

Addis Ababa University  
**School of Graduate Studies**

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***Impact of Population Growth on the  
Ethiopian economic Performance***

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*This is to certify that thesis prepared by Kassahun Alemu, entitled: **The Impact of Population Growth on the Ethiopian Economic Performance** and submitted in Partial Fulfillment of the Requirements for the Degree of Master of Art in Economics in Applied Economic Modeling and Forecasting (concentrated to Fiscal Policy Analysis and Managment) complies with the regulations of the university and meets the accepted standards with respect to originality and quality.*

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## Abstract

*Ethiopia is the second populous country in Africa while it is one of the Sub-Saharan Countries trapped by poverty. Her population is increasing at an average rate of 2.5%. Thus the objective of this study to examine whether population growth has its own bad effects on the Ethiopian economy*

*Population may be considered a major factor for the abject poverty trap of the country in the period 1970/71-1990/91 since per capita income was very low. Although there has been registered improvement of economic performance since 2004/05, population growth has been still high though the rate has been decreasing. Econometric analysis has shown that population growth has had a significant negative impact in the short run but that of positive impact in the long run on the economic performance of the country.*

*Thus realistic population policies should be designed and implemented to adjust/control high rate of population growth and make it a beneficial resource for the economy. For instance minimizing high birth rate can be an effective policy instrument since high birth rate can be a burden on the economy. Moreover, further research should be done to identify productivity of population.*

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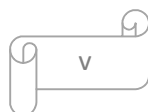
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## Acronym

CSA= Central Statistical Agency

DCs = Developed Countries

ECA= Economic Commission of Africa

EEA= Ethiopian Economic Association

GDP= Gross Domestic Product

GKF= Gross Capital Formation

LDCs= Less Developed Countries

MEDaC=Ministry of Economic Development and Cooperation

MOFED= Ministry of Finance and Economic Development

IMR= Infant Mortality Rate

IMF= International Monetary Fund

NBE=National Bank of Ethiopia

NOP= National Office of Population

OPHCC= Office of Population and Housing Census Commission

pcGDP= per capita GDP

PCI= per capita Income

POP=Population

TFR=Total Fertility Rate

UN=United Nations

UNDP= United Nation Development

WB= World Bank

# Chapter One

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## 1. Introduction

### 1.1. Background

Population growth and economic growth are highly interrelated since they affect each other. Their relation has attracted the attention of economists since economics was established as self-discipline. For example, Adam Smith, called the father of economics, wrote that “the annual labor of every nation is the fund which originally supplies it with all necessaries and conveniences of life.” (Jhagan, 2002: 377). Thus the interaction between population growth and economic growth has been recognized as one of the most fashionable topics.

World population is increasing with changing economic system. In the recent world, however, population growth has different consequences for the two groups of countries in the world of economic development. For the Developed Countries (DCs), its growth has helped changing their economics because they are already wealthy, have abundant capital and scarce labor force (Ibid). So a high growth rate of population has led to a rapid increase in productivity. This implies that increase in population has resulted in a more than proportionate increase in the GDP. Therefore, they have enough food to eat, they are literate and live in good health (Todaro, 1994: 381).

Nevertheless, the conditions prevailing in the Developing Countries, usually called Less Developed Countries (LDCs), are quite different from these DCs economies. Their economies are poor in performance, scarce in capital but have abundant labor (Jhagan, 2002: 377). Todaro argued that the peoples of LDCs live in low level of living standards which are manifested quantitatively and qualitatively in the forms of low incomes (poverty) inadequate housing and poor

health, limited or no education, high infant mortality, low life expectancy, etc. (Todaro, 1994: 381). The implication is that the LDCs are characterized by high population growth as well as greater burden on economy. Therefore, population growth may be blamed as a major reason to their economic backwardness.

Even with LDCs standard, the continent of Africa is characterized by highly rapid population growth and poor economic performance compared with Asia and Latin America. Especially Sub-Saharan Africa is recognized by the highest rate of population growth while poverty is also a very important problem (Tsega, 2005: 3). Ethiopia is second populous country in Africa and 14<sup>th</sup> in the world.

## **1.2. Statement of the problem**

It is undeniable that Ethiopia's population is growing in alarming rate. At the beginning of 20<sup>th</sup> century, Ethiopian population was estimated at 11.75 million with 0.2% annual growth rate and its doubling time was expected to be in 346 years. But then population grew very fast and took only 60 years to double. Thus between 1960 and 1990, population once again doubled (EEA: 1999/2000: 57-58). According to three population and census reports, which have been carried out in 1984, 1994 and 2007, Ethiopian population was registered at 42.04, 53.48 and 73.3 million, respectively. The doubling time needs about 27 years.

However, Ethiopia is known as one of the poorest sub-Saharan African countries. Her population growth has not also matched with her economic performance although recently its economy is coming to grow at much faster rate than its population. From 1982 until 2012, Ethiopia's GDP Annual Growth Rate averaged 5.1 percent with an all time high of 13.9% in 1986/87 and a record low of -11.1% in 1984/85. The GDP per capita in Ethiopia is equivalent to 2% of the world's average. According to a World Bank report, from 1981 to 2012, Ethiopia's GDP per capita averaged 156.8 USD reaching an all time high of 255.7 USD in 2011/12 and a record low of 113.0 USD in 1991/92. Most of the population relies on subsistence agriculture and foreign aid. Thus Ethiopia is one of the poorest

countries in the world. Yet, Ethiopia is amongst the fastest growing non-oil economies in the world; especially since 2003/04 average growth rate of 11% has been registered.

The trends suggest that the interaction of population pressures and the economy is a very important issue and may have contributed to perpetuation of poverty trap in Ethiopia. Thus this paper will attempt to examine the links between population growth and economic performance. If the population is continuing to grow fast and economic growth also is registered as such, what does rapid population growth imply in the country's economic performance?

### **1.3. Objective of the study**

The main objective of this study is to examine the impact of population growth on the Ethiopian economic performance.

Specifically, the objectives are to:

- Briefly examine the major patterns of population growth in Ethiopia;
- Briefly review some recent findings of studies on the relationship between population growth and economic development in Ethiopia; and
- Show whether population growth has its own bad effects on the Ethiopian economy

### **1.4. Method of the study**

As premises, the study will realize the theoretical arguments using secondary data sources such as MOFED, CSA, EEA, WB, IMF, and ECA annual reports, books, and other publications.

The study would apply descriptive and econometric analysis. Descriptive analysis would include tables, charts, and figures. By specifying model, econometric analysis would use the time series model like stationary test, co-

integration test for long-run and short run relation, etc. In particular, the following model would be applied from neoclassical production function.

$$+ \quad + \quad +$$

Where:

- =Per capita real GDP;
- , & = parameters of productivity, capital and population
- =Capital accumulation
- =population
- =stochastic error term in the model

## 1.5. Scope and Limitation

Since there are many factors that affect both demographic changes and economic performance, it would be very difficult to address all related variables. Due to this, the study has to be limited to analyzing only some of the factors.

In this study, primary data were excluded due to aggregating data behaviors for both population economic patterns at national level. Even if primary data were necessary to study, the limitation of time would make it difficult to collect data from respective parts.

## 1.6. Significance

This paper willis expected to contribute to the literature by providing informationon the effect of population growth on economic performance. Additionally, it willalso attempt to identify major Ethiopian population problems and how handle them.

## 1.7. Organization

The paper would have five chapters. The first chapter contains the introductory part. The second chapter discusses review of theoretical and empirical literature on impact of population growth on the economy. Chapter three presents descriptive analysis, and chapter four includes econometric analysis and its interpretation. The last chapter would contain the conclusion and recommendation of the study.

# Chapter Two

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## 2. Literature Review

### 2.1. Theoretical Literature

The issue population is argumentative that can create controversy among economic scholars whether it should be considered as affirmative for economic development or should be seen as having a negative impact on economic development. In general case, people are considered as material out of which nations and societies are made; and concern over the number of people runs through history from the early and undifferentiated writings of ancient times to the more elaborated and specialized formulations found in political economy, modern economics and sociology (Hutchinson, 1967: 1-2). Due to this, from ancient statesmen and thinkers (like Confucius, Plato and Aristotle) to the modern economists (like Malthus, D. Ricardo, K. Marx, etc.) have concerned with how the condition of population growth can have influence on the economic development (UN, 1973: 33-34; Hutchinson 1949: 18-28). This concern invites us to investigate some economic perspectives.

As their perspective, economists argue the impact of population growth from the three alternative ways: from consumption approach, from production approach and from aspect of mobility (Dejene, 2011: 41; Bicanic, 1964). The consumption approach gives more emphasis population pressure on carrying capacity of land with related to production for a certain standard of personal consumption while the production approach argues for the requirement of the number of people in excess of a standard number of producers to produce optimal production. The third approach that is called mobility concept

emphasizes that the number of people whose productivity is zero (at least near zero). Although these approaches are highly controversial, most economists focus on the consumption approach in order to investigate the relationship the population growth with food supplies (Dejene, 2011: 41). To examine the impact of population on the economic development, we can primary see theoretical assessment in terms of theorization and argument, and then analyze what empirical evidences has stated.

### **2.1.1.Theories of Population Growth from economics perspectives**

There are popular population theories. Among them, Malthusian Population Trap, Demographic Transition, Boser Up’s Model and Consumer Behavior Theory and Fertility are most concerned for this study.

#### ***2.1.1.1. Malthusian Population Trap***

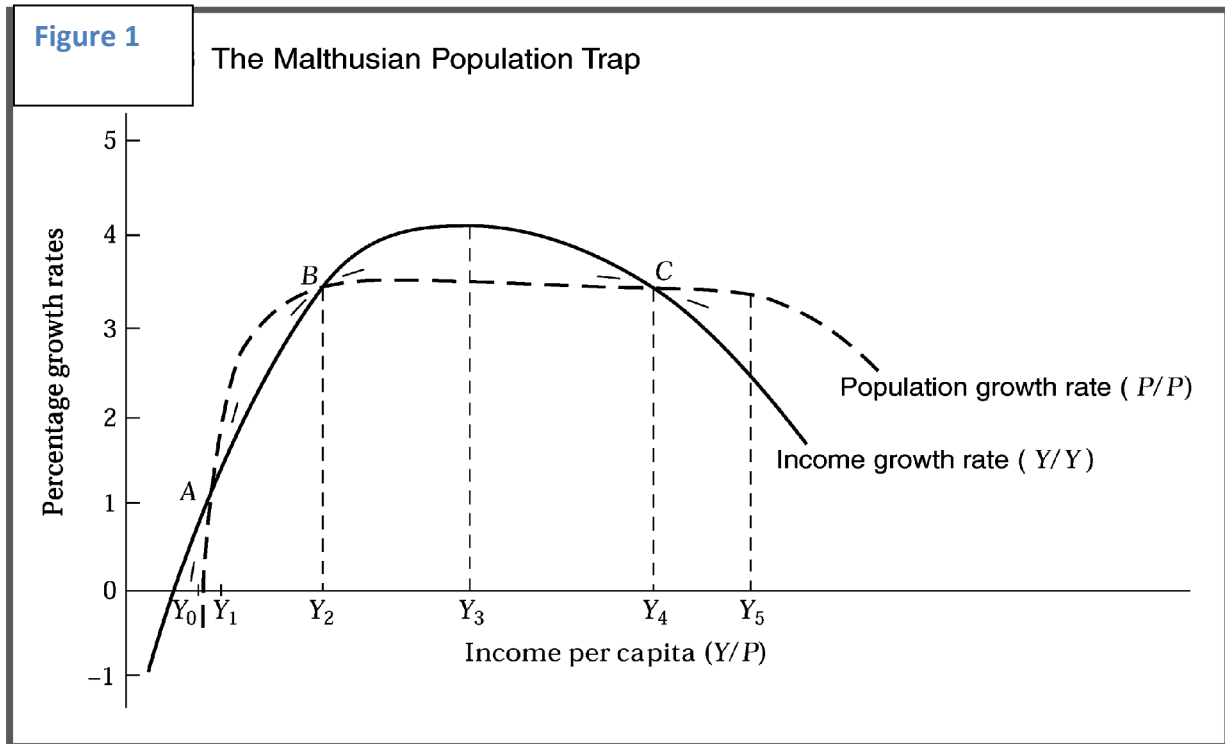
The Malthusian trap is based on Malthus population argument. Malthus was one of 18<sup>th</sup> century population scholars and considered as the first scholar to develop population theory (UN, 1973: 33). Malthus developed his ideas on population on population mainly in his writing titled “Essay on the principle of population”, first published in1798 (Ibid: 38). His writing constituted an important factor in the subsequent development of population theory, and made controversy between his proponents and opponents on the conscious of the need for better understanding of population trends and their relations with socio-economic conditions (Ibid: 39-40).

