EFFECT OF MORTALITY, FERTILITY AND NET MIGRATION ON POPULATION GROWTH IN UGANDA (1985-2015)

By

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DECLARATION

I, **ABDULLAHI Mohamud Osman** hereby declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature: Abdullahi

Date: 30 / 10 /2017

APPROVAL

"I confirm that the work in this dissertation was carried out by the candidate under my supervision"

Supervisor's Name: Dr. JAMES Wokadala

Signature: _____

Date: 30 / 10 **/2017**

DEDICATION

This dissertation is dedicated to my father MOHAMUD OSMAN and my mother SAIDO YUSUF for their great contribution and efforts that they have put in for me to reach this level of education.

Thank you very much my parents.

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ACRONYMS/ABBREVIATIONS

ADF	:	Augmented Dickey-Fuller
AIC	:	Akaike Information Criteria
DF	:	Dickey Fuller
TRF	:	Total Fertility Rate
UBOS	:	Uganda Bureau of Statistics
UDHS	:	Uganda Demographic Health Survey
UN	:	United Nations
UNDP	:	United Nations Development Program
UNPFA	:	United Nations Population Fund
VIF	:	Variance Inflation Factor

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ABSTRACT

The study aimed at examining the effect of mortality rate fertility rate and net migration on population growth in Uganda from the period of 1985 to 2015 using time series data. Specifically, the study aimed at examining how each of these variables affects population growth. The objectives were; to examine the relationship between mortality rate and population growth rate in Uganda, to determine the relationship between fertility rate and population growth rate in Uganda are and to assess the relationship between net migration and population growth rate in Uganda rate. The hypothesis of the study was that there is no significant relationship between the independent variables of mortality rate, fertility rate, net migration and the dependent variable of population growth in Uganda. The study tested for stationarity among variables using ADF and Philip Perron methods. The stationarity results showed that all the variables of the study were stationary at level. Correlation analysis was used to exhaustively discuss the objectives. The findings from the correlation analysis indicated that fertility rate (r=0.228) and net migration (r=0.275) had appositive relationship with population growth while mortality rate (r=-0.30) had a negative relationship with population growth rate. Furthermore, the regression model showed that net migration has a positive significant effect on population growth also fertility rate has a positive non-significant relationship with population growth rate. On the other hand, mortality rate has a negative significant impact of population growth. The study concluded that fertility rate and net migration are positively related to population growth while mortality rate is negatively related to population growth. Basing on the findings, this study recommended that there should be improvement on the health facilities across the country as a way of reducing infant and child mortality and that the policy makers must ensure that there is equitable and proportional distribution of resources to all geographical locations whether urban or rural in the country. Finally, the study recommended that through government and NGOs, contraception counseling be provided by trained family or general physicians and be conducted prior to marriage as this will better inform couples with choices of contraception. This will also contribute to meeting the unmet need for contraception and reducing unwanted fertility thus reducing population growth rate in the country.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter consists of background, problem statement, and purpose of the study, research objectives, hypothesis, scope and significance of the study.

1.1 Background to the study

The background of the study is classified into perspectives namely; historical, theoretical, conceptual and contextual perspectives.

1.1.1 Historical Perspective

Population growth in both underdeveloped and developed nations can cause an array of problems. These problems typically include deficiencies in health care programs, lack of resources and pollution. Unfortunately, certain difficulties, such as malnourishment due to food shortages, may spark related crises, such as outbreaks of disease due to malnourishment. In order to combat these problems, a government's lawmakers and leaders must implement wise policies that concentrate on vital reform measures (Rodríguez, 2008).

Malnutrition and disease are concerns that must be addressed by regions that experience high population growth. Even in developed nations such as the United States, poor, displaced or elderly citizens are unable to receive access to sufficient health care. In highly populated urban areas of these developed nations, just as much as in third world nations, diseases can easily spread when people are residing in close quarters. A person's susceptibility to diseases like malaria and respiratory infections is aggravated by malnutrition. Profound immuno-suppression is also exacerbated in victims of HIV as a result of malnutrition (Menjívar, 2008).

Issues such as air pollution stemming from industrial activity, waterborne infections carried through unsanitary drinking water, and mismanagement of solid waste plague densely populated areas of the world. Major cities with high populations create a significant amount of pollution through factory waste and automobile emissions. In the absence of sufficient regulation, environmentalists allege that these cities severely damage the earth's atmosphere. By contrast, underdeveloped regions with dense populations can cause damage to the earth's soil via groundwater pollution or crude farming techniques (Jiang, 2007).

Thomas Malthus believed that human beings, like plants and non-rational animals, are "impelled" to increase the population of their species by what he called a powerful "instinct", the urge to produce. Further, if there are no checks on population growth, human beings would multiply to an "incalculable" number, filling millions of the worlds (Malthus, 2013) in a few years"2. The "population explosion" that occurred since the World War II gave rise to a host of doomsday prophesies proclaiming a calamitous end to human society. Although these messages may have been strident, they did hammer out a public consciousness about the quality of our physical and social environment (Urdal, 2005).

