data, The result revealed that there is positive relation between economic growth (proxies by GDP growth) and population fertility and export while a negative relation were found between economic growth (proxies by GDP growth) and life expectancy. The study reveals that variables such as the growth of working age population and life expectancy has a positive effect on growth while total population and population density has a negative effect on economic growth, impacts of total population giving statistically insignificant. Thus the authors conclude that though the overall rate of population growth had little effect on economic growth. Although, this study would use econometric analyses such as Augmented Dickey Fuller (ADF) unit root test, Johansen co-integration test, used to examine the long run relationship between population growth and economic development. There are several researches done on this area in the world most of uses certain methodology and certain variable such as: (Adediran, 2012) used ordinary least square method of analysis to examining the relationship between population growth and economic growth Nigeria (Gideon, 2010) using vector auto regression estimation technique.

To make this study different from previous ones, I employed Johansen co integration technique, Granger causality test, VAR estimation technique, and Vector Error Correction Mechanism in the study. And also, this study is different from previous research by incorporating variables including health variables and education variables which were not addressed in their studies especially in case of Ethiopia. Furthermore, most of the study used bivariate method to their analysis while this study uses multivariate technique in studying population growth and economic development of Ethiopia during the period 1974/75 to 2015/16 a time series analysis.

CHAPTER THREE

MODEL SPECIFICATION AND METHODOLOGY

3.1 Data Type and Sources

To achieve the desired objectives this study used, secondary and time series data. The study covers the period from 1974/75 to present 2015/16 as sample to investigate the impact of population growth on the Ethiopian economic development. Data was collected from different institutional published materials like World Bank data indicator, World population data sheet, National bank of Ethiopia (NBE), Central statistics Agency (CSA). The detailed source of data for each variable are described in table (3.1)

Table 3.1 summary of data source by variable

Types of variable	Unit/proxy	Source
Economic development	Real gross domestic product	NBE
Education variable	Ratio of government expenditure on education (recurrent and capital) to RGDP	NBE
Health variable	Ratio of government health expenditure (recurrent and capital) to RGDP	NBE
Total population growth	Population growth	World Bank and CSA
Physical capital stock	Ratio gross capital formation to real GDP	NBE

3.2 Model Specification

This study analyzes the impact of population growth on economic development in Ethiopia using a time series data covering the year between 1974 and 2015. There are several studies that done in this area some of used real GDP and the others use real GDP per capita as proxy for economic development. As indicated by Gidisa and Haile cited by Todaro and Smith (2012), real economic output and per capital income are proxies for economic development. In this study, however, real gross domestic product is used to proxy for economic development.

This study adopts the frame work of popular neoclassical growth model developed by Robert Solow. The model attempts to explain long run economic growth by estimating capital accumulation or produced capital, labour or population growth and increasing in productivity which is known as technological progress. The model could be expressed as;

$$y_t = f(k_t, A, L_t) \text{ ----- (3.1)}$$

Where

y_t = Is the total output at time t

k_t = Is the produced capital at time t

L_t = Is the labor at time t

A = is the labor Augmenting technology or knowledge

The study borrows the frame work and reformulating it in to a model using some other variables. Thus, Y_t which is total output is replaced with real GDP, K_t which is the physical capital replaced with ratio of gross capital formation to real GDP, government expenditure on education and health percentage of RGDP proxy of education human capital and health human capital respectively and L_t which replaced with population growth. The study like Musa (2015), Gideon et al.(2013) and Mohammed (2015) applied similar economic function to analysis the impact of population growth on economic development/growth in India, Kenya and Pakistan respectively .Moreover, the variables are preferred based on their relevance and data availabilities. Therefore, the model adopted during the study can be expressed as follows:

$$GDP_t = f(POP_t, GCF_t, GEE_t, GHE_t) \text{ ----- (3.2)}$$

All variables are transformed into their natural logarithm so that their first differences approximate their growth rates. On the other hand, to eliminate the impact of heteroscedasticity for economic variable time series data, all variables are in natural logarithm (Gujarati, 2004). The empirical model was designed to model the three variables after logarithmic transformation for the linear model, is easy to verify, so the transformed model:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln POP_t + \beta_2 \ln GCF_t + \beta_3 \ln GHE_t + \beta_4 \ln GEE_t + e_t \text{ ----- (3.3)}$$

The variable that formed the model are expressed with respect to time where

LNRGDP = Natural logarithm of real gross domestic product

LNPOP= Natural logarithm of population growth

LNGCF= Natural logarithm of gross capital formation as a percentage of real GDP

LNGHE= Natural logarithm of health expenditure as a percentage of real GDP

LNGEE= Natural logarithm of education expenditure as a percentage of real GDP

$e_t = \text{error term}$

$\beta_0 = \text{intercept}$

β_1, \dots, β_4 The coefficient of independent variables

3.3 Methodology of the Study

3.3.1 Unit Root Test

The concept of stationarity is related to the properties of stochastic processes (sequence of random variable indexed by time). Time series data is assumed to be stationary if the mean, variance and covariance of the series are independent of time. On the other hand, non-stationarity in a time series occurs when there is no constant mean, no constant variance or both of these property. In this case it is no possible to use simple OLS to estimate long run linear relationship between variables .If we do so, it would lead to spurious regression/non sense economic analysis were R-square is approximating unity ,t and F-statistics look significant and valid. Hence we will be obliged to falsely concluding that there is a relationship between two unrelated non-stationary series. This kind of problem (unit root problem) can be solved by differencing the data set (Gujarati, 2004) If the variable is stationary without differencing, then it is integrated of order zero (I (0)). A variable is said to be integrated of order one or I (1), if it is a variable differencing twice or I (2). In order to determine the degree of statinarity, a unit root testing will be carried through the Augmented Dicky-Fuller (ADF) test Wooldridge (2005). Several tests are usually employed to test whether time series variables are stationary or non-stationary: the Dick-Fuller (DF), the Augmented Dick-Fuller (ADF) test, Auto Correlation Function (ACF) and Phillips-Peron Test. In this study I was employ ADF test to determine the existence of a unit root by incorporating the autoregressive process of order p, this model becomes superior to DF. The general form of the ADF equation where only an intercept is included is as follows:

$$\Delta Y_t = A_0 + \gamma Y_{T-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i} + \varepsilon_t \text{-----(3.4)}$$

The hypotheses of the above equation form are:

$H_0 : \delta = 0$; there is a unit root, i.e., the time series is non stationary

$H_1 : \delta \neq 0$; there is no unit root, i.e., the time series is stationary (level stationary)

The Null hypothesis (H_0): Y_t is not $I(0)$, if the calculated ADF statistics are less than their critical values from Fuller's table, then the null hypothesis (H_0) is accepted and the series are stationary or integrated or order one i.e, $I(1)$. If the coefficient of the lag of Y_{t-1} , δ is significantly different from zero, then the null hypothesis is rejected.

To allow for the various possibilities, the ADF test is estimated in three different forms, that is, under three different null hypotheses.

1st possibility: Y_t is a random walk without drift: $\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^q \zeta_i \Delta Y_{t-1} + \varepsilon_t$

2nd possibility: Y_t is a random walk with drift: $\Delta Y_t = \beta_0 + \delta Y_{t-1} + \sum_{i=1}^q \zeta_i \Delta Y_{t-1} + \varepsilon_t$

3rd possibility: Y_t is a random walk with drift around a stochastic trend:

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^q \zeta_i \Delta Y_{t-1} + \varepsilon_t$$

β_0 is intercept, t is linear time trend, q is the number of lagged first differences, and $(i=1,2,3,\dots,q)$ is q is the number of lagged terms chosen by Akaike Information Criterion (AIC) to ensure that ε_t is white noise.

Where Y_t is any variable in the model to be tested for stationarity, ε_t is an error term and Δ is the first difference operator. The null hypothesis of ADF is $\delta=0$ against alternative hypothesis that $\delta<0$. Where $\delta=r-1$, a rejection of this hypothesis means that the time series is stationary or it does not contains a unit root while not rejecting means that the time series is non stationary (Gujarati, 2005)

3.3.2 Optimal Lag Selection

Before going deep into the test, there is need for appropriate selection of the lag length to be used. Estimating the lag length in many econometric analyses is very crucial exercise. The lag

length in this study is selected using explicit statistical information criteria obtained through unrestricted VAR estimate. These statistical information criteria include, Akaike Information Criterion, Schwartz Information Criterion, Posterior Information Criterion (PIC) and Final Prediction Error (FPE). The study will use among the lag selection criteria, the Akaike Information Criterion

3.3.3 Co integration Tests

In time series analysis, we are allowed to model one non stationary time series (Y_t) as a linear combination of another non stationary time series ($X_{1t}, X_{2t} \dots X_{nt}$). In other words:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + \epsilon_t \text{ ----- (3.5)}$$

A regression model like the one above gives spurious (nonsense) results unless their linear combination eliminates the stochastic trend and produces stationary residuals.

$$Y_t + \mu_1 X_{1t} + \mu_2 X_{2t} + \dots + \mu_k X_{kt} \sim I(0) \text{ ----- (3.6)}$$

In principle, testing for co integration is similar to testing the linear regression residuals for stationarity. Thus, we refer to a set of variables as co integrated when the residuals from their linear combination are stationary even though the variables ($Y, X_1, X_2 \dots X_k$) are individually non stationary. The outcome from such regression can no longer be considered as spurious or nonsense result. To create co integration relationship, one needs to run first an OLS regression model for the variables and subject the residuals for stationarity test using perhaps the popular Augmented Dickey Fuller (ADF) or Phillips Perron (PP) unit root tests. Co integration methods have been very popular tools in applied economic work since their introduction few decades ago. One important test for co integration that is invariant to the ordering of variables is the full-information maximum likelihood test of Johansen Test of Co integration Wooldridge (2000).

3.3.4 Johansen Co integration Test

Named after S. Johansen, the Johansen Test is a procedure of testing co integration of several time series data. This test permits for more than one co integrating relationship and turnout to be

more applicable than the Engle Granger test which is based on the Augmented Dickey Fuller (ADF) test for unit roots in the residuals from a single (estimated) co integrating relationship.