Malthus core argument relied that:

- a. *“Population is necessarily limited by the means of subsistence.*
- b. *Population invariably increases where the means of subsistence increase, unless prevented by some very powerful and obvious checks.*

- c. *These checks which repress the superior power of population and keep its effects on the level with the means of subsistence are resolvable into moral restraint, vice and misery.” (Ibid: 39 and Malthus, 1872).*

What proposition he attempted to prove as after stating that strong impediments to population growth are constantly in operation, Malthus inquires what would be the rate at which the means of subsistence can be increased. From this basis, he drives his two basic propositions that population tends to double itself every 25 years, thus increasing in geometric ratio, while under favorable conditions agriculture product increases only in arithmetical ratio. Then he concludes that “taking the whole earth(...) the human species would increase as the numbers 1, 2, 4, 32, 64, 256 and subsistence as 1, 2, 3, 4, 5, ... 9. In two centuries, the population would be to the means of subsistence as 256 to 9” (Ibid: 39 and Malthus, 1872). These rates result in disequilibrium that each member of population would have less land to work marginal contribution to food production would actually start to decline (Dejene, 2011: 44). Since the growth in food supply would not keep pace with the burden of population, per capita income would have a tendency to fall so low as to lead to a stable population existing barely at or slightly above the subsistence level (Dejene, 2011: 45 and UN, 1973: 40). The trap can be observed from the following figure.



How to resolve this incidence he proposed two heading checks, which are called preventive and positive checks in order to control high population growth (Ibid). The formers arise from man's reasoning faculties and include moral restraints through marriage and vice which could take the form of prevention. The latter, positive checks consisted of epidemics, wars, plague and famine, all manifestation of misery; which contributed in any degree to shortcoming of the normal duration of life.

By seeing this implication, modern economists have given a name to be called the Malthusian population trap (Bhatia, 1978: 133). That means population growth ties at low level equilibrium simply because Malthus theory forces to live at subsistence levels to income. Even for the neo-Malthusian, poor nations are never able to raise much above their subsistence levels of per capita income unless they initiate preventive checks on their population growth. In the absence of such preventive checks, Malthusian positive checks would inevitably provide the restraining force on the population growth (Ibid).

### *2.1.1.2. Boserup's Model*

This model has been proposed by Ester Boserup (1965), who has rejected classical (Malthusian trap) theory and rather basically argued that we would never outstrip food supply (Dejene, 2011: 46). And technology will continue to improve and keep up with demand since she argues that population growth will give to the society opportunity to invent new technology in the intensification of agriculture with socioeconomic change that results in improving soil fertility (Ibid: 46-47). She considers population growth as an autonomous force of exogenous factor that causes technological progress in agriculture and postulates that aggregate agricultural production function in the long run will always shift upwards in response to population pressure to maintain output per capita though there may be diminishing return to the agricultural labor in the short run (Ibid: 47-48; Dejene, et.al.2001: 3). Thus for her, the primitive agricultural communities are subject to continuing change in agricultural technology.

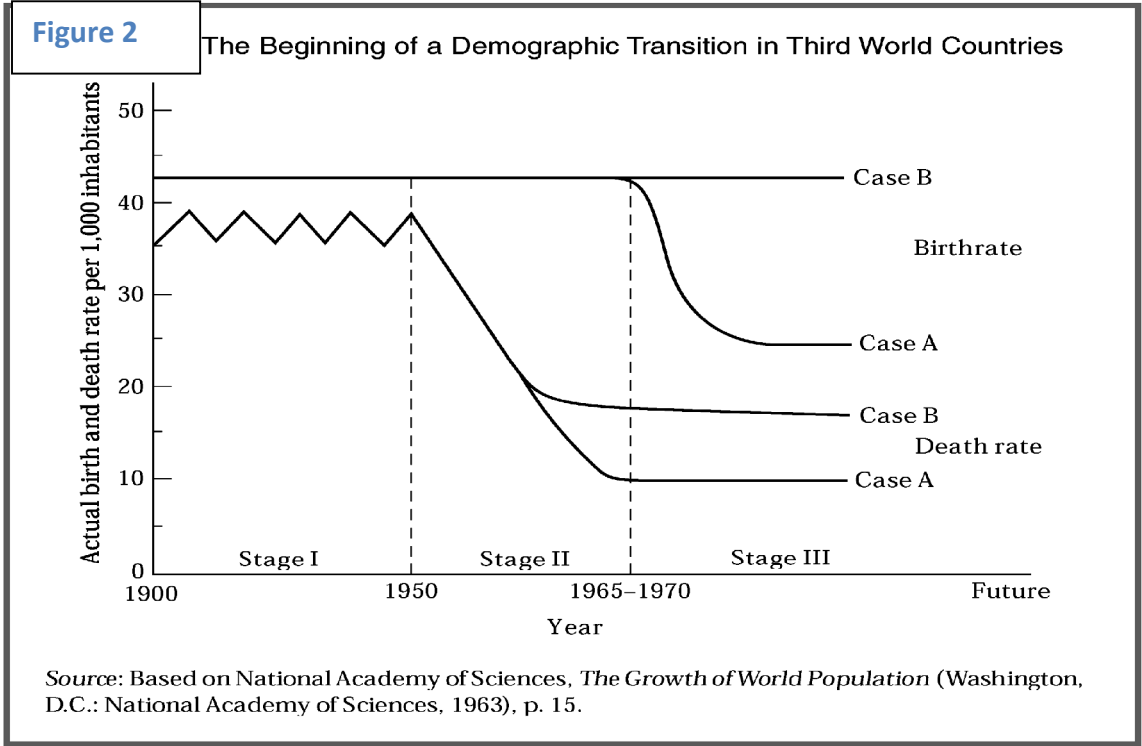
What the tenet argument in her thesis is that “primitive communities with a sustained population have a better chance of getting into a process of genuine economic development than primitive communities with stagnant or declining population” Dejene (2011: 47) argued. She also said that “the highest levels of pre-industrial civilization have usually been reached by peoples with plow cultivation” (Ibid: 48; Boserup, 1965). Accordingly, population for Boserup is behind successive transition from ‘forest fallow’ of 20-25 years to ‘bush fallow’ of 6-10 years, and then to ‘short fallow’ of 1-2 years to be followed by annual cropping (Ibid: 48). Thus she argues that the most intensive system of land is multiple cropping with adopting irrigation system. Due to this, Boserup has argued to reject classical Malthusian argument of extensive margin.

The reason why she rejects classical extensive margin is that land productivity can increase due to factors. Firstly, she argues increases in physical labor

input to work longer hours will give rise increased output per hectare. Secondly, in the long-term technological progress would lead increased output per hectare that results in to shift in the production function (Ibid: 48-49). In order to maintain the level of function and prevent output per person from falling, people can work more hours. The general implication of her argument can be stated as continuous technological progress to main consumption per person at a level well above the subsistence requirements and as that population pressure can be considered as the means of economic development through technological improvement.

### ***2.1.1.3. Theory of Demographic Transition***

This theory is portrayed the process by which morality and fertility rates eventually decline to replacement levels. It also attempts to explain why all contemporary developed nations have more/less passed through the same three stages of modern population history. Thus we can see these four stages how the whole population growth is divided accordingly (Jhingan, 2002: 383-386; Dejene, 2011: 42-44).



### Stage I

This stage is considered backward country and is characterized by high birth rate and high death rate. The reason of high birth rate is considering children as God given and old age guarantee while that of high death rate is high mortality due to disease and absence of proper medical care. Since there is no as such economic development due to backwardness, the population is somehow stable. It is so considered a primitive stage of economic development with slow population growth.

### Stage II

This stage is characterized by the high birth rate but low death rate. In this stage, economy enters the phase of economic growth that manifests modernization, associated with better public health uses, heal their incomes and other improvement, which lead to reduce mortality rate. However, the stage is known as unbalanced and unstable stage because the growing divergence between high birth rate and falling death rate lead to shoot

population growth. Because there are wide gap between birth rate and death rate due to very low death rate. This also marks the transitional phase of population exploitation although it has had high burden at the beginning.

### **Stage III**

This last stage is characterized by low birth rate and low death rate due to the forces and influences of advanced modernization and development such combining effects of urbanization, education expansion and use of contraceptive methods. Due to this, there is little or no population growth in this stage although some time, low death rate may be greater than low birth rate. Thus because of balancing to care the capacity of economy with good life for the people, this stage is taken as attainable phase that ever country wants to achieve it.

#### ***2.1.1.4. Theory of Consumer Behavior and Fertility***

This theory argues that children should be considered as consumption or investment goods like other commodities. Due to this, a person who begot a child can choose to determine before to have his/her child. Because of choice and micro-economic determinants and family fertility behavior, the theory has been extended to include the choice of whether or not to have a child on assumption that fertility behavior has the strong component of economic rationality (UN, 1974: 481-482). This reveals what is called Leibenstein's economic theory of fertility (1975) decline, and that it has been the seed of inspiration to go beyond economics to explore the relationship between personality and consumer behavior (Albanese, 1993). Thus it can recently attract many economists.

According to proponents of the theory (Leibenstein, 1950, 1975; Albanese, 1993, 2002; Duesenberry, 1949) demand for children is directly related to house hold income and to the price of all other goods, and indirectly related to the cost of children and to the test for goods relative to children. Due to this, parents will

demand fewer additional children, by substituting quality for quantity. The reason is based on the assumption that the consumer makes consistent choices over time and that goes beyond the requirement of a transitive preference ordering (Albanese, 2002).

In the third world nations, expanded efforts to make jobs, education and health more broadly available to poverty groups will not only contribute their economy and psychic well-being but it can also contribute substantially to their motivation for smaller family which is vital reducing population growth rates.

### **2.1.2. Arguments for/against Population Growth**

The question is that whether population growth is problem has created controversy among the economists since antiquity. The basic argument is concerned with assumption of that people are considered as both producers and consumer. At one extreme case, large and solid foundation of even cause of technological progress is the impelling force that has raised man from his primitive state and pushed him forward on the road of civilization (UN, 1973; Todaro, 1994:180). An equally considerable body of theory and speculation, however, asserts that the multiplication of mankind has had the contrary effects of forcing whole nations down into poverty and misery, generating crime and vice of descriptions, and letting loose the scourges of war, and disease. Thus it is understood that population growth should be considered as additional manpower and productive capacity in one time while it should be regarded as an increase in the number of mouths to feed more for another time, or simultaneously by different scholars. This acknowledges that population growth is fashionable issue for economic development of a nation.

Because of this duality nature of population growth, economists disagree about whether it restricts or promotes economic growth. For some scholars, population growth is a serious problem, but for others, it is not as much serious problem for economic development rather favorable for it. This

controversy creates three different views, which are called Pessimistic, Optimistic and Neutralistic arguments.

### ***2.1.2.1. Pessimistic argument***

The scholars who argue against population growth for economic growth are called pessimists. According to them, population growth creates negative economic, social and environmental consequences. Therefore, it needs to be curtailed by different control mechanisms. They argue that rapid population growth is the principal causes of poverty, low levels of living, malnutrition, ill-health, environmental degradation and a wide any social problems. Moreover, the dire-prediction of world flood catastrophes and ecological disaster are attributed to the growth in numbers.

It is argued that population growth is a problem because it intensifies the economic, social and psychological problems of a nation and it retards the prospects for better life for those who are ready born. It shifts the countries effort from developing process to address the social issues (UN, 1974, 141-143). So a high rate of population growth not only has an adverse effect on improvement in food supplies, but also intensifies the constraint on development of saving, foreign exchange and human resources (Meier, 1995: 276).

### ***2.1.2.2. Optimistic Argument***

According to proponents of this argument, population growth is not a serious problem. And the proponents argue that population growth as a problem is an attempt by developed countries to hold down the development of developing countries to maintain an international status quo that is favorable to their selves' interests H. Chener.et.at, 1988: 490-492, UN, 1973: 55-56)). That is to keep poor countries dependent on the rich ones.