Furthermore, the Population Density of Uganda in 2014 was 173 persons per square kilometer, a two-fold increase from the 85 persons per square kilometer in 1991 as shown in table 2.3. Uganda's population density in 2014 was much higher than some of her neighbors (South Sudan – 18, Tanzania – 54 and Kenya – 74) for the same year. However, it was lower than that of Rwanda (421) and Burundi (377) for the same period. Figure 1 below presents Uganda's population growth from 1911 to 2015 depicting the trend in these population figures over that period (UBOS, 2014).

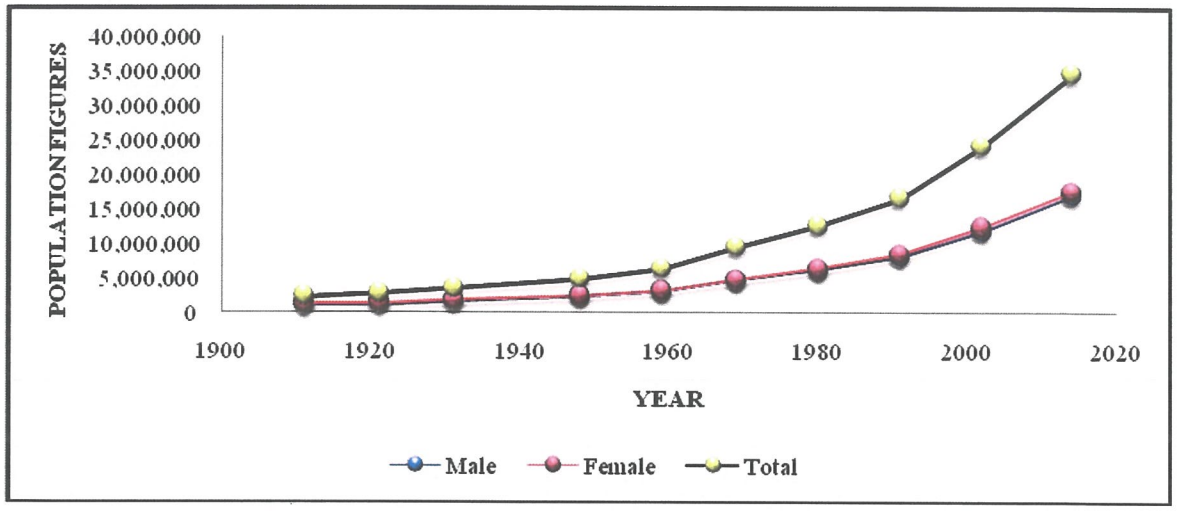


Figure 1.1: Population changes in Uganda from 1911 to 2015 by gender and overall growth.

Source: Data retrieved from UBOS (2016)

The data indicates that Uganda's population has been growing annually for all the years considered in the study. The females seem to have registered a much larger increase in the population compared to the males as depicted in figure 1. Nevertheless, the overall population has been increasing at an alarming rate. Notable among the reasons as to why the population has been increasing at such a rate is the increasing fertility rate, decreasing mortality coupled with recent refugee influx in the country as a result of wars and conflicts in the neighboring countries (Lwasa, 2007). The debilitating effects associated with uncontrolled population increases has inspired several researches and studies aimed at the studying the salient factors leading to population changes in Uganda.

Fertility refers to the number of children born to women. Note that though our concern lies primarily with the total impact of child bearing on a society, we have to recognize that the accumulation of thousands, even millions, of individual decisions to have or not to have children. The Total Fertility Rate (TFR) is the number of children a woman would have by the end of her childbearing years if she were to pass through those years bearing children at a given observed age-specific rates. If fertility were to remain constant at current levels, a

Ugandan woman would bear an average of 6.2 children in her lifetime. This represents a decrease of 0.5 children in the 5 years since the 2006 UDHS, when the TFR was 6.7 births per woman. Fertility is significantly higher among rural than urban women. Rural women will give birth to nearly three more children during their reproductive years than urban women (3.8 and 6.8, respectively). (UDHS, 2011).This lives Uganda with the second highest fertility rates in the world.

Mortality dynamics on the African continent has been hindered by lack of data resulting from incomplete vital registration systems or by the use of techniques which do not take into account sudden changes in the burden of disease resulting from the emergence and re-emergence of infectious diseases for instance HIV/AIDS. Infant and child mortality rates are basic indicators of a country's socioeconomic situation and quality of life (UNDP, 2007). In Uganda, estimates of childhood mortality are based on information collected in the birth history section of the questionnaire administered to individual women (UDHS, 2011). The section begins with questions about the aggregate childbearing experience of respondents (i.e., the number of sons and daughters who live with the mother, the number who live elsewhere, and the number who have died).The rates are estimated directly from the information collected using the birth history table on a child's birth date, survivorship status, and age at death for children who died. Whereas the Population and Housing Census has fairly reliable information about migration into Uganda.