The Johansen test takes its starting point in the Vector Auto regression (VAR) of order p given by

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t \quad (3.7)$$

Where Y_t is an $n \times 1$ vector of variables that are integrated of order one commonly expressed as $I(1)$, and ϵ_t is an $n \times 1$ vector of innovations. The above equation can be re-writing as $\Delta Y_t = \mu + \Pi Y_{t-1} + \Sigma \Gamma \Delta Y_{t-1} + \epsilon_t$

Where

$$\Pi = \Sigma A_i - I \text{ and } \Gamma_i = -\Sigma A_j$$

If the coefficient matrix Π has reduced rank $r < n$, then there exist $n \times r$ matrices α and β each with rank r such that $\Pi = \alpha \beta'$ and $\beta' Y_t$ is stationary. r is the number of co integrating relationships, the elements of α are known as the adjustment parameters in the vector error correction model and each column of β is a co integrating vector. It can be shown that for a given r , the maximum likelihood estimator of β defines the combination of Y_{t-1} that yields the r largest canonical correlations of ΔY_t with ΔY_{t-1} after correcting for lagged differences and deterministic variables when present. Johansen proposes two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the Π matrix. These tests are: the trace test and maximum Eigen value test. More than 90% of the outcomes of these tests are the same though in rear cases, their inferences might be a little bit different.

$$J_{\text{trace}} = -T \sum \ln(1 - \lambda_i) \quad (3.8)$$

$$J_{\text{max}} = -T \ln(1 - \lambda_{r+1}) \quad (3.9)$$

T is the sample size and λ_i is the i th largest canonical correlation. The trace test tests the null hypothesis of r co integrating equations against the alternative hypothesis of n co integrating equations. On the other hand, the maximum Eigen value tests the null hypothesis of r co integrating equations against the alternative hypothesis of $r + 1$ co integrating equations. These tests follow asymptotic critical values which can be found in Johansen and Juselius (1990).

3.3.5 Granger Causality Test

A Granger Causality Test is a statistical hypothesis test used to find out whether a given time series can be used to forecast or predict another. It was developed by Clive Granger (a Nobel Laureate, 2003) in 1960s and has been widely used in economics since then. According to Granger (1969), If variable X Granger causes another variable Y, then the past value of X should contain information that are useful in predicting Y, over and above the information contain in the past value of Y alone. Its mathematical formulation is based on linear regression modelling of stochastic process. More complex extension to non-linear cases that seems to be practically difficult also exists. In the of two variables as mentioned earlier, the mathematical approach to test whether there exist a causal relationship between them can be written as:

$$Y_t = a_0 + a_1 Y_{t-1} + \dots + a_p Y_{t-p} + b_1 X_{t-1} + \dots + b_p X_{t-p} + u_t \quad (3.10)$$

$$X_t = c_0 + c_1 X_{t-1} + \dots + c_p X_{t-p} + d_1 Y_{t-1} + \dots + d_p Y_{t-p} + v_t \quad (3.11)$$

Here we assume that u_t and v_t are uncorrelated. A unidirectional causality exist when from X to Y if the estimated coefficients on the lagged X in the first equation are statistically different from zero as a group and the set of estimated coefficients on the lagged Y are not statistically different from zero. In the same vain, unidirectional relationship from Y to X do exist when the lagged Y in the second equation are statistically different from zero and the lagged X are not statistically different from zero in the first equation. A bilateral causality do exist when the set of both lagged X and Y are statistically different from zero in both equations. But when the set of lagged X and Y are not statistically different from zero in both equations, we can simply say that no causal relation between the variables Gujarati (2004).

3.3.6 Vector Error Correction Model

The appropriate econometric specification for two or more non stationary variables found to be co integrated, that is to say, the variables have underlying stochastic trends along which they move together on a non-stationary path, is the Vector Error Correction Model (VECM). VEC is just a special case of the VAR for variables that are not stationary at their level form and become stationary after differences ($I(1)$).

Consider two variable x and y that are co integrated (i.e., $I(1)$), then there exist a unique α_0 and α_1 in which:

$$u_t \equiv y_t - \alpha_0 - \alpha_1 x_t \sim I(0) \text{ -----(3.12)}$$

The error correction model of this single equation where y is the dependent variable and x is the independent variable can be appropriately specified as:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \lambda u_{t-1} + \varepsilon_t = \beta_0 + \beta_1 \Delta x_t + \lambda (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \varepsilon_t \text{ ----- (3.13)}$$

Since α coefficient, which is the co-integrating vector, are known or consistently estimated, the terms in the above equation turn out to be $I(0)$. The u_{t-1} term is the magnitude by which y was below or above its long run equilibrium value in the previous period. The coefficient λ (which is expected to be negative) represents the amount of correction of this period ($t-1$) disequilibrium that happens in the period t . for example if we are using annual data in our time series analysis and λ happens to be 0.5, it means one half of the gap between y_{t-1} and its equilibrium value would tend to be reversed in the period t . this is because the sign is negative Musa.A (2015).

3.3.7 Test of Volatility

There are two approaches, impulse response function and variance (forecast error) decomposition for characterizing the impulse response functions and variance decomposition technique are useful devices in the VAR frame work for testing the sources of variability. The impulse response function contract the response of the endogenous variables to a shock in another variable. The variance decomposition breaks down the variance of the forecasting error for each variable in to components that can be attributed to each of the endogenous variables. Following Sims (1980) seminal paper dynamic analysis of VAR model is routinely carried out using the “orthogonalized” impulse response were the underlying shocks to the VAR model are orthogonalized using the cholesky decomposition method. This method assumes the system is recursive and the estimation of impulse response function and variance decomposition are orthogonalized so that the covariance matrix of the resulting innovations is lower triangular. Therefore, the Cholesk decomposition method in attributing a common effect and changing the order of the equation may dramatically change the impulses. Recently, Pesaran and Shin (1998) proposed an alternative approach the generalized impulse response analysis which is invariant to the ordering of the variables in the VRA. In contrast to the Choleski decomposition method the generalized impulse response functions are unique Meheri (2010).

3.4 Description of the Variables and their Expected Signs

The description and measurement of the dependent and explanatory variables that are including in the model of this paper are explained as follows:

I. Real gross domestic product (RGDP) is the market value of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real Gross Domestic Product. Since most economists argue that economic growth can be measured as growth in real GDP, it includes in the model dependent variable is taken as a proxy for economic development.

II. Population growth (POP), is independent variables that define increase in the number of individuals in a population. Global human population growth amounts to around 75 million annually, or 1.1% per year. Many nations with rapid population growth have low standards of living, whereas many nations with low rates of population growth have high standards of living. The "population growth rate" is the rate at which the number of individuals in a population increases in a given time period, expressed as a fraction of the initial population. Specifically, population growth rate refers to the change in population over a unit time period, often expressed as a percentage of the number of individuals in the population at the beginning of that period.

The study by Adedirano (2015) and Kassahun (2014) result showed that short run significant and negative relationship between population growth and economic advancement but in the long run positive and significant relationship between population growth and economic development. However, the study by Gidisa and Haile (2012) result show that long run negative relationship between population growth and economic development. Therefore, it is difficult to expect the sign.

III. Share of gross capital formation to RGDP (GCF) it is a proxy for physical capital stock in the economy and it is derived by dividing the gross fixed capital formation adjusted through GDP deflator to real GDP. Barro and Sala-i-Martin (2004) show that the sign expected from the coefficient GCF is positive, because the accumulation of the capital is supposed to favor the growth of the real GDP by fostering further production of new goods and services. Similarly this research also expected to be positive relationship.

VI. Health expenditure (HE) is the percentage of gross domestic product that has been spent on health care of human capital. Most of the empirical studies that examine government health expenditure find a positive or significant effect on growth. But the researcher Cooray (2009) study that support negative insignificant significant effect of government health expenditure on growth. The sign of the coefficient would be expected positive.

V. Education expenditure (EE) is the percentage of gross domestic product that has been spent on education of human capital. Education considered as one of the most significant investment in human capital and affect growth through different mechanisms. Buldacci (2008) study conduct on impact of government education expenditure on economic growth .The study finds that positive association between government education expenditure and economic growth. Most of the empirical studies that examine government education expenditure find a positive and significant effect on growth and this paper also expected a positive impact on economic development.

3.5 Method of Data Analysis

In this study both simple descriptive and econometrical methods of data analysis were employed. To analyze the impact of population growth on economic development of Ethiopia during the study period, the study used tools of descriptive statistical analysis such as mean, median and also econometrical techniques would apply to analysis impact of population growth on economic development of Ethiopia under the study period. Finally, Eview 9.0 versions have been used as statistical software package for the entire analyze running this study.

CHAPTER FOUR

AN OVERVIEW OF POPULATION GROWTH AND ECONOMIC DEVELOPMENT IN ETHIOPIA

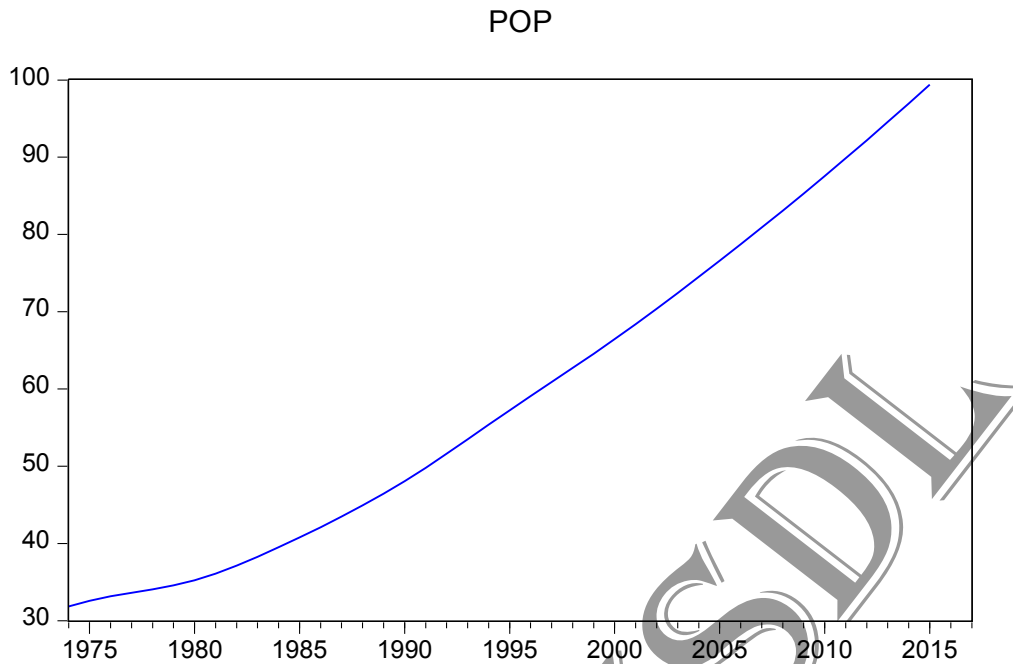
The study is based on data covering the period 1974 to 2015 analyze to the impact of population growth and economic development both descriptive and econometric method of analyses were employed.

4.1 The Trend of Population Growth

Ethiopia is endowed with a large and fast growing population and globally acknowledged and included among the largest countries in the world (EEA, 1999/2000; 53). According to the 2010 revision of the UN's world population prospects, Ethiopian's total population was 82.95 million in 2010, compared to 18.43 million in 1950. It is believed that the projected population of 169 million for 2050 will make the country the 9th most population's nation in the world and the second in Africa following Nigeria.