This argument provides both economic and non-economic issues (UN, Ibid). Regarding economic argument, high population growth is desirable that provides the needed consumer demand to generate favorable economies of scale in production to lower production costs and to provide a sufficient and low cost labor supply to achieve higher levels. The non-economic argument is that population growth is desirable to protect the under populated border regions the expansionist intentions of neighboring nations. Furthermore, there are also many ethnic, national and religion groups in developing countries whose attitudes in favoring large family size have to be protected for both political and moral reasons. Moreover, military and political powers are often seen as dependent on large and youth full population.

### *2.1.2.3. The Neutralistic Argument*

So far an attempt has been made to present the two opposite views of the consequences of rapid population growth. There are also scholars who support the neutralistic view. They argue that there is no significant correlation between population growth and economic growth rather other factors can play more significant roles. Although countries with rapid population growth tend to have more slowly growing economies, this negative correlation typically disappears or even reverses the direction when other factors such as size of country, level of education and quality of civil and political institutions are taken into account. That is when controlling for other factors, there will cross-country evidence that population growth impedes economic growth (Bloom, et.al, 2001).

In fact, this is an intermediate position on which bothsides of the debate can meet for agreement in some aspects. In general the premises of the argument are the following (H. Chenert, et.al, 1988: 493-500).

- i. Population growth is not the primary causes of low levels of living, gross inequalities etc. rather the fundamental causes of these problems must be the dualistic nature of the domestic and international economic and

social order and failures of development plans to create jobs and incomes for poor families.

- ii. The problem of population is not the problem of the numbers but it involves the quality of life and material well-being.
- iii. Rapid population growth serves to intensify problems of underdevelopment makes prospects for development more difficult.

## 2.2. Empirical Literature

Many empirical studies have been carried out to show whether population growth is burden of the economy of a nation. According UN, Population Division report of 2005, global population which was estimated to be just over 2 billion in 1650, has risen to 6.5 billion in 2005. The world is gaining new inhabitants at rate of around 76 million a year. In spite of slowly growing, medium variant projections suggested that the world will have 9.1 billion inhabitants by 2050, when growth will be approximately 34 million a year. Nearly all (95%) population of middle of this century, with several poor countries will be tripling of their population over period. By contrast in the developing countries, the population is expected to remain steady, at around 1.2 billion, with some wealthy countries seeing population declines.

In order to show what empirical evidences have told, several works have been carried out for the trends of population growth and economic change. For instance, Asmerom (1991) attempted to argue the demographic interaction by developing specific model for Ethiopia. Nega (1996) argued impact of population growth on human capital formation giving more emphasis on education sector in Ethiopia. The work made by EEA (1999/2000) tried to show the trends and effects of population growth on the Ethiopian economic performance. Hassen (2004) also contended that rapid population growth has negatively affected Ethiopian economy.

Regarding population trend, several guess, projection and individual suggestion have been carried out till the first national population and housing census could take place in 1984. According to Pankhurst (1966: 147-150), the first population guess was made by different travelers (foreigners) and their guess was coverage very limited geographical area, for Shoa in 1840s. Among the guesses, the lowest was one million while the highest was estimated around 2.5 million. In 1850s, visitors to the country of Emperor Tewdros II made several guesses of population inhabiting areas under his control. All estimates varied between 3 and 4 million. Attempts made during the reign of Emperor Yohannes IV for his three provinces of Tigre, Amhara and Shoa placed population 4 million. The geographical coverage could increase with the size of population during the reign of Emperor Menelik.

For instance, according to EEA (1999/2000: 57-58), Dr. Merab, Emperor Menelik II physician, thought that the population of the country was guessed about 10 million for 1900 increasing to 12 million in 1909 at growth rate of 2% per annum. His guess for 1900 is much closed to the 11.8 million obtained by projection of reconstructing the population by the CSA from the 1984 census.

Among Ethiopian scholars, there was no educated guess until professor MesfinWolde-Mariam made in his estimate for 1954 at 23.4 million. The first official estimate by the Ethiopian government was made in 1960 with historical data going back to 1950 projection to 1966 based mainly of information provided by the ministry of interior. Accordingly, population was estimated at 17.8 million for 1950 at growth rate of 1.5% per annum, increasing to 21 million by 1961 and 22.6 million by 1966. Then modern statistical studies on the Ethiopian population was initiated in 1960s by the CSA, which conducted a series of National Sample Survey, the results of which provided demographic data for administrative planning and research purposes until the first census was conducted in 1984(Ibid).

Although several works have made regarding relationship of population growth and economic change of the country; we can clearly observe two limitations in terms of timing and updating information. As we have seen the work could be carried out at least before ten years that couldn't include the 2007 census report as inputs. However, after the works were made, a lot of things have been changed. For instance, there are demographic changes and new recording economic growth in the country. Thus this gap should be to fill what consequences have happened up to now.

# Chapter Three

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## 3. Descriptive Analysis

### 3.1. Patterns of Ethiopian population and economic Growth

In the previous chapter, we have seen theoretical and empirical review of studies. In this section, we present data on patterns of Ethiopian population growth and economic growth.

#### 3.1.1. Pattern of Ethiopian population growth

Ethiopia is endowed with a large and fast growing population and is 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, Ethiopia'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 9<sup>th</sup> most populous nation in the world and the 2<sup>nd</sup> in Africa following Nigeria.

Although there were several guesses before the 1984 population census, that year was the first in its kind in Ethiopia and bringing to an end the guesses and serving as basis to estimate different projections. The 1984 population census data shows that the total population was 40.2 million, out of which 20.3 million (51.4%) were males and 19.9 million (49.6%) females. The second census of the country was carried out in 1994 and the total population reached 53.5 million, out of which 26.9 million (51.3%) were males and 26.6 million (49.7%) females. Accordingly, the data showed that 13.4 million people were added for the country within ten years. The third census was carried out in 2007. According to the PCC's population and housing census report in

December 1, 2008, Ethiopian population was recorded about 73.85 million, out of which 37.3 million (50.5%) were males while 36.6 million (49.5%) were females. The census showed that 20.4 million people were added from the 1994 census and 33.7 million from the 1984 census (CSA, 1984, 1994 and 2007).

These three censuses also revealed that Ethiopian population was mostly rural based as overwhelming majority about 35.6 million (88.6%) of the population resided in rural area while that of only about 4.5 million (11.4%) were urban in 1984. Similarly, out of 53.5 million about 46.2 million (86.4%) were rural based while that of about 7.3 million (13.6%) were urban residents in 1994. The same is true for 2007 census. Of 73.9 million population, about 62 million (83.9%) were rural people while that of 12 million (16.1%) were urban inhabitants. Although the size of population increased about 62 million in 2007 from 35.6 million in 1984 and 46.23 million in 1994 in rural area, the percentage was decreasing 83.5% in 2007 from 88.6 in 1984 and 86.3 in 1994. The proportion of the urban population was increasing in the respective years. The reason is that people migrate from rural to urban areas due to push and pull factors in the respective areas.

**Table 1: Population by Residence and Sex**

Distribution by Sex/ Year	1984		1994		2007	
	Size (in mill)	%	Size (in mill)	%	size (in mill)	%
Total	40.2	100	53.5	100	73.8	100
Male	20.3	50.5	26.9	50.3	37.2	50.5
Female	19.9	49.5	26.6	49.7	36.5	49.5
Urban	4.5	11.2	7.3	13.6	11.9	16.1
Male	2.2	48.9	3.5	47.9	5.9	49.7
Female	2.3	51.1	3.8	52.1	6	50.3
Rural	36	89.6	46.2	86.4	61.9	83.9
Male	18.1	50.3	23.4	50.6	31.3	50.6
Female	17.5	49.7	22.8	49.4	30.6	49.4

Source: CSA, 1984; OPHCC/CSA, 1994; CSA, 2007

Moreover, the sex ratio (male/female ratio) was closely the same in the three censuses. In particular it was 1.02, 1.01 and 1.02 in 1984, 1994 and 2007, respectively. Sex ratio in urban areas was lower about 0.96, 0.92 and 0.99 than in rural areas about 1.03, 1.03 and 1.02 in 1984, 1994 and 2007, respectively. The reason includes the fact that females are more migrants from rural to urban areas due to different social, cultural and economic problems which affect them in rural places(Ibid).

The growth rate of population is determined by two important factors such as fertility rate and mortality rate though migration is taken as insignificant determinant for the growth of Ethiopian population (EEA, 1999/2000: 59). Although the fertility level in Ethiopia is among the highest in the world, for example the World Bank ranked her 40<sup>th</sup> in 2011; it shows significant reduction for recent years. For example, total fertility rate (TFR) declined by 12% from 7.5 to 6.7 and 37% from 6.7 to 4.2 birth per-woman between 1984 and 1994, and between 1994 and 2007, respectively. The reason for the decline in the TFR is related with the adoption of use of contraceptives and exposure to the benefits of family planning in rural and urban areas. Although TFR has shown a declining trend in the recent years, it is still higher even by African standards.

The second significant determinant of population growth is mortality. According to CSA reports, the infant mortality rate (IMR) increased from 110 in 1984, to 116 in 1994 and then declined to 60 in 2007.

As is the case in LDCs in general, Ethiopia is dominated by a young population. According to the recent census report of 2007, 14.6% of the total population is less than 5 years old, 30.8% less than 10 years old, 45.0% less than 15 years old, and 56.9% less than 20 years old in 2007. On the other hand, only 3.2% of the total population is 65 and above years old. The remaining 40% of total population is found between 20 and 64 years old. The census also shows that the size of young population is continuously increasing.

For instance, the population in the age bracket between 0-14 years reached 33.2 million (45%) in 2007 from 19.4 million (48.4%) in 1984 and 24.1 million (45.4%) in 1994 censuses.

Table 2: Age Structure of Ethiopian Population

years	Under 15 Years		15-64 Years		65 and above Years		Dependency Ratio		
	number (in mill)	%	number (in mill)	%	number (in mill)	%	Young	Elderly	Total
1984	19.4	48.4	19.2	47.8	1.9	4.8	101.3	10	111.3
1994	24.1	45.4	27.3	51.4	1.7	3.2	83.8	6.6	90.4
2007	33.2	45	38.3	51.8	2.4	3.2	86.8	6.1	92.9

Source: CSA 1984, 1994, & 2007 Censuses' reports

From table2, one can see a decline in dependency ratio due to decrease in the old and young population overtime. The 1984 census revealed that the total population dependency ratio was 111.3; out of which 101.3 was young while 10 was the old dependency ratio. But the dependency ratio declined to 90.4 in 1994 showing a 20.7 difference in dependency ratio. From the 1994 dependency ratio, the young constituted 83.8 while it was 6.6 for the old ones. In 2007, dependency ratio reached 92.9 out of which 86.8 was for young dependents while 6.1 was the old dependency ratio. From the 2007 census, the decline in dependency ratio emerged from decrease in the proportion of the young population since the old dependency did not change from the 1994 of 3.2. The difference in dependency ratio from 1984 was 20.7 in 1994 and 18.4 in 2007.

Although the dependency ratio seems to decline overtime except the recent 2007 census result, it is among the highest in the world. Such a high dependency structure has important implications on the economic development of the country. It is because of the burden it imposes on the working age population. In 1984, for example, the dependency ratio of 111.3 implies that working age person would support more than one additional

person. It is even true that not everyone in the working age population is gainfully employed due to lack of employment opportunity or disability.

In addition, since young dependency ratio is high but the old dependency is very low, we can observe that the national life expectancy is likely to remain at low level. For instance, only 2.8% of the total population is 65 and above implies that the lion's share of 97.2% would die before reaching at age of 65 years old.

Another implication of high young dependency is that there is high burden on the government to expand education, health and employment and other opportunities for the large number of children. If government left its responsibilities, high unemployment and other socio-economic problems would be created. To avoid these problems, government is forced to incur high expenditure for the construction of these infrastructures.