There is no reliable source of information about migration out of Uganda. It is therefore not possible to ascertain the net effect of migration on the population in the absence net migration data, assumptions about net migration were based on estimates by the United Nations for Uganda. The United Nations estimated net migration during the period 1995-2000 as a net loss of 9,000. However, this figure was not broken down by age and sex. Considering that the only available data is not disaggregated by sex, which is a requirement for the values to be

used in the component projections, and considering that the value is very small, it was deemed appropriate to regard the net migration as zero. This is further strengthened by the fact that the annual net international movement across gazette border posts is less than 50,000 persons annually for the past 5 years (UBOS, 2007).

1.1.2 Theoretical Perspective

Malthusian Theory of Population asserts that human populations grow exponentially (i.e., doubling with each cycle) while food production grows at an arithmetic rate (i.e. by the repeated addition of a uniform increment in each uniform interval of time) (De Sherbinin*et al.*, 2007). Thus, while food output was likely to increase in a series of twenty-five year intervals in the arithmetic progression, and so on, population was capable of increasing in the geometric progression, and so forth (Impagliazzo, 2012). This scenario of arithmetic food growth with simultaneous geometric human population growth predicted a future when humans would have no resources to survive on. To avoid such a catastrophe, Malthus urged controls on population growth (Strulik & Weisdorf, 2008).

Also the demographic transition theory links birth rates and death rates to a society's level of industrialization the process by which a society's economy shifts from a predominantly agricultural and handicraft based to a predominantly industrial and large scale manufacturing base (Omran, 2005). It features the pre-industrial stage, high birth rates are balanced by high death rates, and population size remains fairly stable.During stage 2, the stage of increasing industrialization, the death rate falls primarily because of the improved sanitation, hygiene, and medical conditions (Hoem*et. al.*, 2009). At the third stage the traditional values give way to modern values favoring contraception and family planning. Birth rates decline as a result of later ages at marriage, urbanization, industrialization, rising aspirations, and other factors. At the fourth stage the birth rates fall to about the same level as mortality rates. With births and deaths at similar low levels, the equilibrium of slow population growth is regained. The

study will mainly use the second theory, Demographic Transition, since the theory accounts for the mortality rates, fertility rates and net-migration, the salient factors considered for explaining the variation in overall population. Thus, the theory will be further expounded in the subsequent sections of the study.

1.1.3 Conceptual Perspective

Population growth as a concept refers to the actual aggregation of organisms, and explicitly to human organisms in a given area or locality (Impagliazzo, 2012). Conceptually, population growth refers to the total number of individuals in the country in a given year.Mortality rate refers to the probability of an individual dying (Shelton, 2014). Conceptually, mortality rate refers to the number people who die in a given year divided by the total population in that specific year. Fertility rate refers to the number of children born to women (Omran, 2005). Conceptually, fertility rate refers to the number of children that are produced by a female in her reproductive age for instance 15-49. A direct measurement of migration requires counting persons who change their residence across migration defining boundaries (United Nations, 2016). Conceptually, migration refers to the movement of people in and out of the country in a given year.

1.1.4 Contextual Perspective

The study is using Uganda as a case study because several campaigns aimed at checking the population growth have been instituted by the government as several other stakeholders. Furthermore, previous studies on the state of the social-economic conditions and services in Uganda seem to indicate that it is strongly associated with the large population. According to the 2010 revision of the world population prospects, the population of Uganda was 33425000 in 2010, compared to only 5158000 in 1950 (UBOS, 2012). This shows that the population of Uganda has multiplied its self almost seven times between 1950 and 2010 this is quite alarming at first glance. Uganda has undertaken five population Censuses in the post-

independence period. The most recent 2014 National Housing and population census indicated that the total population of Uganda was 34.6 million persons in 2014 representing an increase of 10.4 million persons from the 2002 census (UBOS, 2014). The most apparent drivers to this heavy population growth are mainly the increasing levels of fertility amongst women in the reproductive age. For instance, recent surveys indicate that an average Ugandan woman is expected to have 6 children in her lifetime before hitting menopause. This alarming figure shows that the population is meant to increase at a rather alarming rate (UBOS, 2014). Further evidence also indicates that the mortality rate has registered shortfalls possibly due to increased science in the health care meaning people can live long enough to go through their reproductive age. In this study, a long lasting and dependable solution to population growth that would entail paying close attention to the three population attributes so as to develop solutions to population growth in Uganda is to be developed.

1.2 Statement of the Problem

An increased population presents a lot of challenges for both the developed and the under-developing countries. The negative effects are felt more in the countries that are developing especially on the African continent (Cohen, 2006). For instance, an increased population decreases the mortality rate, increases the fertility rate and net migration. It further curtails the development of welfare problems, affects the environment. All these interact to initiate an endless vicious cycle of poverty coupled with a decrease or shortage in social amenities. Consequently, there has been growing concern for reducing the speed at which the population increases in the country.