The natural increase in population size of a given country depends on the crude birth rate and death of that country. The crude birth rate is the number of children born alive each year per 1,000 Population. On the other hand, death rate is the number of deaths each year per 1,000 Population. The difference between the two represents the rate of population growth if we control for immigration and emigration. The birth rate of Ethiopia was around 47.8 in 1961 which in 2011 reduced to only 34.1. Though this indicates a reduction, it doesn't signify fall in the addition to the total population in absolute terms as population is growing progressively. Looking at the death rate of the country, there is considerable reduction to 8.1 in 2011 from a 24.4 in 1961. This is a more than half reduction in death rate which could be due to the modern medication and people's awareness about health Gidisa and Haile (2012).

Figure 4.1 Trend of total population (1974 to 2015)



Source: Authors computations based on World Bank data base (2018)

The above result show that the total number of population in 1974 was 31 million and in year 2015 was 99 million the latter in absolute term adds to the total population by more than 3.12 times the former .This indicate booming population size of a country for the time period considered on average the population was growing at an average rate of around 2.774 which is higher than the 1974 and 2015 case considered on the data. The lowest population growth rate in the country was recorded between the years 1976 to 1980 with an average annual growth rate of 1.57 contrary to this the highest population growth rate was recorded between the time period of 1983 to 1998 with an average rate of around 3.085 percent. Ethiopia population growth is characterized by one of the fast growing in the world. According to the central statistical authority the population of Ethiopia in 2010 was 78.8 million, and if the current trend of population growth continues, the population of Ethiopia is expected to be double every 24 years and it will reach 120 million by 2012. Currently the total population of Ethiopia is 99.34 million with the growth rate of 3.179 percent

4.2 The Trend of Real Gross Domestic Product from the year 1974/75 to 2015

Table 4.1 The average growth rate of real GDP

Period	Average growth rate of RGDP
1974/75-1980	2.1
1980/81-1984/85	-0.9
1985/86-1990/91	4.3
1991/92-1996	5
1996/97-2000/01	4.1
2001/02-2005/06	7.1
2006/07-2015	10.4

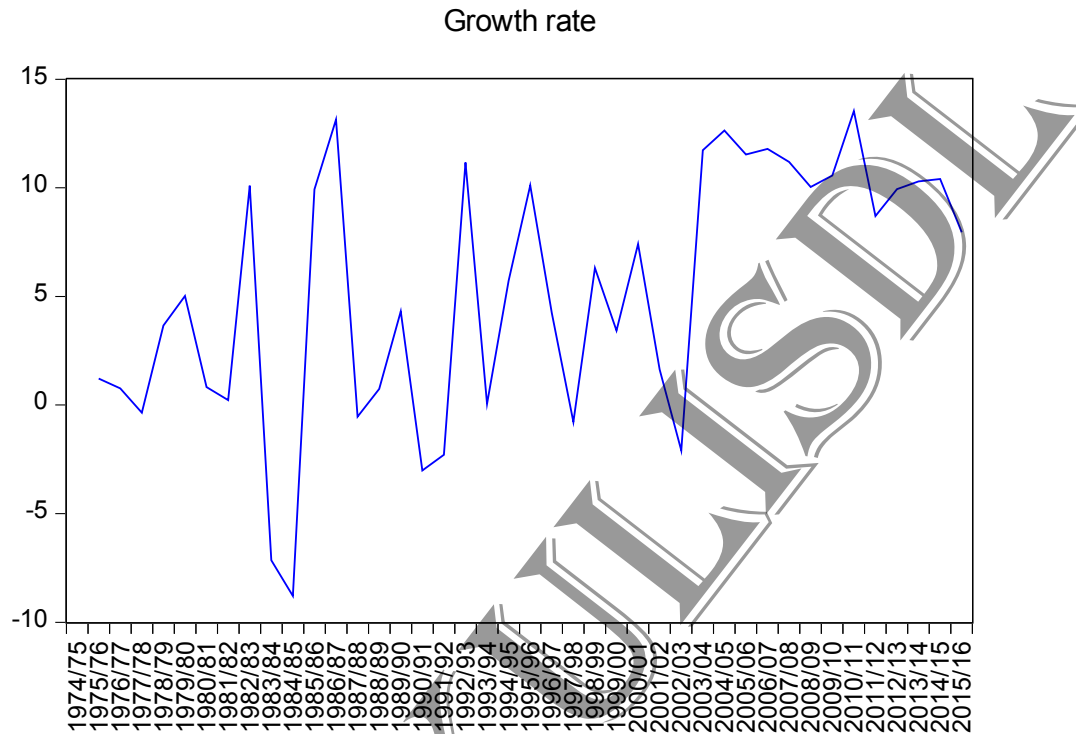
Source: Authors computations based on World Bank data base (2018)

As we have seen the blow figure (4.2) and the above table (4.1) the average rate of growth in real gross domestic product for the period 1975/76-1979/80 was 2.1 percent per annum. In next five year (1980/81-1984/85) real GDP growth rate has decelerated at an average 0.9 percent. In the last six year the period of military regime (1985/86-1990/91) the growth rate of real domestic product has increasing to 4.3 percent .This increment due to the double digit growth rates in 1985/86 and 1986/87 manly showing the recovery from the small base .in generally the growth rate trend of real gross domestic product in the military regime extremely irregular due to drought, war and lack of instability. According to (Eshetu and Mekonnen, 2005), which is cited by Tewdros (2015) the average growth of gross domestic product (GDP) and the per capita term was 1.6%and -0.7% respectively during 1974-1990 and this growth rate was for below the estimated population growth of 2.5 percent.

In the period 1991/92-1995/96 the overall real gross domestic product growth rate average 5.0 percent per annum. In the next five years (1996/97-2000/01), thought there was a drought in 1997/98 it has recorded an average growth rate of 4.1 percent. During the period 2001/02-2005/06 it has an average growth rate recorded 7.1 percent but in the year 2001/01 and 2002/03

the growth rate has negative because of drought .After 2003 rapid economic growth recorded for the next 12th years and the average annual growth rate Of 2006/07-2015 is still as high as 10.4 percent. From period 2004/05-2015/16 the lowest growth rate of real gross domestic product achieve in the year 2015/16 because of drought (Lalino and Ilono)

Figure 4. 2 Trend of growth rate of real GDP (1974 to 2015)



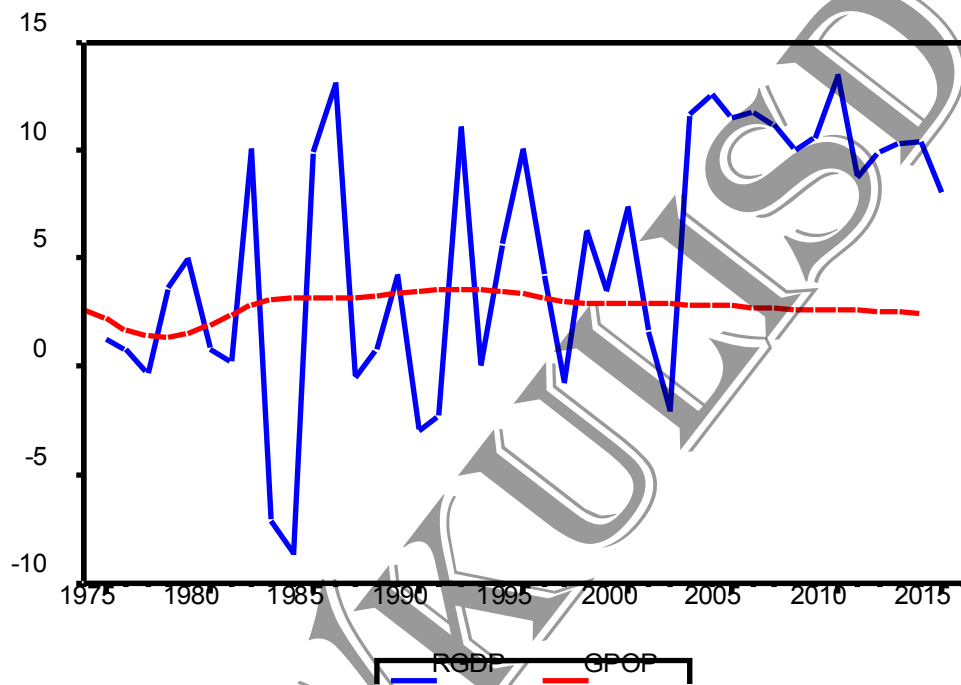
Source: Author computation based on NBE data (2018)

As we have seen figure 4.2 the economic growth fluctuated, which registered the highest growth rate 13.5 percent in year 2010 and lowest growth rate 8.8 percent below zero point in year 1984, which was due to best rain seasons, and catastrophic drought and famine, respectively. The RGDP of the country has experienced an increasing trend with an exceptional, the consecutive 13 years between 2003/04 and 2015 double digit registration of economic growth. This may be because of stability, may be government tendency for development through planning transformation program.

4.3 Growth rates in Real GDP and Population

In the least developing country in generally and Ethiopia in particularly more population more consumption even though more population is significant to provide surplus labor forces which helps the country in order to bring good economic growth. This is because of more population is put burden on the level of national saving and investment which were a good real GDP growth of one countries

Figure 4.3 The trend of population growth and economic development by proxy of RGDP



Source: Authors computations based on WB and NBE data (2018)

As figure (4.3) shows, from 1974/75 to 2015 population growth rate in Ethiopia was stable an average approximately 2.94 percent per year by contrast during the same period of time the state’s economic development as proxy of real gross domestic product was an even. Growth rate of real gross domestic product is it shows positive increment an average 2.1 percent in the year 1975/76 to 1980/81 and also become negative (-0.9) percent growth rate in the year between 1880/81-1984/85 then regained the place and also some increment in the year 1985/86 to 1990/91 .From the year real gross domestic product was highly volatile and from the year 2004 to 2015 an average the highest growth rate recorded.

In generally the trend show that there was slightly decline in the growth rate of population while the size of population was increasing from 31855294 and growth rate of population (2.63%) at the year 1974/75(2.43%) to 9939075 in the year 2015. Due to high (increasing) economic growth or real gross domestic product with decreasing rate of population growth per capital real gross domestic product has also increased. This shows that there was improvement of standard of life comparing with previous period over time with assuming other thing is constant.