However, population growth with increase in labor force has been considered as a positive factor in stimulating economic growth since high labor force refers to the presence of high productive man power. According to the CSA definition of labor force by 1984 and 1984 census, person age 10 years and above are considered as labor force. The definition added a short reference period of the seven days prior to the census date in 2007 census. Thus it is defined as "all persons aged ten years and over who were productively engaged or available to be engaged during the reference week were considered as economically active." However, it includes the people who are economically active, and those who are economically inactive. Within economically active people, population is included in three categories: employed, unemployed and not in the labor force. Unless the economic system of the country has ability to absorb the labor force efficiently, economically inactive and unemployed population can create socio-economic problems for the country.

According to CSA, 51 million people (69% of total population) in 2007 were in labor force compared with 21.9 million (51%) in 1984 and 36.6 million (69%) in

1994. The increase in labor force in 2007 was 14.4 from 1994 and 29.1 from 1984 between 13 and 23 years, respectively. The proportions of the male and female members of the labor force were almost the same in the three censuses. Regarding activity status, from the total labor force 67.2% in 1984, 72.5% in 1994 and 69.2% in 2007 were considered economically active. The activity rate was higher for male members of the labor force 79.2%, 82.1% and 75.1% for male in 1984, 1994 and 2007 respectively compared with the figures for female members of the labor force which were 55.5% in 1984, 62.9% in 1994 and 63.4 in 2007.

Furthermore, members of labor force in urban area were estimated at 3.3 million (68% of the total population) in 1984, 5.5 million (75.8%) in 1994 and 9.4 million in 2007 censuses. In terms of activity rate, 43.5% in 1984, 49.9% in 1994 and 54.9% in 2007 were considered as active among the total labor force. And among the urban male members of labor force, 58.2%, 62.2% and 61.8% were economically active while the corresponding figures for females were 31.2%, 39.1% and 48.1% in 1984, 1994 and 2007, respectively.

Regarding employment condition, among active population, over 98% were employed in 1984. However, the figure declined to 97% in 1994 and 96.3 in 2007. In urban area, about 92% of the total economically active population was employed in 1984, but the figure declined to 78% in 1994 and slightly to 83% in 2007. The adverse living condition due to low productivity and low income of labor in rural areas of the country seems to lead employed people to migrate to urban areas by expecting to get better job and living. For example, observing two censuses 1984 (48.4%) and 2007 (47.6%) revealed that migrants to Addis Ababa. The highest proportion (58% in 1984 and 55% in 2007) came from rural areas. However, the danger is that urban areas have also experienced rapid expansion of unemployment and further other related complicated problems. Due to this, unemployment in urban areas of the country is higher and increasing.

In Ethiopia, unemployment is measured on the assumption that there is no unemployment in rural areas and that unemployment is exclusively an urban phenomenon. Based on these assumptions, we can see the phenomenon of unemployment during three census periods. In 1984, the total 14.7 million economically active population, 170 thousands (1.2%) were unemployed. In 1994, among the 26.5 million economically active people, 770 thousand (2.9%) were unemployed. And in 2007, from 35.3 million economically active people, 1.34 million (3.8%) people were unemployed. This reveals that the number of unemployed people nationally increased by 600 thousand, representing 35.3% during ten years period, and increased by 570 thousand (54.4%) between the second and the third censuses (1994 and 2007). The age and sex distribution of unemployment seems to be almost the same for the first period (between 1984 and 1994) while a slight difference was observed in 2007. Regarding age group, the highest rate of unemployment in 1984 was 15-20 with 2.5% while the highest rate in 1994 was observed for 20-24 age-group with 6.6%. The highest unemployment rate in 2007, however, was recorded for age-group 20-24 age group with 5.9%. In the three censuses, the proportion of female unemployed was higher than that of the male. This might be due to tradition and culture that favors male employment than female.

In terms of educational status, about 78.2 thousand unemployed people were illiterate in 1984 and the size of illiterate unemployed people increased to 279.6 thousand in 1994. The people who completed grade 12 educational level were trapped by unemployment problems. In 1984, 28.5 thousand unemployed people completed grade 12 and size of this educated unemployed people increased to 189.9 thousand in 1994. In short, the three censuses reveal that unemployment was increasing with population growth and increasing in labor force and development of the country.

## 3.1.2. Pattern of economic growth

### 3.1.2.1. Pattern HDI's performance

According to world HDI report in 2012, value of Ethiopia's HDI for 2012 was 0.396, which was categorized in the low human development category, positioning the country at 173 out of 187 countries. However, the index value increased from 0.275 to 0.396 between 2000 and 2012, an increase of 44% or average annual increase of about 3.1%. The rank was improved from ranked position of 174 to 173 out of 187 countries.

However, even the trend reveals that the country HDI has registered some improvement. For instance, the life expectancy at birth, expected years of schooling, GNI<sup>1</sup> per capita and HDI value in Ethiopia from 51.7, 4.4, \$519 and 0.275 in 2000 have been improved to 59.7, 8.7, 1,017 and 0.396 in 2012, respectively. Table 3 shows the consistency of improvement over time.

Table 3: Ethiopian HDI overtime

Years	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP\$)	HDI value
1980	43.9	2.4			
1985	44.5	3.2		503	
1990	47.1	3.5		540	0.172
1995	49.3	2.6		479	0.252
2000	51.7	4.4	1.5	519	0.275
2005	55.2	6.7	1.5	630	0.316
2010	58.7	8.7	2.2	928	0.387
2011	59.3	8.7	2.2	974	0.392
2012	59.7	8.7	2.2	1,017	0.396

Source: UNDP, HDI report 2012

Although there has been improvement of HDI overtime, the country is in the group of low income countries. For example, Ethiopia's 2012 HDI of **0.396** is

<sup>1</sup> GNI, Gross National Income

below the average of **0.466** for countries in the low human development group and below the average of **0.475** for countries in Sub-Saharan Africa. Among the Sub-Saharan Africa countries which are close to Ethiopia in 2012 HDI rank and Rwanda and Uganda, which have HDIs ranked **167** and **161**, respectively. Table 3:4 shows Ethiopia's HDI for 2012 relative to selected low income countries (Rwanda and Uganda) in Africa and groups (Sub-Saharan Africa, very high HDI, high HDI, medium HDI, Low HDI and world's HDI).

Table 4: Comparison of Ethiopian HDI with Others

	HDI value	HDI rank	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (PPP US\$)
Ethiopia	0.396	173	59.7	8.7	2.2	1,017
Rwanda	0.434	167	55.7	10.9	3.3	1,147
Uganda	0.456	161	54.5	11.1	4.7	1,168
Sub-Saharan Africa	0.475		54.9	9.3	4.7	2,010
very High HDI	0.905		80.1	16.3	11.5	33,391
High HDI	0.758		73.4	13.9	8.8	11,501
Medium HDI	0.640		69.9	11.4	6.3	5,428
World's HDI	0.694		70.1	11.6	7.5	10,184
Low HDI	0.466		59.1	8.5	4.2	1,633

Source: UNDP, HDI report 2012

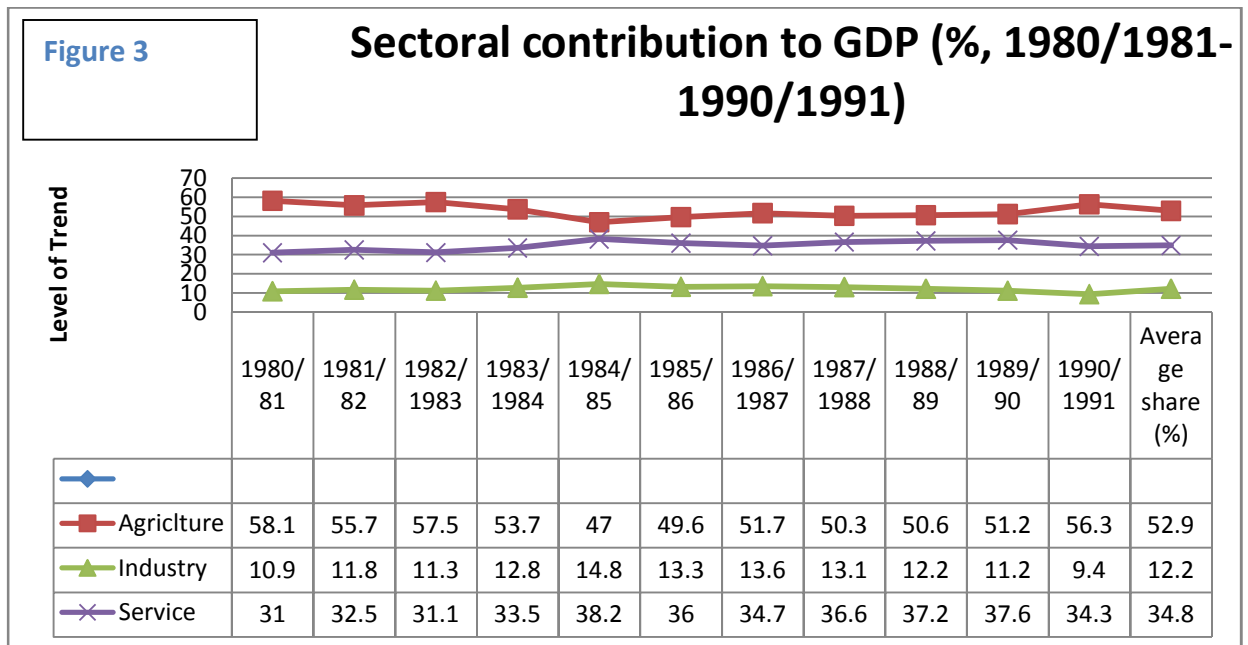
The table 4 portrays that Ethiopia's HDI is almost 1/3<sup>rd</sup> of very high level HDI, 1/2<sup>nd</sup> of world's HDI and lower than low income HDI countries. Even among Sub-Sahara African countries, like Rwanda (167) and Uganda (161) have been better positions than Ethiopia. Regarding life expectancy measure, Ethiopia is higher position 59.7 than Sub-Sahara African countries, which is registered 54.9, and Rwanda 55.7 and Uganda 54.5, and slightly similar with low income countries of life expectancy in average. This is found in improving position from 51.7 in 2000. Expected years of schooling is very low from sub-Sahara African countries, 9.3 and almost similar with low income countries. Regarding per capita income, each Ethiopia could be expected to get 1,017 US dollar per annum, which was lower from low HDI and Sub-Sahara African countries

average per capita income. Even an average person in Sub-Saharan countries could have had slightly twice an average person who lives in Ethiopia, very high HDI 33 times and World in general 10 times greater than of an Ethiopian citizen. Implication is that although Ethiopia has improved, she is still categorized under the poorest group. This results in the vicious cycle of poverty as main feature. For instance about 1/3<sup>rd</sup> of the total population (29.6%) in the country lived under poverty line in 2010/11.