Latest statistics from the Uganda Bureau of Statistics (UBOS) reveal that the country's population growth rate has plummeted from 3.2% in 2002 to 3.0% today, experts warned that the population growth rate had not declined enough to enable Uganda to reap demographic dividend. Also there has been a marked reduction in the mortality rates and fertility rates

between 1985 and 2015 (0.0192, 5.075) respectively, for net migration rates Uganda has experienced an average positive Net-migration between 1985 and 2015.

Previous literature indicates that mortality, fertility and net migration are the three major determinants of population change and any population control measure ought to focus on the controlling these three population attributes. Studies conducted in other developed countries have indicated that the interaction of these variables has strong association to population and thus controlling them using an effective perspective would control population growth and its adverse effects. Thus, this study develops a model of population growth in Uganda's case employing these three variables in model development. The study seeks to identify the major natural drivers to population growth that are commensurate with demographic theory in a bid to identify proper plausible and feasible solutions to the increasing population in the country. With special emphasis on mortality, this study attempt to provide possible alternatives or fill gaps that tend to accord a lot of attention to only controlling fertility as a tool for curbing the ever-increasing population. Empirically, the study will generate information through a thorough scientific model that would enable the policy makers developed informed decisions regarding population control measures.

1.3 Purpose of the study

The purpose of the study is to investigate the relationship between mortality rates, fertility rates, net migration and population growth in Uganda.

1.4 Specific Objectives

1. To examine the relationship between mortality and population growth in Uganda.
2. To determine the relationship between fertility and population growth in Uganda.
3. To assess the relationship between net migration and population growth in Uganda.

1.5 Hypotheses

Ho_1: There is no significant relationship between mortalityand population growth.

Ho_2: There is no significant relationship between fertility and population growth.

Ho_3: There is no significant relationship between net migration and population growth.

1.6 Scope of the study

The study considered the mortality rates, fertility rates, net migration rates and population growth rates data for years running from 1985 to 2015.

1.7 Significance of the study

This research will generate a lot of scholarly and technical knowledge about the use of the three demographic components in developing population forecasts. This will entail developing a statistical model that can be used for studying the population causes, making further population forecasts for the population distribution in the years when the population census is not done yet population figures are required.

The study will beneficial in the sense that it will generate immense statistical knowledge and literature that would be employed in developing further related studies in in this and related genres.

The population figures and structures projected by the component method can be used as inputs for projecting the number of households, school enrolment, and the size and composition of the labor force.

1.8 Operational Definition of the Key Terms

Mortality: refers to the number people who die in a given year divided by the total population in that specific year.

Fertility: refers to the number of children that are produced by a female in her reproductive age for instance 15-49.

Net migration: refers to the movement of people in and out of the country in a given year.

Population growth: refers to the rate of the total number of individuals in the country in a given year.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section presents a review of the theories associated with the study of population distribution and estimation. It also involves an empirical review of previously conducted studies on the subject of population estimation and studies. All the literature reviewed in this section of the study is in line with the objectives of the study.

2.2 Theoretical Review

Malthus Theory

In 1798 Malthus published an Essay on the Principle of Population. By analyzing the then prevailing situation in different countries, Malthus initiated a debate about the connection between population and food resources that continues to this day. His premise was that: (1) food was necessary for the continuation of life, and (2) procreation was also necessary for the continuation of life. Necessity of food for human survival is to continue, similarly the passions between the sexes are to continue, and both are natural necessities of life. But the two necessary factors of human life grow at different rate (Svizzero&Tisdell, 2014).

Whereas population size increases geometrically (2, 4, 8, 16, 32, 64), the food supply increases arithmetically (1, 2, 3, 4, 5, 6,). Population size, therefore, always pushes against the limits of food supply needed to support the population (Myrdal, 2013). With the existing rate of growth, the population is expected to double again every 25 years. For such a high growth rate of population, human beings should adopt such measures to check the growth of population. In his opinion the population checks were the Preventive checks, and Positive checks (Barry, 2007). Among the preventive checks, Malthus recommended (1) to follow celibacy (2) to marry late, (3) abstinence from entering into sexual unions resulting in procreation. If human beings don't adopt the "preventive checks", "positive checks" come

into operation in the form of famine, epidemics, war, and other natural calamities, and a lot of population is wiped out. For the remaining population food supply may be sufficient, though it may be a temporary relief (Myrdal, 2013).