4.4 Education and Population Growth

Expansion of education at all levels help to achieve more rapid technological adaptation and innovation and better natural resource management. It also one of the powerful instrument societies has for reducing deprivation and vulnerability. It helps to raise earning potentials, expand labor mobility, promotes the health of parent and children, and reduces fertility and child mortality. In other word, most problems that could rise from rapid population growth could be addressed through expansion of educational system

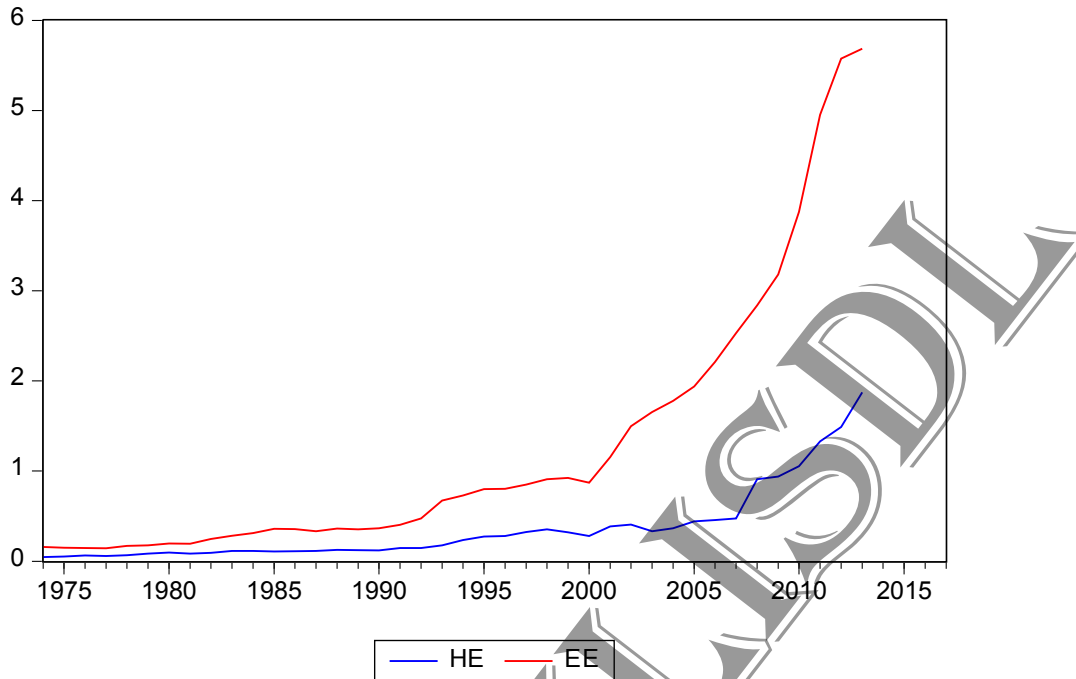
The higher the fertility and birth rates which are the cause for high population growth rate at national levels, the lower the capacity of the family to spend on education. As a result, children will be forced to be without schooling or will not go far in this respect. In this regard, the adverse effect of rapid population growth will be the pressure it place on existing education resources, namely unmatched funds to satisfy expressed needs, the low teacher student ratio and limited resource for equipment and infrastructure (UCPD, 2015).

The interrelationship between population and development education is one of the important instruments in addressing and resolving population issues. At the same time it is highly affected by rapid population growth as a result of in ability to provide education service and crowding which leads to excluding some of the children population from the school system.

There is a growing crisis in the sector in terms of availability and condition of educations facilities (EEA, 2009/10). These include overcrowded classes, low level of teacher qualifications and motivations as well as non-conducive over all learning environment. The increase in population size will aggravates the problem by widening the gap of unmet need for school enrolment. It is appropriate to analyze the trends of the government expenditure on education

percentage of real gross domestic product is used as one indicator to see the trend in the improvement of the education sector

Figure 4.4 The trend of government education and health percentage of real GDP



Source: Author computation based on NBE data (2018)

Figure 4.4 the trend of government education and health percentage of real GDP

As shown in figure the share of government expenditure on education to real gross domestic product increasing from average of 0.157percent in the year 1974/75-1979/80to an average of 0.265 in the years 1980/81-1985/86. During the years 1986/87-1990/91 the share has also increases to an average value of 0.354percent .However, during the military period there were forward and back ward movement year value of education expenditure to real gross domestic product. Between the years 1991-2000/01 the average share government education expenditure to real gross domestic product was .76 percent. During the years 2001/02 to2015 it has an average of education expenditure to real gross domestic product is 3.042 percent.

4.5 Health and Population Growth

Health service forms parts of the basic social needs of the society. Health is a factor in the development as a country's feature ultimately depends on the well-being of its population for the realization of its human potential. Improved health also contributes directly to the welfare, by reducing sickness and child mortality as well as by increasing life expectancy, and indirectly by increasing labor productivity. Good health contributes directly to economic growth while poor health drives poverty. The quality of health can be measured by low infant mortality rate, low child mortality, low maternal mortality rate, high life expectancy, and more access to safe water. But in Ethiopian case all of these factors are below that of sub-Sahara Africa. This indicates that, health sector is at its infant growth.

As we have seen above figure (4.4) health expenditure as percentage real gross domestic product increasing from average 0.083 percent in years 1974/75 to 1984/85 to average of 0.163 percent in the year 1985/86-1996/97. during the years 1997/98 to 2015 the share has also increase to an average value of 0.677 percent.

4.6 The Descriptive Analysis

Table (4.2) the descriptive statistics value of variables in the model

	RGDP	GPOP	GEE	GHE
Mean	5.263304	2.772698	1.571944	0.462477
Median	5.717199	2.858437	0.800000	0.275000
Maximum	13.53407	3.586200	7.337400	2.352800
Minimum	-8.791703	1.298359	0.143800	0.052900
Std. Dev.	5.861181	0.570795	1.933760	0.580799
Skewness	-0.450532	-0.929277	1.654037	1.949345
Kurtosis	2.246474	3.516049	4.663908	5.853373
Jarque-Bera	2.357018	6.355909	23.42457	39.87511
Probability	0.307737	0.041671	0.000008	0.000000
Sum	215.7955	113.6806	64.44970	18.96155
Sum Sq. Dev.	1374.137	13.03227	149.5771	13.49308
Observations	41	41	41	41

Source: Author computation based on NBE data (2018)

Table (4.2) above show that the mean or average values of the variables: growth rate of real GDP, population growth rate, government education expenditure percentage of real GDP and government health expenditure percentage of RGDP for the period 1974 to 2015 were 5.26,2.77,1.57 and 0.46 respectively. The maximum value for growth rate of real gross domestic product and population are 13.53 and 3.58 respectively .while the minimum value are -8.79 and 1.29 recorded in the year 1984 and 1978 respectively. The estimated standard deviation of the parameter estimates are 5.86 for growth rate of real GDP and 0.57 for growth rate of population. The Jarque-Bera test of normality is conducted to determine if the data being analyzed using OLS technique conforms to conditions of normality .Therefore, having a mean of 0 and constant variance the jarque-bera test of normality is based on OLS residuals. Skewness measure of asymmetry of a probability distribution about its mean .While kurtosis is the measure of tallness or flatness of the slope. Hence from the above table growth rate of population and real GDP are negatively skewed.

CHAPTER FIVE

RESULTS AND DISCUSSION

This chapter is aimed to discussing the result obtained from different tests, using the methodology proposed in the chapter three. First, the study begins with finding out the order of integration through the stationarity test. Second, the test of co-integration to determine whether there exist any co-integration vector or equation among the variables. Akaike Information Criterion (AIC) is used as a lag selection criterion in this regards. Third, the VAR and vector error correction mechanisms, to discover the short run and the long run relationship as well as the speed of adjustment back to equilibrium in the short run. Forth long run causality test. Finally, to check or applying test of volatility.

5.1 Unit Root Test

As clearly discussed under methodology chapter, it is necessary to test the nature of stationarity of the variables before running regression analysis. This helps us to avoid the possibility of running a spurious regression, which makes the result to be unreliable and inconsistent. This test can be done using the Augmented Dickey-Fuller (ADF) unit root tests. When the ADF test statistics is larger than the critical value in absolute terms at 5 % level of significance, the null hypothesis of unit root is rejected, and if the ADF test statistics is less than the critical value in absolute terms, we fail to reject the null hypothesis. To find the order of integration between the variable under consideration (LNRGDP, LNPOP, LNGCF, LNGHE and LNGEE), the study begin with testing for the presence of unit root in the variables by employing a univariate analysis for stationary. The results of ADF test for unit root of variables used in the study is presented in the following table (5.1). All variables are in logarithmic forms

Table (5.1) unit Root test (Augmented Dick Fuller)

Variables	Level			1 st difference		
	Statistics (constant)	Statistics(constant and trend)	Critical value at1%	Statistics(constant)	Statistics(constant and trend)	Critical value at 1 %
LNRGDP	4.109792	-0.0871917	-4.198503	-1.952411	-6.608519	-4.211868
LNPOP	-3.11599	-2.667514	-4.198503	-1.987482	-6.863110	-4.216868
LNGCF	0.614660	-2.149241	-4.198503	-4.835720	-5.349	-4.226815
LNGHE	1.048694	-1.32360	-4.198503	-4.560812	-6.470235	-4.211868
LNGEE	1.355894	-2.409589	-4.198503	-5.083870	-5.155300	-4.205004

Source: Author's calculations (2018) using Eview 9.0

As we have seen from table (5.1) unit root results of the series at level and first difference. The absolute values of the calculated test statistics for all variables intercept and intercept with trend at level are less than its critical value at 1% level of significance. The result indicates that all variables are non-stationary at level with constant and trend. Thus, the null hypothesis that each variable has unit root at a level cannot be rejected by ADF test. However, after first difference constant with trend the test statistic value of all variables are greater than the corresponding critical values. Therefore the variables become stationary at first difference intercept with trend and also real gross domestic product (LNRGDP), population growth (LNPOP), gross capital formation percentage of real GDP (LNGCF) government health expenditure percent of RGDP (LNGHE),and government education expenditure percentage of RGDP (LNGEE) are integrated of order on I (1).

Since the all variable are integrated of the same the next step is to find out whether these variables have along run relationship. In other words whether there exists equilibrium in the long run to determine this, the study adopts Johansen co integration test. However, before applying this test we need to determine first the appropriate lag length and check the stability of the VAR since Johansen's co integration test and thus VAR is very sensitive to lag length the determination.

5.2 Optimal Lag Length

In the Johansen approach, the first step in testing for co integration and estimation a VAR model is to determine the optimal lag length of the VAR. Johansen co integration analysis is very sensitive to the number of lags included in the model, the more lags we lose. If we include too few lags the size of the test will be incorrect.

The optimal lag order is determined with sequential modified likelihood ratio test statistics (LR), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SC) and the Hannan-Quinn Information Criterion (HQ).

Table (5.2) VAR lag order selection criteria

VAR Lag Order Selection Criteria

Endogenous variables: LNRGDP LNPOP1 LNGHE LNGEE

Lag	LogL	LR	FPE	AIC	SC	HQ
0	37.78868	NA	2.08e-06	-1.732753	-1.562131	-1.671535
1	296.2142	450.5881	8.33e-12*	-18.16483*	-16.31172*	-13.85874
2	351.4889	85.03796	1.14e-12	-14.17892	-14.64332	-15.62796
3	414.8235	84.44617*	1.09e-12	-16.60633	-15.38825	-17.81050*

Source: Author's calculations (2018) using Eview9.0

* indicates lag order selected by the criterion

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Lag that provides the minimum value is chosen as the optimal lag length that means among the information criterion that provides majority lag has been chosen as optimal lag length. While checking up to three lags order to include the 5% significance level suggest that lag one would optimum lag length in majority cases. The smaller the values of the information criteria the better the model. The study employs the optimal lag length of one for estimation techniques thus the next step is to estimate Johansen test of co integration.