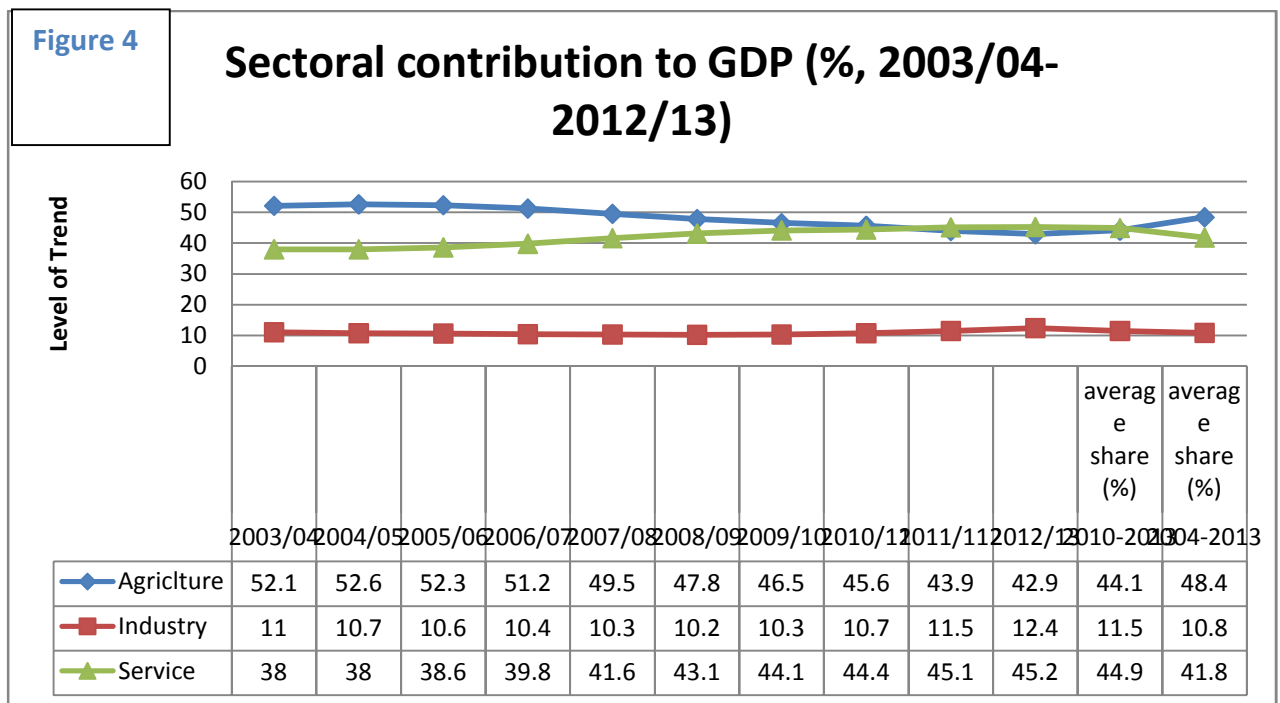
### ***3.1.2.2. Pattern of GDP growth and per capita GDP***

According to MoFED official report, since 2004/05, Ethiopia has registered fast , double digit economic growth. Before we discuss about GDP growth, it is better to see the features of the Ethiopian economy focusing on which sector is dominating the economy. It is obvious that agriculture has dominated for long period of time as share of GDP for the country's economy. During the Derg regime, agriculture contributed about 53% of the GDP on average between 1980/81 and 1990/1991 with the value of 58.1% at the beginning and 56.3% at the last year of the period. The average share of agricultural contribution to GDP has declined to about 48.4% in the years between 2003/04 and 2012/13. The industry sector also seems to be decline from average share from 13.6% in the period between 1980/81 and 1990/1991 to the average share 10.8% in the period between 2003/04 and 2012/12. By contrast, the service sector average share has come to increase from 34.8% in the period between 1980/81 and 1990/1991 to 41.8% in the period between 2003/04 and 2012/13 years. The comparison shows that although the share of agriculture has declined, it can remain with role of dominancy in GDP and account for higher contribution than industry and service sectors. The decline in the share of the industry sector in GDP is a problem. The implication is that the sectoral transformation is abnormal. The reason is that the service sector has expanded without industrial establishment even if the industrial sector should be mediator for

agricultural and service sectors. The general figure is depicted by the following two charts, figure 3 and figure 4.



Source: MEDAC, National Income Account Revised Series, 1998



Source: MoFED, GDP Estimates series 2005

As we can see from tables 3.5 and 3.6, the aggregate performance of Ethiopian economic growth has fluctuated overtime, especially during Derg regime. Population growth, however, has been increasing with alarming rate until 1990/91 although the rate is increasing at decreasing rate since 1990/91.

Table 5: Economic and population growth from 1970/71-1990/91

Year/Item	GDP		POP		pcGDP	
	(in million Birr)	Growth rate	(in million)	Growth rate	(in Birr)	Growth rate
1970/71	33,229.26		29.8		1,115.08	
1971/72	33,266.72	0.11	30.5	2.3	1,090.71	-2.23
1972/73	34,114.66	2.49	31.2	2.24	1,093.42	0.25
1973/74	34,839.27	2.08	32	2.5	1,088.73	-0.43
1974/75	35,109.69	0.77	32.7	2.14	1,073.69	-1.4
1975/76	35,255.27	0.41	33.5	2.39	1,052.40	-2.02
1976/77	35,549.05	0.83	34.4	2.62	1,033.40	-1.84
1977/78	35,134.47	-1.18	35.3	2.55	995.31	-3.83
1978/79	36,855.30	4.67	36.2	2.49	1,018.10	2.24
1979/80	38,708.22	4.79	37.2	2.69	1,040.54	2.16
1980/81	39,095.59	0.99	36.35	-2.34	1,075.59	3.26
1981/82	39,056.37	-0.1	37.23	2.36	1,049.14	-2.52
1982/83	42,952.68	9.07	38.13	2.36	1,126.54	6.87
1983/84	40,158.25	-6.96	38.87	1.91	1,033.17	-9.04
1984/85	36,059.27	-11.37	41.1	5.44	877.27	-17.77
1985/86	39,703.73	9.18	42.38	3.01	936.87	6.36
1986/87	45,501.01	12.74	43.69	3.01	1,041.40	10.04
1987/88	45,304.95	-0.43	45.05	3.01	1,005.73	-3.55
1988/89	45,124.31	-0.4	46.44	3.01	971.61	-3.51
1989/90	46,888.65	3.76	47.88	3.01	979.23	0.78
1990/91	44,827.47	-4.6	49.37	3.01	908.03	-7.84
Average	38,892.10	1.34	38.06	2.48	1,028.86	-1.2

Source: MoFED and CSA, partly own computation

As it is depicted in table 3.5, during the period between 1970/71 and 1990/91, the pace of economic growth was considerably very slow. Per capita GDP growth was actually negative in average of this period although there were

some progressive years within the period. The GDP of Ethiopia was often increasing for the period 1971/71-1977/78 with decreasing rate of growth. Thus until 1977/78, the growth rate of GDP was very small. For instance, the progressive rate of growth was registered at 2.49% in the third year (1972/73) while the least growth at 0.11% in the second years. After the third year of the period the growth rate of GDP was starting again to decline and reach at lower rate 0.41% in 1975/76. This may be due to that there were internal conflict in preceding two years (due to the overthrow of Haile Selassie regime) and external war with Somalia.

The period between 1978/79 and 1982/83 was characterized by positive growth rates of GDP. This may be partly because of annual development campaigns of the period by Derg regime. However, the situation was followed by the catastrophic drought and famine in the years 1983/84-1984/85. Therefore, the GDP of the country declined to be registered from 42.95 billion (9.07%) in 1982/83 to 40.16 billion (-6.96%) in 1983/84 and then 36.06 billion (-11.37%) in 1984/85. However, high economic growth was recorded in 1985/86 (9.18%) and 1986/87 (12.74%). This may be partly due to favorable conditions after famine. After that, the growth rate was declining and fluctuated from 1987/88 (-0.43%) to 1990/91 (-4.6%) although the rate was positive (3.76%) in 1989/90. This may be due to civil wars in the country that marked the end of military regime and the command economy system.

Regarding population issue, however, annual growth rate of population was continuously increasing rate of 2.48 with beginning year at 2.3% and with last year of 3.01% within the period between 1971/72 and 1990/91. Because of this population growth and fluctuation of economic growth, the growth rate of per capita GDP was unstable with (-1.2%) on average in the period. As a result, per capita GDP was very low (1,028.86 birr on the average), and 1,115.08 birr at the beginning in 1970/71 and 908.03 in the last year of 1990/91. During the period, the highest per capita GDP was registered about 1,126.54 birr in 1982/83 while the lowest was about 877.27 birr in 1984/85.

In general term, we can systematically observe that not only the per capita GDP was very low but also it was declining with fluctuation overtime. The implication is that the growth of population tends to retard per capita GDP and that since per capita GDP is one of the determinants of standard of living of the people, the country was characterized by this low standard of living. And constantly increasing population could lead to increase demand for food products and other primary needs. For this case, the famine of 1984/85 was good witness that registered -17.77% growth rate of per capita GDP. Since the supplies of these needs are impossible, the standard of living deteriorated and brings abject poverty with result in vicious circle of poverty.

Table 6: Economic and population growth from 2001/02-2012/13

Year/Item	GDP		POP		pcGDP	
	GDP (in mill. Birr)	growth	Pop (in mill.)	growth	pcGDP	growth
2001/02	201,374.09	1.6	67.21	2.53	2,996.37	
2002/03	197,148.22	-2.1	68.95	2.53	2,859.17	-4.8
2003/04	220,272.43	11.7	70.75	2.53	3,113.57	8.17
2004/05	248,124.14	12.6	72.16	1.96	3,438.48	9.45
2005/06	276,756.11	11.5	74.04	2.53	3,738.08	8.01
2006/07	309,399.21	11.8	73.85	-0.26	4,189.85	10.78
2007/08	344,012.20	11.2	75.73	2.49	4,542.79	7.77
2008/09	378,555.54	10.0	77.67	2.5	4,874.08	6.8
2009/10	418,557.93	10.6	79.66	2.5	5,254.30	7.24
2010/11	466,214.82	11.4	81.7	2.5	5,706.28	7.92
2011/12	507,425.95	8.8	83.79	2.49	6,056.29	5.78
2012/13	556,462.52	9.7	85.89	2.45	c	6.52
Average	343,691.93	9.07	75.95	2.23	4,437.34	6.69

Source: MoFED and CSA, party own computation

In the post 1990/91, however, we have lagged 10 years information in the middle here to incorporate the trends of population and economic growths. However, both trends since 2001/02 have been combined and are depicted in table 6. In the period, the GDP of the country has experienced an increasing

trend with an exceptional decline in 2002/03. Especially, the consecutive eight years between 2003/04 and 2010/11 have exhibited double digit registration of economic growth. This may be partly because of stability, partly because of government tendency for development through planning transformation program and partly due to delaying (lack of) cyclical drought in the period. To compare the trend, the growth rate at the beginning (2001/02) was estimated 1.6 while at the last year (2012/013) was registered 9.7% annually. In the period, the highest growth rate was recorded in the year of 2004/05 (12.6%) while the lowest one was in 2002/03 (-2.1%).

On the other hand, the trend shows that there was slight decline in growth rate of population while the size of population was increasing in the period. The population size was 67.21 million (2.53%) at beginning of 2001/02 which increased to 85.89 million (2.45%) in 2012/13. Due to high economic growth with decreasing rate of population growth, per capita GDP have also increased. Per capita GDP that was registered 4,437.34 on the average 2,996.37 birr at the beginning increases to 6,478.86 birr with growth rate of 6.52 at the last year. Although the highest growth rate of per capita GDP was registered at 10.78% in 2006/07 (4,189.85 birr), the highest per capita GDP has been recorded at 6,478.86 birr in the last year of 2012/13. This reveals that there was improvement of standard of life comparing with previous period over time with assuming other things are constants.

From above descriptive analysis, we can conclude that population growth can negatively affect if its growth rate is very high compared with economic level and growth rate. Especially, the first period of the Derg regime witnessed rapid population growth over stagnant economic performance can bring negative consequence on the life of people. The following chapter examines the link between population and economic growth using a more rigorous method.

# Chapter Four

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## 4. Econometric Analysis and Interpretation

### 4.1. Model specification

Although there are a lot of economic growth models, the three growth models; the endogenous growth model, the structural growth model and the neoclassical growth model are well-known. The endogenous growth model looks for determinants of technological progress. That is factors push the technology frontier upward continuously. This model permits increasing returns to scale in aggregate production and frequently focuses on the role of externalities in determining the rate of return on capital investment (Todaro, 1994:91). Total productivity is also related to the economic factors like research and development, and investment and trade. And it gives more emphasis on human capital formation and the benefits from exchange ideas that comewithan open economy integrated into the world economy (Tsega, 2005:54). However, this model of economic growth is not so relevant for this study because the objective is not concerned with technological progress and human development improvement but rather to see how population growth in general has affected economic growth.

The second structural model basically assumes that the economic growth can be achieved by reallocating labor and capital from less productive to more productive sectors of the economy (ibid). Since the model focuses on structural transformation of resources and productivity, it is not appropriatefor this study.

According to the third neo-classical growth model, output growth results from effective allocation of one or more of three factors: labor in terms of quantity and quality through population growth and education, increase in capital through saving and investment, and improvement in technology (Todaro, 1994: 86). The assumption of this model is that poor economies with lower values of capital and output tend to catch up with the initial rich ones. This model also assumes that population and technology as exogenously determined and production functions are assumed to satisfy the law of diminishing returns. Although the neo-classical growth model has its limitations in some aspects, it can be applied by some modification of population exogenous assumptions and is better for this study.

The standard neoclassical model of economic growth concerns rates on the Cobb-Douglas production function in the form of:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \dots\dots\dots (1)$$

Where: Y is total output, K denotes capital, L represents labor, A is total factor of productivity,  $\alpha$  is elasticity of output with respect to capital and  $1-\alpha$  is the elasticity of output with respect to labor.