The chief preventive checks envisaged by Malthus was that of "moral restraint", which was seen as a deliberate decision by men to refrain "from pursuing the dictate of nature in an early attachment to one woman", i.e. to marry later in life than had been usual and only at a stage when fully capable of supporting a family. This, it was anticipated, would give rise to smaller families and probably to fewer families, but Malthus was strongly opposed to birth control within marriage and did not suggest that parents should try to restrict the number of children born to them after their marriage (Malthus, 2013). Malthus was clearly aware that problems might arise from the postponement of marriage to a later date, such as an increase in the number of illegitimate births, but considered that these problems were likely to be less serious than those caused by a continuation of rapid population increase. He saw positive checks to population growth as being any causes that contributed to the shortening of human lifespans. He included in this category poor living and working conditions which might give rise to low resistance to diseases, as well as more obvious factors such as disease itself, war, and famine. Some of the conclusions that can be drawn from Malthus's ideas thus have obvious political connotations and this partly accounts for the interest in his writings and possibly also the misrepresentation of some of his ideas by authors such as Cobbett, the famous early English radical (Malthus, 2013). Some later writers modified his ideas, suggesting, for example, strong government action to ensure later marriages. Others did not accept the view that birth control should be forbidden after marriage, and one group in particular, called the Malthusian League, strongly argued the case for birth control, though this was contrary to the principles of conduct which Malthus himself advocated (Strulik&Weisdorf, 2008).

On the basis of a hypothetical world population of one billion in the early nineteenth century and an adequate means of subsistence at that time, Malthus suggested that there was a potential for a population increase to 256 billion within 200 years but that the means of subsistence were only capable of being increased enough for nine billion to be fed at the level prevailing at the beginning of the period. He therefore considered that the population increase should be kept down to the level at which it could be supported by the operation of various checks on population growth, which he categorized as "preventive" and "positive" checks (Malthus, 2013).

There has been lot of criticism of Malthusian theory of population by arguing that:

Malthus did not visualize the power of science and technology with the help of which the food supply could be revolutionized. Even one country like Canada could produce so much of wheat that could be sufficient for the whole of the world. But will Canada supply wheat free? Not at all. Even if it is free some countries may not even have the ability to bear the transportation costs.

Malthus did not advocate the use of contraceptives as a means of preventive measure, though these were available during his time. Being a clergyman perhaps he did not consider the advocacy of the use of contraceptives as appropriate.

Malthus presented a too pessimistic picture of the growth of population. Population of many technologically advanced countries did not follow his predictions.

Nevertheless, the essay on population growth by Malthus generated lot of discussion on the topic, and Malthus may rightly be considered as the father of population studies. The more guarded outlook is that we no longer could use technology as an excuse to ignore Malthus. In relations to this theory, the study considers the controls developed by the government to curb fertility as the major negative checks to the population growth whereas the increasing fertility

as a result of the increasing levels of science in medicines as the positive checks to population growth.

Demographic transition theory links birth rates and death rates to a society's level of industrialization, the process by which a society's economy shifts from a predominantly agricultural and handicraft base to a predominantly industrial and large scale manufacturing. There are four stages in the demographic transition.

During the pre-industrial stage, high birth rates are balanced by high death rates, and population size remains fairly stable. Today the least industrialized nations of the world are in this demographic stage (Hoem*et al.,* 2009).

During stage 2, the stage of increasing industrialization, the death rate falls primarily because of the improved sanitation, hygiene, and medical conditions. The birth rate, however, remains high because of the continued influence of traditional values favoring large families. Having several children ensures survival of at least some of them when infant mortality is high. During this stage the imbalance between the falling death rate and the high birth rate results in high population growth. Pakistan like many other developing nations is in this stage of transition (Hoem*et al.,* 2009).

At the third stage the traditional values give way to modern values favoring contraception and family planning. Birth rates decline as a result of later ages at marriage, urbanization, industrialization, rising aspirations, and other factors. The mortality rates eventually stabilize at low level and birth rates follow (Hoem*et al.,* 2009).

The shift from high to low mortality and fertility is known as the "demographic transition". This shift occurred throughout Europe, North America, and a number of other areas in the 19th and early 20^{th} centuries, and started in many developing countries in the middle of 20th century. Although the pace and paths of decline varied tremendously among countries, the demographic transition emerged as the dominant model of demographic change.

At the fourth stage the birth rates fall to about the same level as mortality rates. With births and deaths at similar low levels, the equilibrium of slow population growth is regained. The pace of change in a country varies depending on its culture, level of economic development, and other factors. As countries pass through the various stages of the transition, population growth from natural increase (birth rate - death rate) accelerates or decelerates depending upon the gap between birth rate and the death rate (Sato & Yamamoto, 2005).

Many developing countries are in an intermediate stage, in which mortality and fertility are falling at varying rates but are still high relative to the levels of Europe and other more developed areas. Many low-fertility countries have entered what some describe as a "second demographic transition" in which fertility falls below the two-child replacement level as forces of contemporary life interfere with childbearing. This transition has been linked with greater educational and job opportunities for women, the availability of effective contraception, a shift away from formal marriage, the acceptance of childbearing (Hoem*et.al.*, 2009).

Outside marriage, and the rise of individualism and materialism Experts disagree about whether all countries will follow the transition experienced in Europe and about whether there are additional stages of transition that we have not identified long-term population decline, for example, But the demographic transition theory provides a useful framework for assessing demographic trends and projecting future population size (Shelton, 2014).