5.3 Johansen Co-integration Results

The existence of the same order of integration, therefore, allows us to test for Co-integration among the variables. To determine the number of co integrating vectors two test statistics called the maximum Eigen value (λ_{max}) and trace statistics (λ_{trace}) are computed. The trace test tests the null hypothesis of r co integrating vectors against the alternative hypothesis of k co integrating vectors, where k is the number of endogenous variables, for $r = 0, 1, 2, \dots, k-1$. The maximum Eigen-value test, on the other hand, tests the null hypothesis of r co integrating vectors against the alternative hypothesis of $r+1$ co integrating vectors.

Table (5.3) Johansen co integration test of trace statistic

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.621289	91.96359	69.81889	0.0003
At most 1	0.484390	43.12426	47.85613	0.1148
At most 2	0.346436	26.62809	29.79707	0.1411
At most 3	0.181150	9.615485	15.49471	0.3115
At most 4	0.039722	1.621315	3.841466	0.2029

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's calculations (2018) using Eview 9.0

Table (5.3) is the trace statistics part of the Johansen test of co-integration the null hypothesis at none is rejected at 5% level of significance since the probability is 0.003 (less than 5%). Also the critical value at 5% level which 69.82 is less than the trace statistic value there is 91.96. The null hypothesis of at most one co-integration equation is not rejected with the probability accounted for 11.48% which greater than 5% level of significance. In the same manner in trace statistic is 47.85 less than critical value at 5% which is 43.12. Therefore according to trace statistic there exists one co integration equation among the variables under study

Table (5.4) Johansen co-integration test of maximum Eigen statistic

Unrestricted Co integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.621289	38.83933	33.87687	0.0118
At most 1	0.484390	26.49617	27.58434	0.0684
At most 2	0.346436	17.01261	21.13162	0.1714
At most 3	0.181150	7.994170	14.26460	0.3793
At most 4	0.039722	1.621315	3.841466	0.2029

Source: Author's calculations (2018) using Eview 9.0

Max-eigenvalue test indicates 1 co integrating equation at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table (5.4) reports the outcome of Johansen co-integration test under maximum Eigen value statistic. The null hypothesis of no co-integration equation is rejected at 5%level, because the probability 11.8% and also the critical value of maximum Eigen value is 33.87 which is less than its corresponding statistic which is 38.83. On the other hand, the null hypothesis of at most one co integration equation is not rejected since the probability is almost 68.4% which is greater than 5% and the critical value of maximum Eigen statistic is 27.58, which is greater than its corresponding statistic value that stands at 26.49. Thus both the trace statistic and maximum Eigen value suggest that is at most one co integration equation among the variables under study. This means that the variables have long run association ship. The existence of one co integrating vector suggests that the first row of β and first column of α matrices are important for further analysis .thus table below reports of β and α matrices of the long run equation.

Table 5.5 Unrestricted Co integrating Coefficients (normalized by $b'S11*b=I$):

Unrestricted Co integrating Coefficients (normalized by $b'S11*b=I$):

LNRGDP	LNPOP	LNGCF	LNGEE	LNGHE
-7.974389	-11.75766	-4.006873	10.29520	1.333415
-9.221251	-12.88812	-1.505017	3.467358	-5.320764
2.588334	2.434095	-7.454728	-2.796396	2.284855
-2.528443	9.037094	1.796266	-5.904735	5.249005
3.957547	-12.63039	-1.053777	0.937938	1.676951

Table 5.6 Unrestricted Adjustment Coefficients (alpha):

D(LNRGDP)	0.038755	-0.001452	-0.000330	0.006376	0.002436
D(LNPOP)	-0.000674	0.000183	4.38E-05	0.000137	0.000178
D(LNGCF)	0.038717	0.055183	0.073336	-0.013484	0.003261
D(LNGEE)	-0.007184	-0.036308	0.038150	0.014119	0.000941
D(LNGHE)	-0.003775	-0.057585	0.025145	-0.045957	0.003121
<hr/>					
1 Co integrating Equation(s):	Log likelihood		366.5729		
<hr/>					
Normalized co integrating coefficients (standard error in parentheses)					
LNRGDP	LNPOP	LNGCF	LNGEE	LNGHE	
1.000000	1.474427	0.502468	-1.291033	-0.167212	
	(0.34684)	(0.14604)	(0.16882)	(0.12614)	

Source: Author's calculations (2018) using Eview 9.0

Since the existence of only a unique co integrating vector is statistically supported in the Johnson's co integration test, only the first row of and the first column of in Table (5.5) and (5.6) respectively are happen to be the relevant entries. The values of obtained from the co integration show the speed of adjustment of the long run parameters towards the steady state and the deviation from long run equilibrium. For instance, the coefficients of population growth, government expenditure on education percentage of RGDP and government expenditure on health percentage of RGDP are negative indicating that their speeds of adjustment towards long run equilibrium. That is the speed of adjustment of LNPOP1, LNGEE and LNGHE adjusts to their long run equilibrium by 0.0674, 0.7184 and 0.3775 percent respectively. However, the coefficient of LNGCF is positive which indicates the extent to which those variables deviate from their long run steady state path after a certain shock.

5.4 Long Run Impact of Variables on Economic Development

Table 5.7 Estimates of β coefficients normalized to LNRGDP

Vector Error Correction Estimates

Date: 05/26/18 Time: 00:43

Sample (adjusted): 1976 2015

Included observations: 40 after adjustments

Standard errors in () & t-statistics in []

Co integrating Eq:	CointEq1
LNRGDP(-1)	1.000000
LNPOP(-1)	1.474427 (0.34684) [4.25101]
LNGCF(-1)	0.502468 (0.14604) [3.44071]
LNGEE(-1)	-1.291033 (0.16882) [-7.64728]
LNGHE(-1)	-0.167212 (0.12614) [-1.32559]
C	-37.85822

1 Co integrating Equation(s): Log likelihood 366.5729

Normalized co integrating coefficients (standard error in parentheses)

LNRGDP	LNPOP	LNGCF	LNGEE	LNGHE
1.000000	1.474427 (0.34684)	0.502468 (0.14604)	-1.291033 (0.16882)	-0.167212 (0.12614)

Source: Author's calculations (2018) using Eview 9.0

The long run relationship is derived by normalizing growth in real GDP from the above table 5.7 and also the log run co-integration equation can be written as:

$$\text{LNRGDP} = -1.474\text{LNPOP} - 0.502\text{LNGCF} + 1.291\text{LNGEE} + 0.167\text{LNGHE} + 37.85 \text{ ----- (4.1)}$$

From the above equation it can observe that LNPOP is negative and statistically significant relationship with real GDP in long run this result is line with the pessimistic arguments of Malthus (1978), Solow growth model (1956) and Bucci (2003) were population growth

adversely affects economic growth in the long run. Moreover, the study result consistence with study of Jhahjaha (2015) in Bangladesh, Stund and Aminu (2012) the comparative review of population growth between developing and developed nations including Ethiopia, Gidisa and Haile (2012) in Ethiopia and Dao (2012) in 43 developing countries. As a result a1% change in LNPOP (new birth) is resulted in decrease the real GDP by 1.474 percent on average in long run under study period. The estimated result that LNGEE positive and statistically significant relationship with real GDP in log run. The result is similar with the result founds by Tewodros (2014) and Kidanemariam (2013) in Ethiopia. A one percent increase in LNGEE result in 1.291 percent increase in real gross domestic product on average in long run. However, LNGHE is positive and statistically insignificant relationship with real GDP in long run. This might be due to the government expenditure on health percentage of RGDP may not be a good proxy for health sector development. The finding of LNGCF is negative impact with economic development. This unexpected sign of gross capital formation similar to the finding of Martha (2008) and Kidanemariam (2013) in Ethiopia. The unexpected sign of the coefficient of LNGCF contradicts with the economic growth theories. That means an increasing in the gross capital formation the country has been negatively affecting the real domestic product of the country. This contrary result might happen because of poor infrastructure, low savings, backward means of production and mismanagement system of government administration. But it is difficult to justify the exact reason behind such result. Hence, further detailed research should be done to identify the reason behind such result.

To examine the impact of variables used in the study on economic development we can run VAR mode

Table (5.8) VAR estimation of coefficient

Dependent Variable: LNRGDP

Method: Least Squares

Date: 05/26/18 Time: 00:49

Sample (adjusted): 1975 2015

Included observations: 41 after adjustments

$$\text{LNRGDP} = \text{C}(1) * \text{LNRGDP}(-1) + \text{C}(2) * \text{LNPOP}(-1) + \text{C}(3) * \text{LNGCF}(-1) + \text{C}(4) * \text{LNGEE}(-1) + \text{C}(5) * \text{LNGHE}(-1) + \text{C}(6)$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.899202	0.065826	13.66023	0.0000
C(2)	-0.235478	0.150503	-1.564606	0.1267
C(3)	-0.083733	0.049484	-1.692126	0.0995
C(4)	0.196362	0.073205	2.682346	0.0111
C(5)	0.035871	0.046780	0.766799	0.4483
C(6)	5.358389	3.178064	1.686054	0.1007
R-squared	0.995048	Mean dependent var		12.22455
Adjusted R-squared	0.994340	S.D. dependent var		0.620033
S.E. of regression	0.046646	Akaike info criterion		-3.157990
Sum squared resid	0.076156	Schwarz criterion		-2.907223
Log likelihood	70.73879	Hannan-Quinn criter.		-3.066674
F-statistic	1406.471	Durbin-Watson stat		2.098761
Prob(F-statistic)	0.000000			

Source: Author's calculations (2018) using Eview 9.0

The result in the above table shows the long run impacts of independent variables with growth in LNRGDP for the acceptable lag length.

The result show that LNRGDP (-1) and LNGEE (-1) are statistically significant meaning in the long run the impact on economic development. Is observed from the previous one year of growth in real GDP itself on average it can be explained that 1% increase in the previous one year real GDP increase the current real GDP growth by 0.89% on average and 1% increasing in the previous one year government education expenditure percentage of real GDP is increase the growth rate of real GDP by 0.196% on average.