Nevertheless, this can be applied where the economy depends only on the industry and service sectors. Thus it tells us the economy of more advanced countries. The structure of Ethiopian economy, however, is found still in the subsistence agricultural sector although the other sectors have a little contribution for it. The output of agricultural sector depends on land size and its productivity, and population. And the sector is characterized by constant return to scale (Jhingan, 2002: 162ii). Thus the factors of agricultural production function can be written as:

$$Y_{at} = A_{at} L_t P_t^{1-\beta} \dots\dots\dots (2)$$

Where:  $Y_a$  represent agricultural output,  $A_a$  is technical change in agricultural productivity, L is fixed quantity of land availability in the economy,  $\beta$  is the share of households in the product which takes the form of rent, P is total population in the sector, and  $1-\beta$  is the

elasticity of output with respect to population. However, since population is fixed, the equation (2) can be modified as:

$$Y_{at} = A_{at} P_t^{1-\alpha} \dots\dots\dots(3)$$

As we have mentioned above, since the manufacturing and service sectors have their own contribution for the growth of Ethiopian economy, they should be considered in this study. Thus we can write their integrated production function as:

$$Y_{ot} = A_{ot} K_t^\beta L_t^{1-\beta} \dots\dots\dots(4)$$

$Y_o$  is the output of other sector (manufacturing and service sectors),  $A_o$  is total factor productivity in the sectors,  $K$  represents capital stock,  $\beta$  is elasticity of output with respect to capital, and  $1-\beta$  represents elasticity of output with respect to labor.

But according to the objective of the study, labor can be considered as part of population (not as special productive force). Therefore, equation (4) can be written as:

$$Y_{ot} = A_{ot} K_t^\beta P_t^{1-\beta} \dots\dots\dots(5)$$

Accordingly, the summation of equation (3) and equation (5) gives us:

$$Y_t = A_{at} P_t^{1-\alpha} + A_{ot} K_t^\beta P_t^{1-\beta} + \epsilon_t \dots\dots (6); (Y_t = Y_{at} + Y_{ot}, \epsilon_t = \text{stochastic error term})$$

In order to obtain per-capita income equation, we should divide both side of equation (6) by  $P_t$ .

$$\frac{Y_t}{P_t} = A_{at} P_t^{-\alpha} + A_{ot} K_t^\beta P_t^{-\beta} + \epsilon_t \dots\dots (7)$$

Taking natural logs of both sides of equation (7), we can obtain:

$$\ln \frac{Y_t}{P_t} = \ln A_{at} - \alpha \ln P_t + \beta \ln K_t - \beta \ln P_t + \ln \epsilon_t$$

$$\ln \frac{Y_t}{P_t} = \ln A_{at} + \beta \ln K_t - (\alpha + \beta) \ln P_t + \ln \epsilon_t$$

$$\ln \frac{Y_t}{P_t} = \ln A_{at} + \beta \ln K_t - (\alpha + \beta) \ln P_t + \ln \epsilon_t$$

$$\begin{aligned}
 & (\dots + \dots) \\
 & = \dots + \dots + (\dots - \dots) + \dots \dots\dots(9)
 \end{aligned}$$

Finally, from above equation (9), the specification of the model in the Ethiopian case can be written as:

$$= \dots + \dots + \dots + \dots\dots\dots(10)$$

**Where:**  $\dots = \dots$ ,  $\dots = \dots$ ,  $\dots = (\dots - \dots)$ ,  $\dots = \dots$

## 4.2. Estimation Results and Interpretation

Mostly macro-economic time series variables are non-stationary because their mean, variance and covariance depend on time. However, interpretation of non-stationary variables doesn't give meaning. Therefore, the interpretation of the test should be conducted to determine the order of integration of the variables by using unit root test. For this purpose, applying Augmented Dickey Fuller (ADF) test is more preferable so that unit root test is performed on both levels and first difference for each variable with using critical value. Additionally, to examine the long run relationship between GDP and population growths and to perform their integration test for the stationary, we should implement the following steps.

### 4.2.1. Test for Stationarity of the variables.

In the first step, if the value of ADF test statistic exceeds the critical values, the variable is stationary and can pass this test; otherwise, it is non-stationary. However, by transforming into differencing the series, the variable can pass the test at its first level. If the series shows the test of stationary in the first difference, it is called integrated of order one (i.e. I(1)). This is depicted in table 4.1.

Table 7: Unit root test for the variables at level

variables	DAF-test statistic	Critical Value 1%	Critical Value 5%	Critical Value 10%	P-value	
LNGDP	2.119	-3.662	-2.96	-2.619	1	I(0) (at level)
LNGKF	0.06	-3.662	-2.96	-2.619	0.957	
LNPOP	-2.337	-3.738	-2.992	-2.636	0.169	
						I(1) the first difference
LNGDP	-4.195	-3.67	-2.964	-2.621	0.003	
LNGKF	-4.403	-3.7	-2.976	-2.627	0.002	
LNPOP	-4.127	-3.738	-2.992	-2.636	0.004	

Source: Own Estimation

For the model, since all values of ADF test statistics (in absolute value) are greater than all critical values, the variables are non-stationary at this level. However, each series can pass the test at their first difference because the critical values of each series are greater than ADF test statistic at 1%, 5% and 10% in absolute value with significant p-value. Therefore, we can reject the hypothesis because the data are stationary in this difference; that means any variable by itself is an I(1) time series.

#### 4.2.2. Long-Run Relationships

Although the first different test is stationary for each variable of GDP, GKF and POP, the linear combination of these variables might be stationary.

Table 8: Long-Run Regression

Dependent Variable: LNGDP				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	3.95	0.268	14.752	0
LNGKF	0.465	0.06	7.746	0
LNPOP	0.407	0.143	2.845	0.008

Own Estimation

If linear combination of these variables is stationary at level, then we can say that the three variables are co-integrated. From table 8, we can observe that since p-value for each variable is less 5%, they are significant in the long-run.

$$\ln\text{GDP}=3.950 + 0.465\ln\text{GKF} + 0.407\ln\text{POP}$$

$$(14.752) \quad (7.746) \quad (2.845)$$

$$R^2=0.950\dots\dots(11)$$

The equation shows that each of the three variables has expected sign and the regression on the level of I(0) can be meaningful. The fitness of the model is 95% for the long-run of 32 samples of each variable. As theoretical expected each of explanatory variables has the positive sign, so that GKF and POP growth have positive impact in the long-run relation.

Although we have shown that GDP, GKF and POP are co-integrated in the long run stable relationship, it may be disequilibrium in the short run, in which the impact of population may be reversed. In this case, we can treat error term as equilibrium error, which is called Error Correction Model (ECM).

### 4.2.3. Residual Test

To be sure whether the model fulfills the null-hypothesis or not, we can check residual appropriateness in three different ways. As the criteria, if the variables have relationship, the residual (a) shouldn't be serially correlated (non-auto-

correlated), (b) should not be heteroscedastic and (c) should be normally distributed; otherwise the model can violate the assumption of null hypothesis.

Table 9: Residual Test

<b>Heteroskedasticity Test: Breusch-Pagan-Godfrey</b>			
F-statistic	0.244	Prob. F(3,27)	0.865
Obs*R-squared	0.817	Prob. Chi-Square(3)	0.845
Scaled explained SS	0.360	Prob. Chi-Square(3)	0.949
<b>Breusch-Godfrey Serial Correlation LM Test:</b>			
F-statistic	0.100	Prob. F(2,25)	0.905
Obs*R-squared	0.246	Prob. Chi-Square(2)	0.884
<b>Jarque-Bera -Non-normality Distribution</b>			
Jarque-Berast.	1.3133446	Prob.	0.518548

Own Estimation

Table 9 depicts that the above three criteria are fulfilled because all of them are insignificant since p-values for two obs.\*R<sup>2</sup>s and Jaque-Bera statistic are greater than 5%; so that we should reject the null-hypothesis. The implication is that there are stable relationships between the variables in the long-run.

#### 4.2.4. Short-Run Relationships

Table 10: Short-Run (adjusted) Regression

Dependent Variable: D(LNGDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.262	0.093	2.827	0.009
D(LNGKF)	0.17	0.038	4.424	0
D(LNPOP)	-7.612	3.053	-2.493	0.019
ECT(-1)	-0.233	0.093	-2.512	0.018

Own Estimation

From table 10, we can observe that each variable is significant. And we can also formulate the following short run equation

$$D(LNGDP) = 0.262 + 0.17 D(LNGKF) - 7.612 D(LNPOP) - 0.233 ECT$$

(2.827)      (4.424)      (-2.493)      (-2.512) ..... **(12)**

$R^2=0.540$  and  $R^{2*}= 0.489$

In the short run, the equation (12) shows that there is negative deviation of error correction term (ECT) that exhibits -0.233 and that the fitness of the model and its adjusted  $R^2$  can be explained 54% and 49% in the equation, respectively. The equation states that although the expected sign of explanatory variable of GKF is positive, the sign of POP is negative. That is to say that population growth in the short run can negatively affect economic performance of the country whereas it has affirmative implication for the long run development. Regarding GKF, as it is theoretically considered as substantial component for the economic growth. Similarly, the regression analysis has revealed that GKF has significantly positive effect on the economic growth.

From general regression results, we can conclude that population issue is very controversial because although it has negative impact in the short run, implication is positive in the long run as we have seen. This invites to investigate other variables that affect economic growth if its correlation can be positive in the long term. However, the short run effect shouldn't be neglected because if population adversely affects in this term, it may contribute stagnant economic performance in the long run duration. Hence the opposite result should be left for further study. The short run implication explains that large number of economically inactive people with high growth rate of population depresses the GDP growth of the country whereas economy can adjust in the long run and absorb existing people as labor force and that the burden of population can be avoided so that people can play as active actor of economic development of the country.

# Chapter Five

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## 5. Conclusion and Recommendation

### 5.1. Conclusion

Population is a main factor to affect an economy positively or negatively. And it has attracted a number of scholars to study how it affects the countries' economic growth.

There are different models of population which are related to economic growth. Among these models, Malthusian population trap, theory of demographic transition, Boserup's population model and consumer behavior theory and fertility can be taken as major models. Three broad views can be identified regarding the controversy among economists regarding the link between population and economic growth. Some scholars who are called pessimists argue that high population growth can have negative effects on the economy. Others called optimists contend that people are producers and they should be considered as additional manpower and productive capacity. Yet others called neutralists argue that population growth is not as such primary problem for low economic performance since people are considered dualistic in nature as producers and consumers. So, there is a debate on the link between population and economic growth.

Empirically, population has been increasing in the world in general, except in a few countries. According to UN (2005), the world population was 6.5 billion in 2005 and will reach 9.1 billion in 2050. Regarding Ethiopian population, it was estimated at 40.2 million in 1984, 53.5 million in 1994 and 73.85 million in

2007. Although there is a decrease in Ethiopia's population growth rate (from 2.9% to 2.5%), it is still high as it will double within 28 years.

This rapid population growth can be a danger unless the economic performance of the country absolves it.

Econometric analysis has shown that this population growth has had a significant negative impact in the short run but a positive impact in the long run on the economic performance of the country.

## 5.2. Recommendation

From the results of this study, we can recommend the points.

High rate of population growth has held per capita GDP of the country at low level in the short run. To decrease the rate of population growth in short term, people could be made aware of family planning techniques in traditional and modern ways with the provision of available contraceptive methods to all people as much as possible at low price, specifically for the rural areas.

Since education is a major instrument to create awareness on how high population growth affects economic performance of the country, the educational curriculum should be revised to find a solution to this problem for the present and the next generation.

Moreover, to minimize high birth rate, the government should formulate new policy.

Moreover, since high population growth is not the only reason for low economic performance, the other factors should be carefully examined. For example, macroeconomic environment, institutional accountability and transparency, and technological policies and capacity development should be considered and checked rather than focusing only on population growth. We also note that as

the long run regression results show, population contributes to economic performance positively in the long run..

Generally, in order to design and implement realistic policies regarding population issues that affect economic performance of the country, further researches should be studied. Moreover, effective policies should be prepared to adjust/control high rate of population growth and make it beneficially resource of the economy based on the results of reporting the researches.