Ecological Theories

Ecological perspectives focus on the earth's capacity to meet the demands of an increasing human population. The roots of such theories are found in Thomas Malthus' 1798 publication An Essay on the Principle of Population as it affects the Future Improvement of Society, where population growth was found to increase at a rate faster than food supply. It was predicted that these trends would eventually lead to food shortages triggering famine and

radical social change. Contemporary theorists continue to build on this tradition by considering the possibility of imminent crises, including global food insecurity (Leisinger, Schmitt and Pandya-Lorch, 2002). The ecological approach explains population growth despite resource depletion and increasing poverty (Dasgupta 1995; O'Neill, MacKellar and Lutz, 2001). With indicators that affect food security such as economic development and modernization (Jenkins and Scanlan, 2001).

Population according to UBOS 2015 refers to the number of people living in a particular area, from a village to the world as a whole. A secondary meaning of population is the inhabitants themselves, but in most uses population means numbers. For example as of 1 January 2016, the population of Uganda was estimated to be 39 660 151 people. This is an increase of 3.26 % (1252474 people) compared to population of 38407677 the year before (Mureşan, 2009).

The population structure of Uganda has affected land use pattern ,since the majority of people are poor land will be utilized through use of rudementally technology that lead to low agricultural out, with high population growth rates this will lead to land fragmentation, land degradation, Soil Erosion, Pollution and desertification. Since land is a major determinant of food security, this will also affect food production, food availability at household levels and market levels, food availability and storage for the people to Utilize and consume food (Bogaarts, 2000).

According to the current population census of Uganda report 2016, women are more than men (gender) and the biggest percent of women are employed in Agriculture. People in rural areas of Uganda depend on farming as the main source of income and 90 per cent of all rural women work in the agricultural sector. In addition to agricultural work, rural women are responsible for the caretaking of their families (NAADS Report, 2013).

The Optimum Theory of Population by Edwin Cannan (1924)

The optimum theory of population was propounded by Edwin Cannan in his book Wealth published in 1924 and popularized by Robbins, Dalton and Carr-Saunders. Unlike the Malthusian theory, the optimum theory does not establish relationship between population growth and food supply. Rather, it is concerned with the relation between the size of population and production of wealth. The Malthusian theory is a general theory which studies the population problem of a country in keeping with its economic conditions. Thus the optimum theory is more realistic than the Malthusian theory of population (Keilman, 2008).

The optimum population is the ideal population which combined with the other available resources or means of production of the country will yield the maximum returns or income per head. The concept of optimum population has been defined differently by Robbins, Carr-Saunders and Dalton. Robbins defines it as "the population which just makes the maximum returns possible is the optimum population or the best possible population." Carr-Saunders defines it as "that population which produces maximum economic welfare". To Dalton, "Optimum population is that which gives the maximum income per head." If we were to examine these views, we find that Dalton's view is more scientific and realistic which we follow (Barry, 2007).

Cohen (2006) argued that this theory is based on the following assumptions that; the natural resources of a country are given at a point of time but they change over time, there is no change in techniques of production, the stock of capital remains constant, the habits and tastes of the people do not change, the ratio of working population to total population remains constant even with the growth of population, working hours of labour do not change and finally the modes of business organisation are constant.

Given these assumptions, the optimum population is that ideal size of population which provides the maximum income per head. Any rise or diminution in the size of the population above or below the optimum level will diminish income per head. Given the stock of natural resources, the technique of production and the stock of capital in a country, there is a definite size of population corresponding to the highest per capita income. Other things being equal, any deviation from this optimum-sized population will lead to a reduction in the per capita income. If the increase in population is followed by the increase in per capita income, the country is under-populated and it can afford to increase its population till it reaches the optimum level. On the contrary, if the increase in population leads to diminution in per capita income, the country is over- populated and needs a decline in population till the per capita income is maximized (Jiang, 2007).

The optimum theory of population is superior to the Malthusian theory on the ground that; malthusian law is a general study of the population problem because it is applicable to all countries irrespective of their economic conditions. The optimum theory is superior to the Malthusian theory because it studies the population problem in relation to the economic conditions of a particular country. Malthus had a narrow vision. He related the growth of population to food supply. Cannan, on the other hand, had a much wider outlook. He related the problem of population to the total production of the country, both industrial and agricultural. The Malthusian theory is a static concept which applies to a period of time. The optimum theory is a dynamic one because over a period of time the per capita income may rise with the expansion in output due to improvements in knowledge, skill, capital equipment and other elements in production. This may raise the optimum level of population. Thus, the optimum theory is more realistic. Despite the superiority of the optimum theory over the Malthusian theory of population, it has serious weaknesses whereby; it is difficult to say whether there is anything like an optimum population (Impagliazzo, 2012).