Among the coefficients of variables only two variables are statistical significance however measuring the statistical significance of two independent variables jointly would be very

important in order to clearly say whether two independent variables at a given lag length are jointly significant or not. Wald test of coefficient restriction is examined with null hypothesis of two coefficients can't jointly influence dependent variable, against the alternative hypothesis of joint influence dependent variable. The following table shows Wald test of coefficient restriction

Table (5.9) Wald coefficient restriction

Wald-coefficient restriction	Year effect	Chi-square	Probability
C(1)=c(2)	1	183.7171	0.00
C(2)=c(3)	1	4.0938	0.1291
C(3)=c(4)	1	8.237751	0.0163
C(4)=c(5)	1	7.548513	0.0230
C(5)=c(6)	1	4.4079	0.1107

Source: Author's calculations (2018) using Eview 9.0

Performing the joint significance of coefficients provided that the coefficients for growth in real GDP and LNPOP both at lagged year one jointly affect economic development for the period under investigation. The one year lagged value of both LNGCF and LNGEE jointly affect economic development and LNGEE lagged year one and LNGHE at lagged one year jointly affect economic development for the period under investigation.

Furthermore, this study was applied Wald tests on the various null hypothesis involving sets of regression coefficients. The results are shown below the table. The P-value indicates that we reject the null hypothesis that regression coefficients of all the variables in the LNRGDP equation are equal to zero. The null hypothesis that regression coefficients in each equation are equal to zero is also rejected as shown by the p-values

Table (5.10) Wald coefficient restriction

Wald Test:

Equation: Untitled

Test Statistic	Value	Df	Probability
F-statistic	2741.318	(5, 35)	0.0000
Chi-square	13706.59	5	0.0000

Null Hypothesis: $C(1)=C(2)=C(3)=C(4)=C(5)=C(6)$

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(6)	-4.459187	3.223799
C(2) - C(6)	-5.593867	3.324797
C(3) - C(6)	-5.442122	3.190953
C(4) - C(6)	-5.162027	3.117139
C(5) - C(6)	-5.394259	3.169342

Restrictions are linear in coefficients.

Source: Author's calculations (2018) using Eview 9.0

5.5 The Long Run Model Stability and Diagnostic Test

To check the verifiability of the estimated long run model, some diagnostic test is undertaken. Priority in doing any analysis, we required to check the standard property of the model. In this study we carried a number of model stability and diagnostic checking, which includes Serial correlation test (LM test), Normality (Jaque-Bera test), and Hetroscedasticity test. In addition to the above diagnostic tests, the stability of long run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. In order to reject or accept the null hypothesis, we can decide by looking the p-values associated with the test statistics. That is the null hypothesis is rejected when the p-value are smaller than the standard significance level (I.e. 5%).

Appendix 1 show that the long run model estimated in this study passes all the diagnostic tests. This is because the p-value associated with both the LM version and the F version of the statistics was unable to reject the null hypothesis specified for each test. Therefor based on the result of the test:

I. Breusch-Godfrey Serial Correlation LM Test

The null hypothesis of no serial correlation (LM test) is failed to reject for the reason that at lag two the p-values associated with test statistic is greater than the standard significant level (I.e. $0.7390 > 0.05$). Her LM test for testing serial correlation is applied because unlike the traditional Durbin Watson test statistic which is totally inapplicable when the lagged dependent variable appear as a repressors, LM test avoid such limitation of DW test.

II. Normality test

The second diagnostic test is about the residual test. As the result indicates that we could not reject the null hypothesis which says that the residuals are normally distributed, for the reason, that the p-value associated with the Jaque-Berra, kurtosis and skewness normality tests are larger than the standard significance level ($0.249245 > 0.05$).

III. Heteroskedasticity Test: Breusch-Pagan-Godfrey

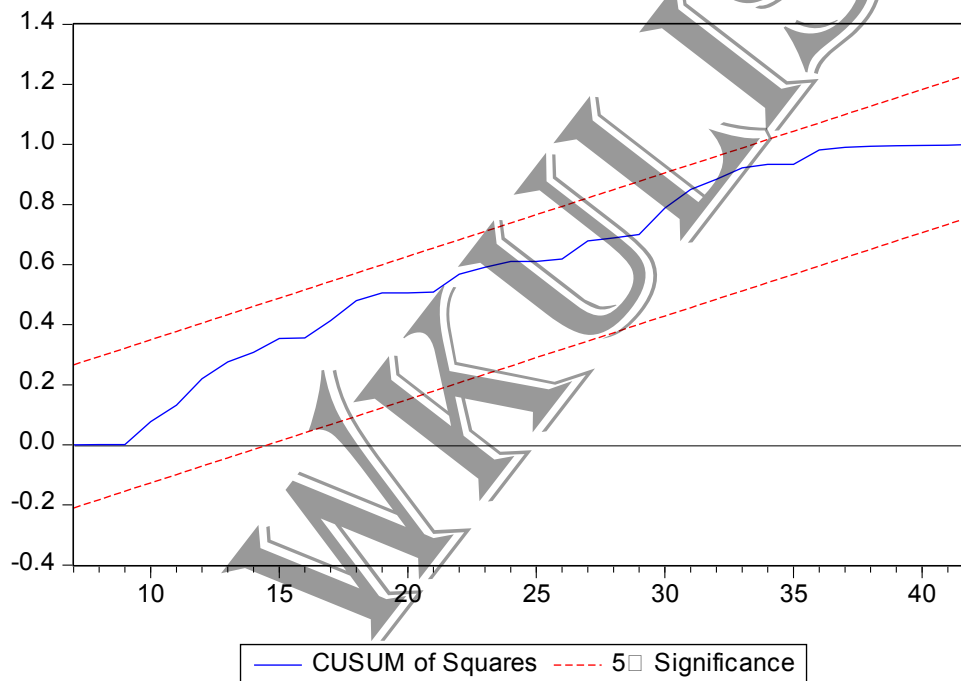
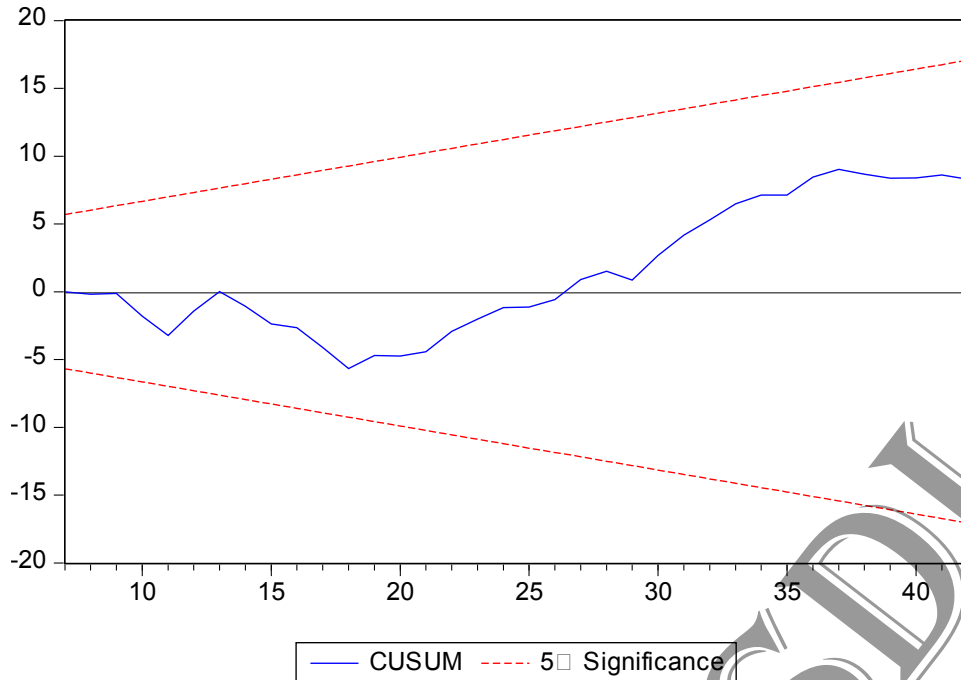
The last diagnostic test is for hetroscedasticity test. As we have seen from the appendix1, we could not reject the null hypothesis at 5% significant level due to its p-value associated with the test statistics are greater than the standard significance level(I.e. $0.1605 > 0.05$).

The p-value associated with both LM version and the F version of the statistics was unable to reject the null hypothesis specified for each test. Therefore the study passes all the diagnostic tests appropriately.

Moreover, the stability of the model for long run relationship is detected by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of

Recursive residuals (CUSUMSQ) tests. The test finds serious parameter instability if the Cumulative sum goes outside the area (never returns back) between the two critical lines.

Figure 5.1 The cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of Recursive residuals (CUSUMSQ) tests



Source author's calculations (2018) using Eview 9.0

As can be seen from the first figure, the plot of CUSUM test did not cross the critical limits. Similarly, the CUSUMSQ test shows that the graphs do not cross the lower and upper critical Limits. So, we can conclude that long run estimates are stable and there is no any structural break. Hence the results of the estimated model are reliable and efficient.

5.6 The Short Run Impact of Variables on Economic Development (VECM)

Having obtained the long run model and estimated coefficients, the next step is to estimate Vector Error Correction Model (VECM), which captures both the long run and short run relationship. The change in the variables represent variation in the short run, while the coefficients obtained for the error correction term represents the speed of adjustment towards the long run relationship. A VECM was estimated starting with the general over parameterized model.

Table (5.12) Estimation of VECM

Dependent Variable: D(LNRGDP)

Method: Least Squares

Date: 05/26/18 Time: 00:45

Sample (adjusted): 1976 2015

Included observations: 40 after adjustments

$$D(LNRGDP) = C(1) * (LNRGDP(-1) + 1.47442747696 * LNPOP1(-1) + 0.502467708421 * LNGCF2(-1) - 1.29103299097 * LNGEE(-1) + 0.167212152846 * LNGHE(-1) - 37.858215105) + C(2) * D(LNRGDP(-1)) + C(3) * D(LNPOP(-1)) + C(4) * D(LNGCF(-1)) + C(5) * D(LNGEE(-1)) + C(6) * D(LNGHE(-1)) + C(7)$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)=CointEq1	-0.309044	0.051696	-5.978063	0.0000
C(2)=D(LNRGDP(-1))	0.030788	0.128410	0.239766	0.8120
C(3)=D(LNPOP(-1))	-4.315258	1.367345	-3.155941	0.0034
C(4)=D(LNGCF(-1))	0.064638	0.041695	1.550264	0.1306
C(5)=D(LNGEE(-1))	-0.230872	0.091560	-2.521536	0.0167
C(6)=D(LNGHE(-1))	-0.013707	0.046157	-0.296975	0.7683
C(7)=C	0.192274	0.043395	4.430778	0.0001
R-squared	0.581328	Mean dependent var		0.051487
Adjusted R-squared	0.505206	S.D. dependent var		0.058288
S.E. of regression	0.041001	Akaike info criterion		-3.392821
Sum squared resid	0.055475	Schwarz criterion		-3.097267
Log likelihood	74.85641	Hannan-Quinn criter.		-3.285958
F-statistic	7.636788	Durbin-Watson stat		2.157895
Prob(F-statistic)	0.000034			

Source: Author's calculations (2018) using Eview 9.0

The speed of adjustment or the lagged error correction term (ECT) from the above is represented by C (1) and come up with the expected sign and level of significance. That implies 30.9% of the

disturbance in the short run is corrected each year or it adjusts any disequilibrium towards long run equilibrium state path will be correcting in one year. When a shock occurs in the system each year about 30.9% of it will be adjusted towards its long run equilibrium.