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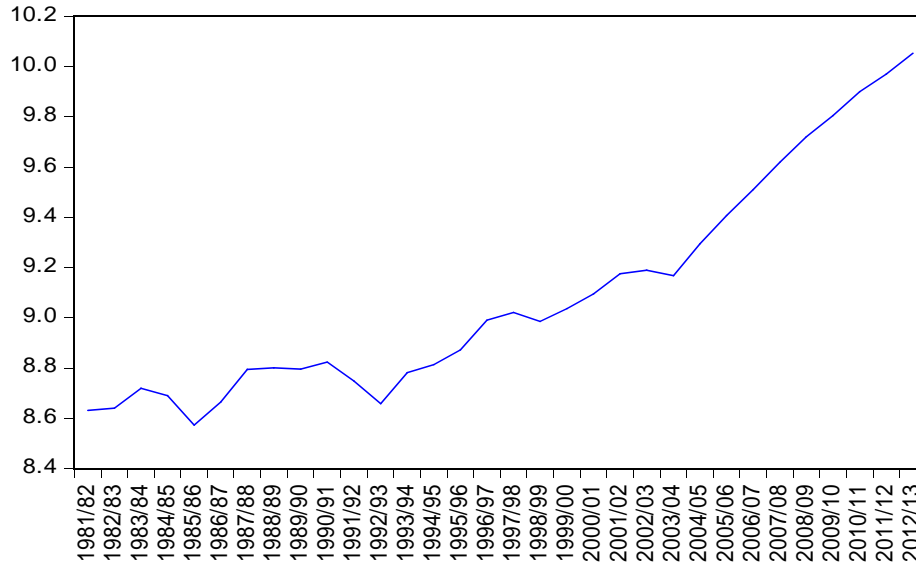
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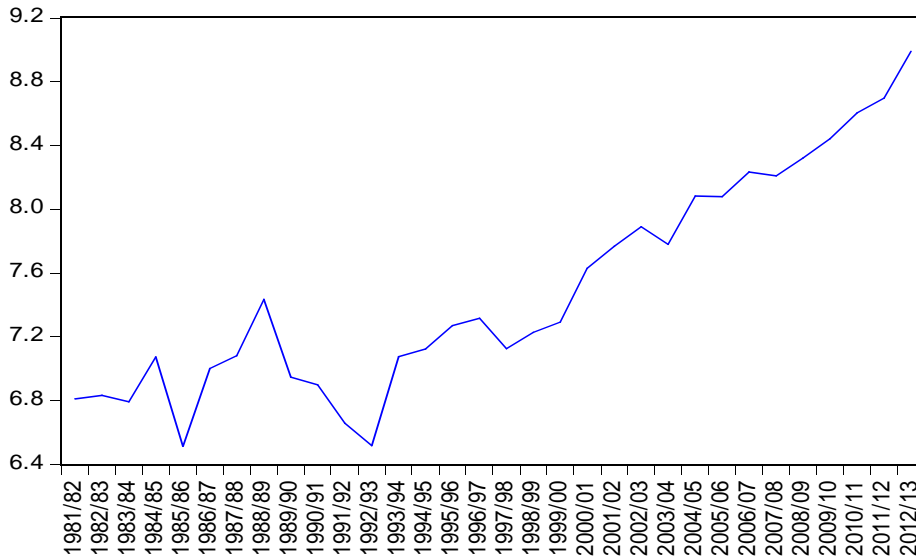
# 7. Appendix

## 7.1. Graphical trends

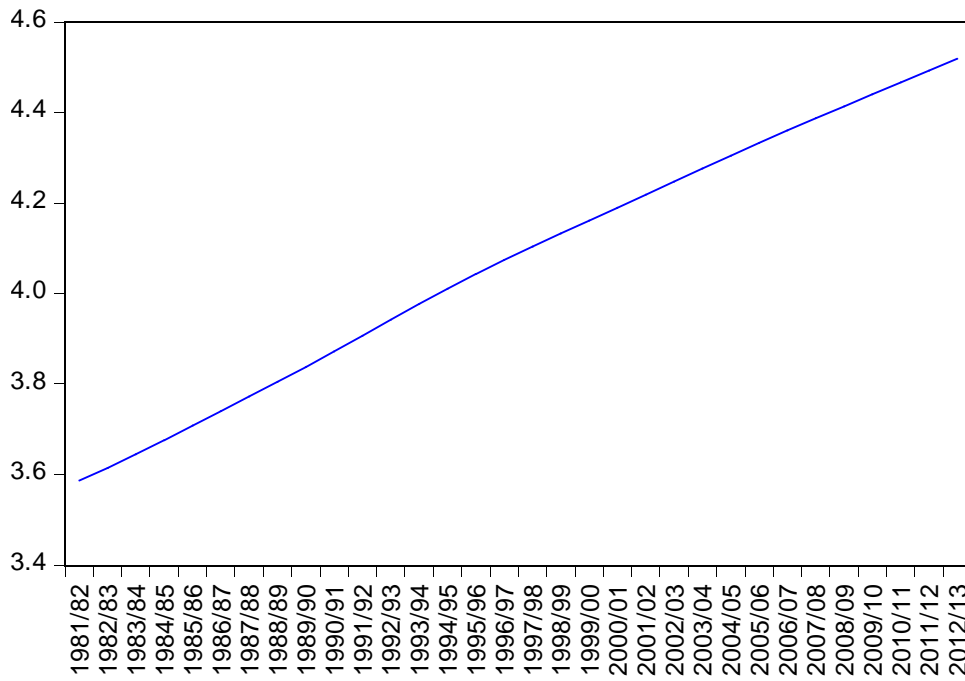
LNGDP



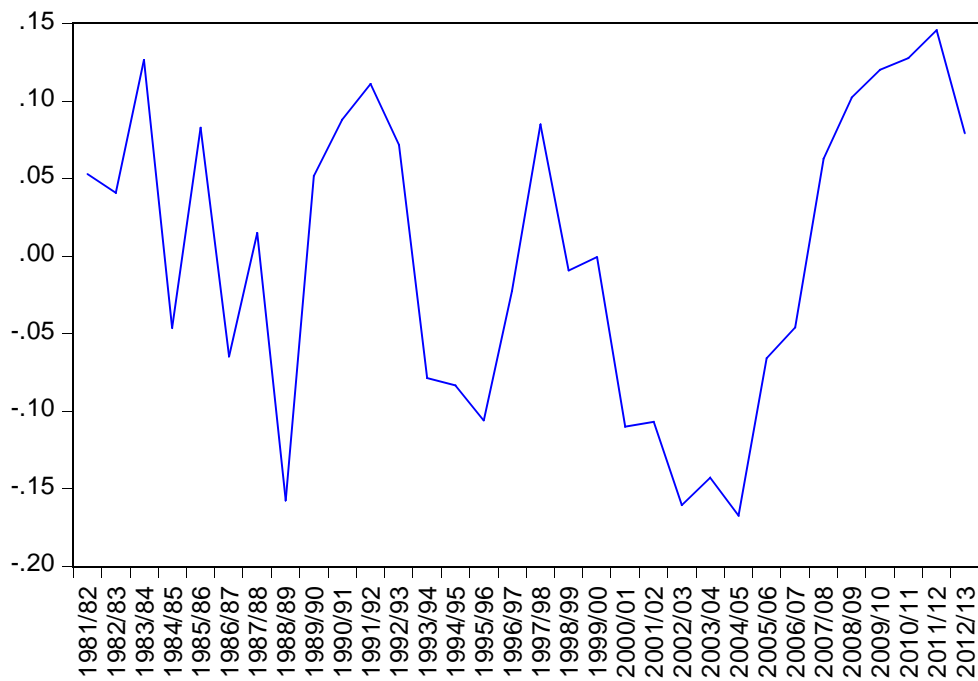
LNGKF

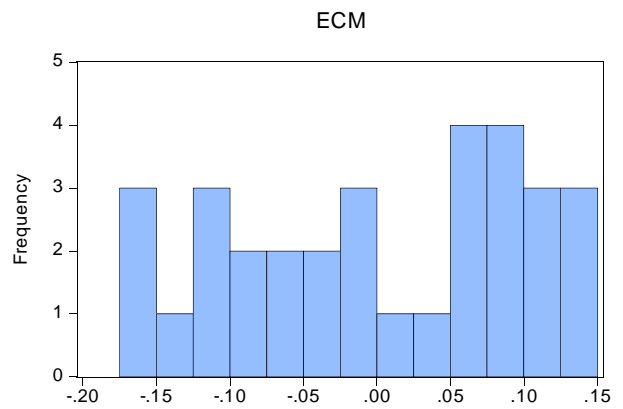
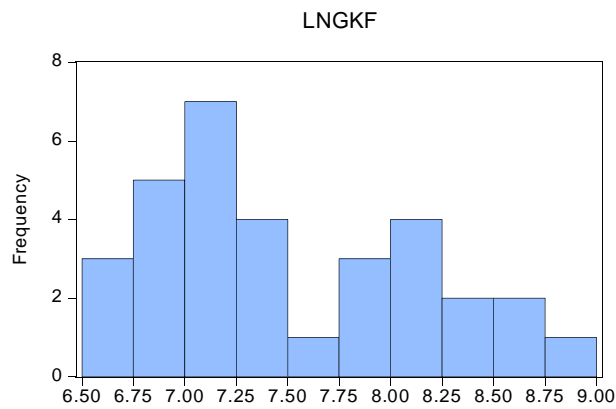
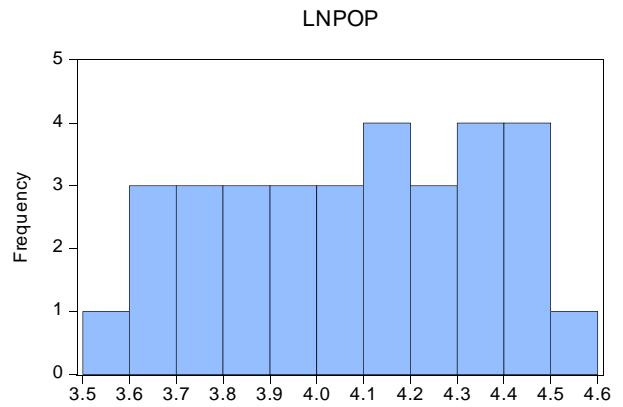
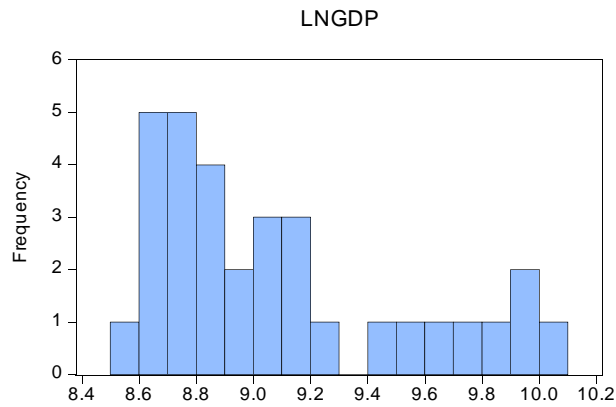
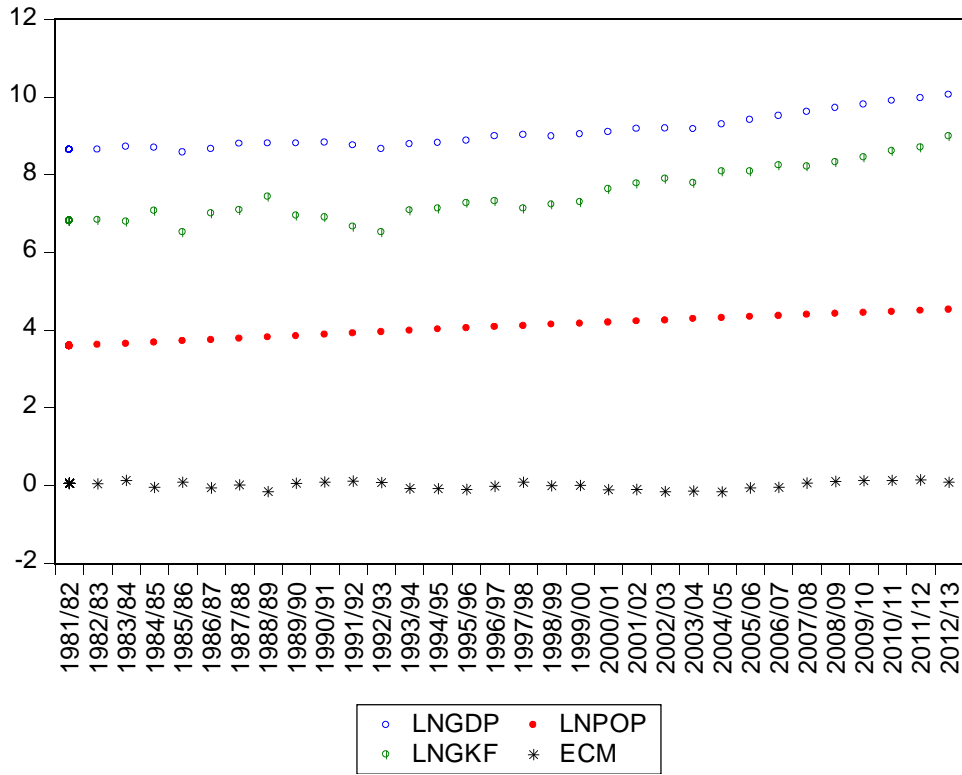