Theory of Demographic Transition by Robbins (1924)

The theory of demographic transition is based on the actual population trends of advanced countries of the world. According to this theory, every country passes through three different stages of population growth. In the first stage, the birth rate and the death rate are high and the growth rate of population is low. In the second stage, the birth rate remains stable but the death rate falls rapidly. In the second stage, death rates began to decline gradually from 30 per thousand to 20 per thousand from the middle of the 19th century to the end of the century. In the third stage beginning with the 20th century, birth rates began to decline from 20 per thousand and have continued for about a century now, nearing 15 per thousand. Death rates also continued to decline but seem to have stabilized between 10 to 55 per thousand in Western Europe (Keilman, 2008).

In the first stage, the country is backward and is characterised by high birth and death rates with the result that the growth rate of population is low. People mostly live in rural areas and their main occupation is agriculture which is in a state of backwardness. There are a few simple, light and small consumer goods industries. The tertiary sector consisting of transport, commerce, banking and insurance is underdeveloped. All these factors are responsible for low incomes and poverty of the masses. Large family is regarded as a necessity to augment the low family income. Children are an asset to the society and parents (Montgomery, 2008).

There being mass illiteracy, the society is not expected to educate them and thus burden itself. The existence of the joint family system provides employment to all children in keeping with their ages. Thus a child becomes an earning member even at the age 5 when he becomes a helping hand to his parents in domestic affairs. More children in a family are also regarded as an insurance against old age by the parents. People being illiterate, ignorant, and superstitious and fatalist are averse to any methods of birth control. Children are regarded as

God-given and preordained. Being childless is regarded as a curse and the parents are looked down upon by the society. All these economic and social factors are responsible for a high birth rate in the country (Omran, 2005).

Along with high birth rate, the death rate is also high due to non-nutritional food with a low caloric value, and lack of medical facilities and of any sense of cleanliness. People live in dirty and unhealthy surroundings in ill-ventilated small houses. As a result, they are, disease-ridden and the absence of proper medical care results in large deaths. The mortality rate is the highest among the children and the next among women of childbearing age. Thus unhygienic conditions, poor diet and the lack of medical facilities are the reasons for a high mortality rate in this stage. This stage continued in Western Europe approximately up to 1840 (Myrdal, 2013).

In the second stage, the economy enters the phase of economic growth. Agricultural and industrial productivity increases and the means of transport develop. There is greater mobility of labour. Education expands. Incomes increase. People get more and better quality food products. Medical and health facilities are expanded. Modern drugs are used by the people. All these factors bring down the death rate. But the birth rate is almost stable. People do not have any inclination to reduce the birth of children because with economic growth employment opportunities increase and children are able to add more to the family income. With improvements in the standard of living and the dietary habits of the people, the life expectancy also increases (Massey, 2007).

People do not make any efforts to control the size of family because of the presence of religious dogmas and social taboos towards family planning. Of all the factors in economic growth, it is difficult to break with the past social institutions, customs and beliefs. As a result of these factors, the birth rate remains at the previous high level.

In the third stage, the fertility rate declines and tends to equal the death rate so that the growth rate of population declines. As growth gains momentum and people cross the subsistence level of income, their standard of living rises. The leading growth sectors expand and lead to an expansion in output in other sectors through technical transformations. Education expands and permeates the entire society. Popular education leads to popular enlightenment and opens the way to knowledge. It creates self-discipline, power to think rationally and to probe into the future. People discard old customs, dogmas and beliefs and develop individualistic spirit and break with the joint family (Phipps, 2015).

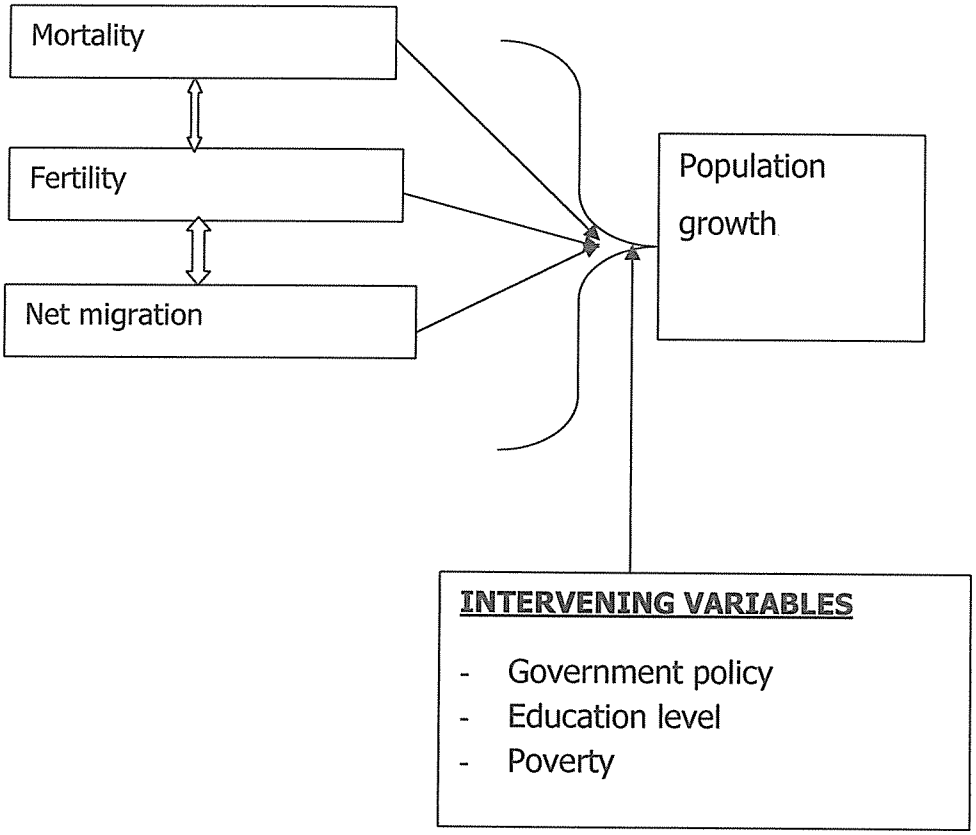
Men and women prefer to marry late. The desire to have more children to supplement parental income declines. People readily adopt family planning devices. They prefer to go in for a baby car rather than a baby. Moreover, increased specialisation following rising income levels and the consequent social and economic mobility make it costly and inconvenient to rear a large number of children. All this tends to reduce the birth rate which along with an already low death rate brings a decline in the growth rate of population. The advanced countries of the world are passing through this last stage and the population is increasing at a slow pace in them (Yamamoto, 2005).