Table (5.12) shows the coefficients estimates from the framework of VECM. The Error correction mechanism (ECM 1) provides a means whereby a proportion of the disequilibrium is corrected in the next period. Thus, an error correction mechanism is a means to reconcile the short-run and long run behavior. Considering the result in Table (5.12), the coefficient of ECM1 (which is also known as the speed of adjustment toward equilibrium or coefficient of the co-integrated model), is not only negative but also significant i.e. the coefficient accounted for -0.309 and the probability accounted for 0.00. It is also important to mention that apart from DLNPOP (-1) is significant in explaining the variation in the dependent variable because their corresponding probability value is less than 5%.

The goodness of fit of the explanatory variables in explaining the explained variable accounted by R-squared is 57.8%. This shows that the independent variables explain almost 58.13% variation in the dependent variables. The Durbin – Watson statistic that captures the presence of serial correlation in the residuals is 2.157 which signifies absence of autocorrelation in the model. The F – statistic is also high accounted for 7.837 and its corresponding probability value is 0.000034.

The impact of lagged population considered in short run negative and significant effect on the real GDP as one period increment in population (new birth) has decrease on average 4.31 percent real GDP. This result supports with different empirical studies (Gideon K. et al (2010) in Kenya, Adediran (2014) in Nigeria, Gidisa and Haile (2012) in Ethiopia) and also the pessimistic economists such as Malthus point out that large population can bring problems in both short run and long run. In general, the short run result output implication explains that large number of economically inactive people with high growth rate of population depresses the real GDP growth of the country.

The short run gross capital formation percentage of real GDP is found to be negative but it is insignificant this may be due to a crowding out of public expenditure by rapid increasing population. The goodness of fit of the explanatory variables in explaining the explained variable accounted by R-squared is 93%. This shows that the independent variables explain almost 93%

variation in the dependent variables. The Durbin – Watson statistic that capture the present of serial correlation in the residuals is 1.853 which signifies absence of autocorrelation in the model. The F – statistic is also high accounted for 77.62 and its corresponding probability value is 0.000

5.7 Short Run Model Stability and Diagnostics Test

To check the verifiability of the estimated short run model, some diagnostic test is undertaken. Priority in doing any analysis, we required to check the standard property of the model. In this study we carried a number of model stability and diagnostic checking, which includes Serial correlation test (LM test), Normality (Jaque-Bera test), and Heteroscedasticity test. In addition to the above diagnostic tests, the stability of short run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. In order to reject or accept the null hypothesis, we can decide by looking the p-values associated with the test statistics. That is the null hypothesis is rejected when the p-value are smaller than the standard significance level (I.e. 5%).

Appendix 2 show that the short run model estimated in this study passes all the diagnostic tests. This is because the p-value associated with both the LM version and the F version of the statistics was unable to reject the null hypothesis specified for each test. Therefore based on the result of the test:

I. Breusch-Godfrey Serial Correlation LM Test

The null hypothesis of no serial correlation (LM test) is failed to reject for the reason that at lag two the p-values associated with test statistic is greater than the standard significant level (I.e. $0.2641 > 0.05$). Her LM test for testing serial correlation is applied because unlike the traditional

II. Normality test

The second diagnostic test is about the residual test. As the result indicates appendix2 that we could not reject the null hypothesis which says that the residuals are normally distributed, for the reason, that the p-value associated with the Jaque-Berra, kurtosis and skewness normality tests are larger than the standard significance level ($0.07281 > 0.05$).

III. Heteroskedasticity Test: Breusch-Pagan-Godfrey

The last diagnostic test is for heteroscedasticity test. As we have seen from the appendix 3, we could not reject the null hypothesis at 5% significant level due to its p-value associated with the test statistics are greater than the standard significance level (I.e. $0.0822 > 0.05$).

The p-value associated with both LM version and the F version of the statistics was unable to reject the null hypothesis specified for each test. Therefore the study passes all the diagnostic tests appropriately.

Moreover, the stability of the model for short run relationship is detected by using the Cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of Recursive residuals (CUSUMSQ) tests in appendix 4. The test finds serious parameter instability if the

Cumulative sum goes outside the area (never returns back) between the two critical lines.

As can be seen from appendix 4 the first figure, the plot of CUSUM test did not cross the critical limits. Similarly, the CUSUMSQ test shows that the graphs do not cross the lower and upper critical Limits. So, we can conclude that short run estimates are stable and there is no any structural break. Hence the results of the estimated model are reliable and efficient.

5.8 Granger Causality Test (Long Run Causality Test)

The dynamic relationship is the simplest technique use to examine the cause and effect relationship between variables in bivariate system and it is applied in the context of the simple linear regression model. However, the simple linear regression model fails to capture the underlying dynamic causality between variables which is efficiently analyzed by Granger (1969) in terms of the Granger causality tests.

To further investigate the dynamic relationship between the variable, we employed Granger causality test using the VAR model. The institution behind of this test is that to find out whether changes in one variable cause the other to change. In order to infer the direction of causation between two variables, the granger causality test analysis must make sense. The following table shows Granger causality test for population growth and economic development in Ethiopia.

Table (5.11) Log run Granger causality test

Pairwise Granger Causality Tests

Date: 05/26/18 Time: 00:51

Sample: 1974 2017

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNPOP does not Granger Cause LNRGDP	41	2.22398	0.1441
LNRGDP does not Granger Cause LNPOP		18.9096	0.0001
LNGCF does not Granger Cause LNRGDP	41	0.43356	0.5142
LNRGDP does not Granger Cause LNGCF		11.7178	0.0015
LNGEE does not Granger Cause LNRGDP	41	5.03174	0.0308
LNRGDP does not Granger Cause LNGEE		0.10723	0.7451
LNGHE does not Granger Cause LNRGDP	41	0.93402	0.3399
LNRGDP does not Granger Cause LNGHE		12.3047	0.0012
LNGCF does not Granger Cause LNPOP	41	0.00986	0.9214
LNPOP does not Granger Cause LNGCF		11.2614	0.0018
LNGEE does not Granger Cause LNPOP	41	4.02249	0.0521
LNPOP does not Granger Cause LNGEE		3.48433	0.0697
LNGHE does not Granger Cause LNPOP	41	3.48359	0.0697
LNPOP does not Granger Cause LNGHE		2.57010	0.1172
LNGEE does not Granger Cause LNGCF	41	16.0648	0.0003
LNGCF does not Granger Cause LNGEE		1.93028	0.1728
LNGHE does not Granger Cause LNGCF	41	16.2904	0.0003
LNGCF does not Granger Cause LNGHE		0.03565	0.8512
LNGHE does not Granger Cause LNGEE	41	0.22002	0.6417
LNGEE does not Granger Cause LNGHE		7.83157	0.0080

Source: Author's calculations (2018) using Eview 9.0

As can be seen from the above table the null hypothesis of no causal relationship between LNPOP and LNRGDP, running from population growth to economic growth could not be rejected at 5% level. However, the null hypothesis of no causal relationship running from LNRGDP to LNPOP could be rejected at 5% level of significance with the probability accounted 0.0001 which is highly significant. Thus, there is unidirectional Granger causality between LNPOP and LNRGDP, that running from economic growth to population growth. This result is line with the findings of Gidisa and Haile (2012) in Ethiopia and Jhahjahn (2015) in Bangladesh. The result implies that economic development in Ethiopia had agentive relationship on

population growth in the long run and also further research studies may want to identify the factors that could have caused such causality.

The relationship between LNRGDP and LNGCF according to table (5.11) can be said to be a unidirectional Granger causality between economic growth and gross capital formation. That, the null hypothesis of no Granger causality between two variables running from LNGCF to LNRGDP is accepted with the probability accounted for 51% which is greater than the required 5% level to reject it. However, the null hypothesis of no Granger causality between LNGCF and LNRGDP that running from LNRGDP to LNGCF could be rejected at 5% level of significance. Therefore, the unidirectional Granger causality from LNRGDP to LNGCF in Ethiopia during study period. This shows that economic growth facilitates investment.

According to the results reported in table (5.11), the null hypothesis that LNGEE does not Granger-cause LNRGDP could be rejected at the 0.0308 level of significance. The results indicate that in Ethiopia LNGEE Granger-causes LNRGDP in the long run. On the other hand the null hypothesis that LNRGDP does not Granger-causes LNGEE could not be rejected. Also, it has detected a unidirectional long run causality from LNGEE to LNRGDP. These findings indicate that improvement in education expenditure enhance economic development. The null hypothesis that LNGHE does not Granger causes LNRGDP could not be rejected but, the null hypotheses LNRGDP does not Granger causes LNGHE rejected at the 0.0012 level of significance. Therefore, the result indicate that a unidirectional long run causality from economic development to government health expenditure percentage of RGDP.

5.9 Impulse Response and Variance Decomposition Analysis

To analyze the impulse response and variance decomposition, the first step is to check the stability of the VAR model. As we have seen above several tests the model is stable. Hence it is possible to undertake impulse response and variance decomposition analysis.

I. Impulse Response

The impulse response function shows the increment to each variable due to one standard error shock of the other variable taking in to account all interactions between the variables. The impulse responses are eventually expected to converge to a level that is consistent with the estimated long run co-integrating relationship. Thus, the study uses generalized impulse response functions and in each case the shock to each variable is one standard error shock. The graphical representation of impulse responses to a one period shock on the variables are represented in appendix (4).

As shown in the appendix the response of real gross domestic product to shocks emanating from the population growth is positive both short run and long run and also real gross domestic product responds positively with government education expenditure percentage of real gross domestic product and government health expenditure percentage of real gross domestic product in the long and short run.

II Variance Decomposition

Variance decomposition depicts the proportion of movements in one variable that are due to errors in own shocks and to each other variables in the system. Basically they give information on how important is each variable in explaining variations in the variable in question in the system. The following table summarizes the variance decomposition of real GDP.

Table (5.13) the variance decomposition of real GDP.