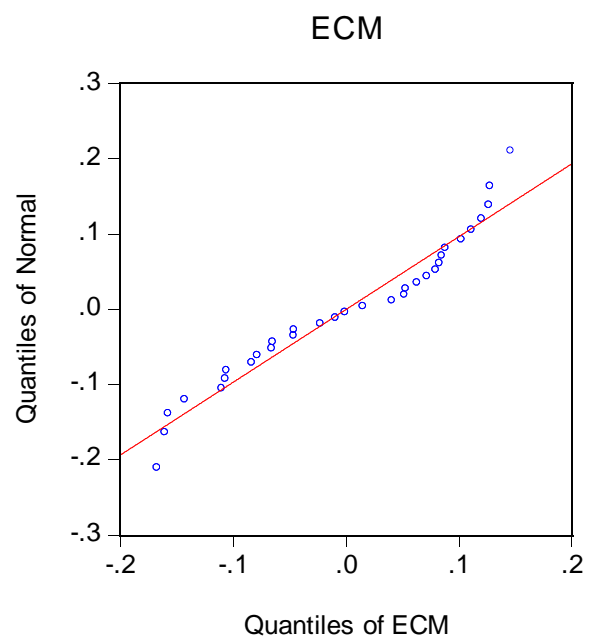
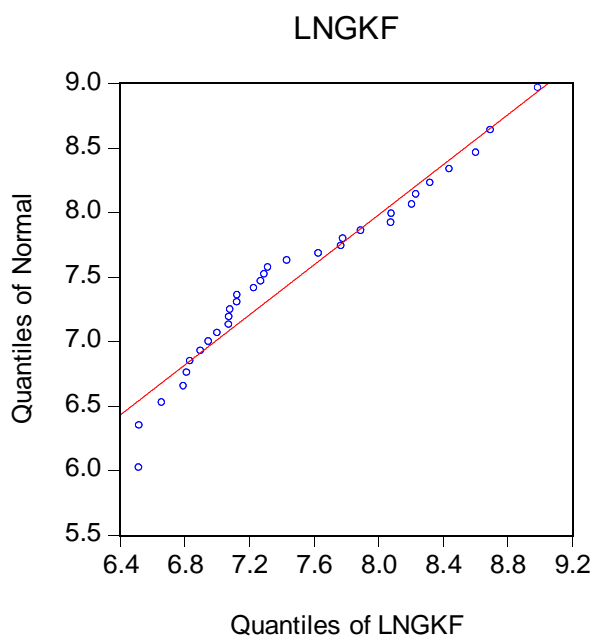
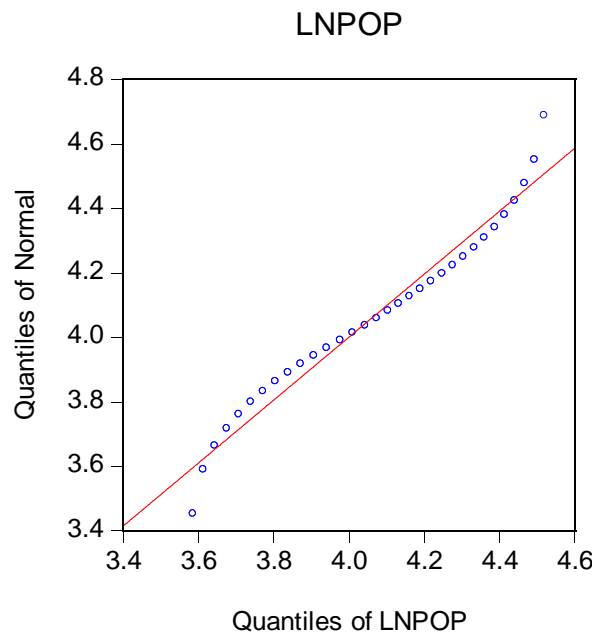
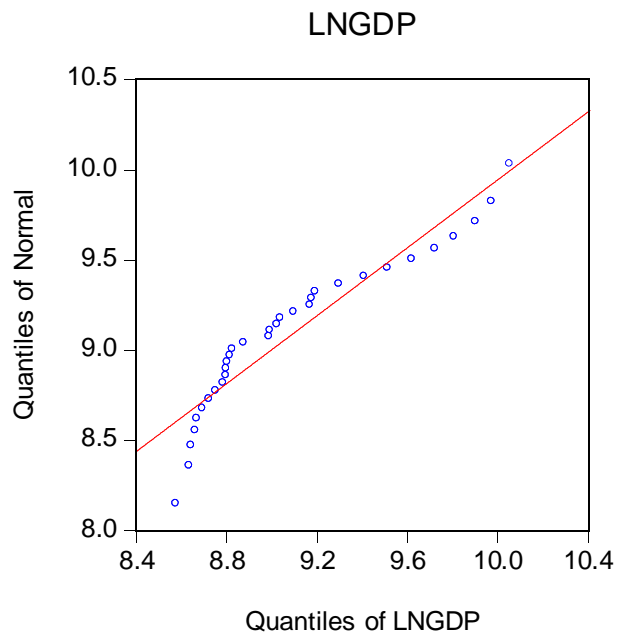
### LNPOP



### ECT







## 7.2. Long-Run Regression

Dependent Variable: LNGDP  
 Method: Least Squares  
 Date: 06/17/14 Time: 10:15  
 Sample: 1 32  
 Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.950352	0.267777	14.75241	0.0000
LNGKF	0.465361	0.060075	7.746404	0.0000
LNPOP	0.406866	0.143012	2.844970	0.0081
R-squared	0.950018	Mean dependent var		9.093211
Adjusted R-squared	0.946571	S.D. dependent var		0.436923
S.E. of regression	0.100994	Akaike info criterion		-1.658452
Sum squared resid	0.295794	Schwarz criterion		-1.521040
Log likelihood	29.53524	Hannan-Quinn criter.		-1.612904
F-statistic	275.6024	Durbin-Watson stat		0.861859
Prob(F-statistic)	0.000000			

## 7.3. Short-Run Regression

Dependent Variable: D(LNGDP)  
 Method: Least Squares  
 Date: 06/17/14 Time: 10:16  
 Sample (adjusted): 2 32  
 Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.262265	0.092761	2.827305	0.0087
D(LNGKF)	0.169947	0.038415	4.423940	0.0001
D(LNPOP)	-7.611541	3.053156	-2.493007	0.0191
ECM(-1)	-0.233148	0.092814	-2.512001	0.0183
R-squared	0.540423	Mean dependent var		0.045797
Adjusted R-squared	0.489359	S.D. dependent var		0.066804
S.E. of regression	0.047737	Akaike info criterion		-3.126295
Sum squared resid	0.061529	Schwarz criterion		-2.941264
Log likelihood	52.45757	Hannan-Quinn criter.		-3.065979
F-statistic	10.58323	Durbin-Watson stat		1.899951
Prob(F-statistic)	0.000089			

## 7.4. Residual Regression

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.243663	Prob. F(3,27)	0.8651
Obs*R-squared	0.817161	Prob. Chi-Square(3)	0.8454
Scaled explained SS	0.359588	Prob. Chi-Square(3)	0.9485

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/17/14 Time: 10:17

Sample: 2 32

Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000717	0.004392	-0.163269	0.8715
D(LNGKF)	0.000207	0.001819	0.113945	0.9101
D(LNPOP)	0.089104	0.144567	0.616353	0.5428
ECM(-1)	-0.002522	0.004395	-0.573845	0.5708
R-squared	0.026360	Mean dependent var		0.001985
Adjusted R-squared	-0.081822	S.D. dependent var		0.002173
S.E. of regression	0.002260	Akaike info criterion		-9.226674
Sum squared resid	0.000138	Schwarz criterion		-9.041643
Log likelihood	147.0134	Hannan-Quinn criter.		-9.166358
F-statistic	0.243663	Durbin-Watson stat		1.975032
Prob(F-statistic)	0.865086			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.099969	Prob. F(2,25)	0.9052
Obs*R-squared	0.245955	Prob. Chi-Square(2)	0.8843

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 06/17/14 Time: 10:17

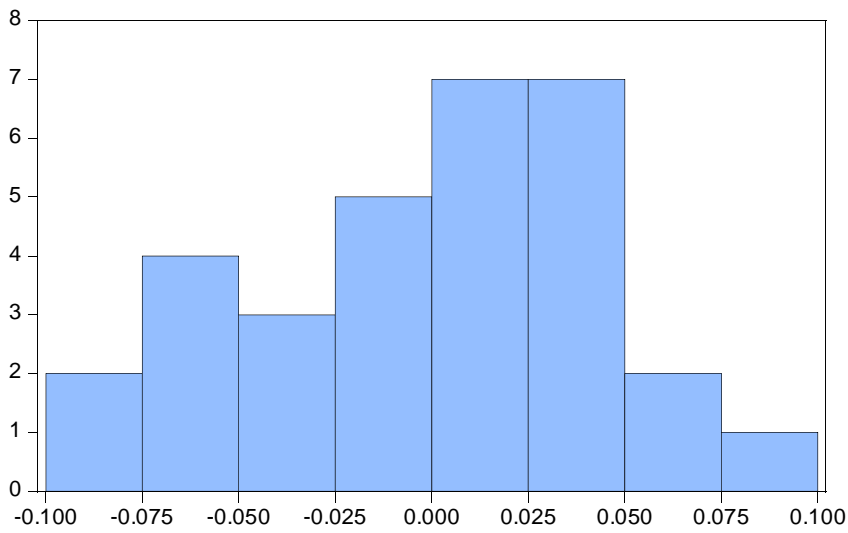
Sample: 2 32

Included observations: 31

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005896	0.097338	0.060572	0.9522
D(LNGKF)	-0.011465	0.049425	-0.231961	0.8185
D(LNPOP)	-0.170507	3.194134	-0.053381	0.9579
ECM(-1)	0.009935	0.120081	0.082733	0.9347
RESID(-1)	0.044568	0.225565	0.197586	0.8450
RESID(-2)	-0.098484	0.257778	-0.382050	0.7057

R-squared	0.007934	Mean dependent var	-2.67E-17
Adjusted R-squared	-0.190479	S.D. dependent var	0.045288
S.E. of regression	0.049413	Akaike info criterion	-3.005228
Sum squared resid	0.061041	Schwarz criterion	-2.727682
Log likelihood	52.58103	Hannan-Quinn criter.	-2.914755
F-statistic	0.039987	Durbin-Watson stat	1.928898
Prob(F-statistic)	0.998993		



Series: Residuals	
Sample 2 32	
Observations 31	
Mean	-2.67e-17
Median	0.000986
Maximum	0.083851
Minimum	-0.083823
Std. Dev.	0.045288
Skewness	-0.279086
Kurtosis	2.160175
Jarque-Bera	1.313446
Probability	0.518548

I, the undersigned, declare that this project paper is my original work and has not been presented for a degree in any other university, and that all the sources of materials used for the thesis have been duly acknowledged.

Declared by:

Name: Kassahun Alemu

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Confirmed by Advisor:

Name: Alemu Mekonnen (PH.D.)

Signature: \_\_\_\_\_

Date: \_\_\_\_\_