Period	S.E.	LNRGDP	LNPOP	LNGCF	LNGEE	LNGHE
1	0.046544	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.064846	91.09117	0.050008	2.161393	6.203248	0.494182
3	0.080448	81.81618	0.121502	4.054249	12.64052	1.367545
4	0.094242	74.56444	0.202149	5.302146	17.66347	2.267798
5	0.106400	69.09786	0.291445	6.098016	21.46462	3.048063
6	0.117058	64.92041	0.391041	6.611680	24.39902	3.677842
7	0.126363	61.64783	0.502766	6.947511	26.73244	4.169456
8	0.134462	59.01580	0.628322	7.167064	28.64266	4.546151
9	0.141494	56.84525	0.769299	7.307418	30.24730	4.830737
10	0.147584	55.01375	0.927196	7.391731	31.62494	5.042389

The variance decomposition of real gross domestic product, which is represented in the above table, show that in the early periods the forecast error of this variable in question is attributed to the variable itself. The deviation explained by the real gross domestic product decreases to 55.01 percent in the tenth period from as much as variation real gross domestic product explained by the variation population growth is insignificant explained zero in the first period and rises to around 0.927 percent in the tenth period. The variation of RGDP due to variation of GCF, GEE and GHE percentage of real GDP is zero at the first period for both case although, has increase to 7.39, 31.62 and 5.04 percent respectively .In generally the contribution of GEE percentage of RGDP to the variation in the forecasting error of real gross domestic product greater as compared to other variable in the model.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study is based on a time series data covering a time period of 1974 to 2015 and analyzed the impact of population growth on economic development of Ethiopia. Both descriptive and econometric methods of analysis were employed. The descriptive analysis shows existence of high population growth and the average growth rate of population is 2.77 in Ethiopia during study period. Based on the trend of population and economic growth while there exist persistence increment in population size and real GDP there is slight fluctuation in real GDP over time. The econometric analysis the study employed different test such as unit root, Johansen co-integration test and Granger causality test are employed. To determine the long run and short run relationship among the variables VAR and VEC models was applied. The Johansen co integration test show that one co integration equation between the variables. The long run VAR result indicated that population growth is negative and statistically significant relation with economic development and government education expenditure percentage of real GDP is positive and statistically significant with real GDP. Based on a VECM of short run estimated result show that the one year lagged population growth is negative and statistically significant relationship with real GDP. On the other hand, the short run speed of adjustment as measured by the coefficient of error correction term dictated by a previous year shock (dis equilibrium) adjusts by 30.9 percent per annum in the model.

In general, the econometric result show that population growth has significant and negative impacts on economic development in Ethiopia both short run and long run during the study period.

6.2 Recommendations

The study suggests that high rate of population growth has negative effect on economic development in Ethiopia both in short run and long run. Thus, to avoid these negative effects of population growth the government and any other concerned body of the country have to control the effect of population growth via different measures. Therefore, the policy to be adopted may include the following points among others.

Thus, the first policy implication suggests by this study is that government and any concerned body of the country working strongly to educate people about the bad consequences of population growth on economic development via methods like formal and informal media, having constant conference for the discussion of bad effect of having more children.

Second, the government of Ethiopia should be allocated large amount of fund in the provision of infrastructures in order to minimize the problem of large population growth in short run and maximize the benefits in long run and also encouraged labor intensive technology.

Third, the study suggests that the government should be investing more resource in human capital development through quality of education and providing basic health services to the society. Thus educated and healthy societies will bring the technology and innovation, which is believed as enhance of economic development.

Fourth, concerted effort by the government to focus on the population growth by providing an integrated approach and political leadership is needed to highlight the issues and coordinate solutions.

Fifth, the government of Ethiopia should be reviews policies regarding population issues that affect economic development.

Generally, In order to design and implement realistic policies regarding population issue that affect economic development of the country. Further, researches should be studied by incorporating other variables.

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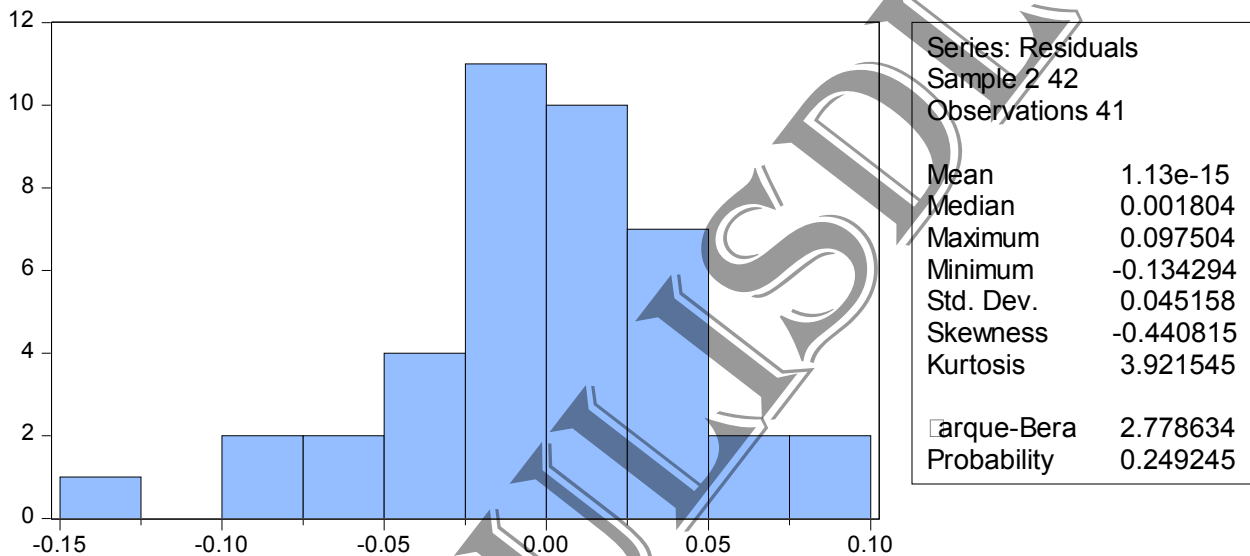
Appendix (1) long run model diagnostic testes

1.1 Serial correlation for VAR

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.112774	Prob. F(1,35)	0.7390
Obs*R-squared	0.131682	Prob. Chi-Square(1)	0.7167

1.2 Normality test of VAR



1.3 Heterosedasticity test of VAR

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.750016	Prob. F(4,36)	0.1605
Obs*R-squared	6.674469	Prob. Chi-Square(4)	0.1541
Scaled explained SS	7.516861	Prob. Chi-Square(4)	0.1110

Appendix (2) Short run model diagnostics testes

2.1 Serial correlation LM test of VECM

Breusch-Godfrey Serial Correlation LM Test:

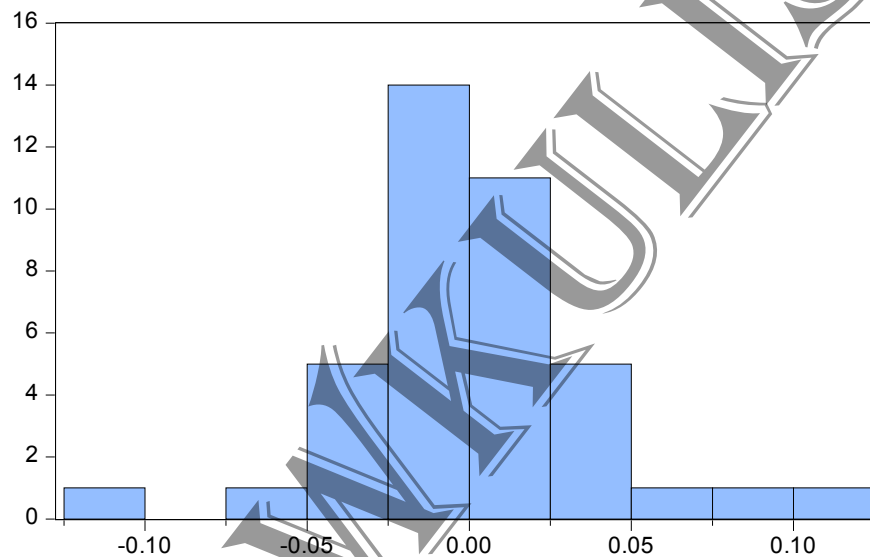
F-statistic	1.292036	Prob. F(1,32)	0.2641
Obs*R-squared	1.552366	Prob. Chi-Square(1)	0.2128

2.2 Heteroskedsticity test Of VECM

Heteroskedasticity Test: Breusch-Pagan-Godfrey

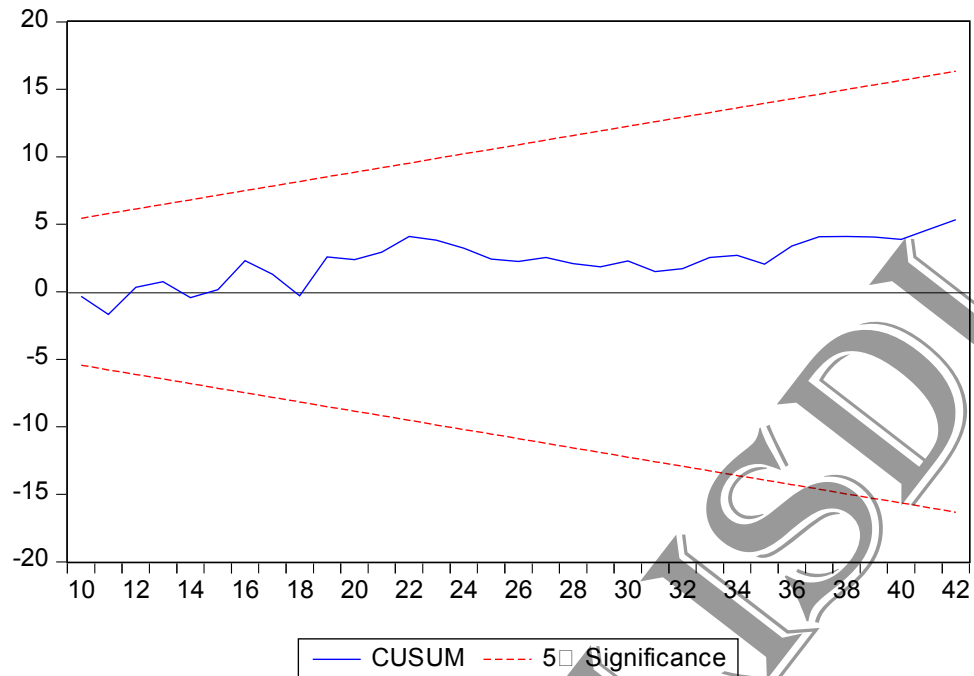
F-statistic	1.926135	Prob. F(10,29)	0.0822
Obs*R-squared	15.96420	Prob. Chi-Square(10)	0.1007
Scaled explained SS	20.36849	Prob. Chi-Square(10)	0.0260

2.3 Normality test of VECM



Series: Residuals	
Sample 3 42	
Observations 40	
Mean	3.99e-16
Median	-0.001601
Maximum	0.100230
Minimum	-0.111661
Std. Dev.	0.037858
Skewness	0.145187
Kurtosis	4.749157
Jarque-Bera	5.239779
Probability	0.072811

Appendix4 short run model stability test



Appendix5 impulse response