In conclusion the theory of demographic transition is the most acceptable theory of population growth. It neither lays emphasis on food supply like the Malthusian theory, nor does it develop a pessimistic outlook towards population growth. It is also superior to the optimum theory which lays an exclusive emphasis on the increase in per capita income for the growth of population and neglects the other factors which influence it. The demographic transition theory is superior to all the theories of population because it is based on the actual population growth trends of the developed countries of Europe (Rodriguez, 2007).

Almost all the European countries of the world have passed through the first two stages of this theory and are now in the final stage. Not only this, this theory is equally applicable to the developing countries of the world. Very backward countries in some of the African states are still in the first stage whereas all the other developing countries of the world are in the transitional stage two it is on the basis of this theory that economists have developed economic-demographic models so that underdeveloped countries should enter the final stage and attain the stage of self-sustained growth. Thus this theory has universal applicability (Sato, 2005).

2.2 Conceptual Framework

INDEPENDENT VARIABLES (IVs) **DEPENDENT VARIABLE (DV)**



2.3 Review of Related Literature

Fertility, mortality and migration are principal determinants of population growth (or its inverse). In the absence of technological intervention, one might say almost the sole determinants, but improvements in contraceptive techniques, increasing acceptance of abortion, and slackening of some traditional religious and cultural traditions has in many parts of the world reduced the role of fertility. Increased fertility rates and migration can have remarkable effects on the overall structure of populations. In the United States the combination has led to the Hispanic ethnic group becoming the largest ethnic minority in the country. The rapid growth of the Hispanic population in the last three or four decades has in effect rejuvenated the aging U.S. population by adding children and working-age adults, at the same time making it more ethnically diverse. The size of the Latino population doubled

between 1980 and 2000, and Latinos also accounted for 40% of the country's population growth. That rapid growth has continued since 2000, accounting for almost half the increase of the U.S. population (Shelton, 2014).

Effect of mortality on population growth

The effect of mortality on population structures is to reduce the component of the population in which the mortality occurs. Historically, the most dangerous ages were infancy and old age (variously reckoned accord to circumstances). In addition, some epidemics of infectious diseases (eg Spanish 'flu) had their highest mortality among young adults, whose immune systems were presumably insufficiently primed. It is expected that the forecast bird 'flu epidemic will behave similarly. War differentially reduces the proportion of younger men. The majority of infectious diseases of early childhood have been conquered by immunisation, and improved nutrition and hygiene have rendered childhood safer. Antibiotics, welfare state, and improvements in medical, surgical, and palliative care have resulted in great increases in life expectancy in the developed world, where life expectancy is now in the middle to upper 70s or lower 80s, and rising every year. The effect of this is to raise the population in the upper age groups substantially. Women have high life expectancy than men wherever they live. The tendency of people to retire to particular resorts means that in some parts of the South Coast of England the average (arithmetic mean) age of the population is only just below retirement age (Weisdorf, 2008).

The down side of this is that the extended lives are often lived in bad health, as the treatments people receive may keep them alive but do little to ameliorate the underlying pain or disability brought on by the diseases, and virtually nothing for the various forms of senile dementia that are increasingly encountered (Strulik, 2008).

Effect of fertility on population growth

The human female is generally fertile from early teens to about mid forties. The human male generally remains fertile throughout adulthood, though sperm count and quality diminish from middle-age onward. In the absence of a conscious effort to control the size of families, the larger the fraction of the population who are in the fertile age range the more rapid will be the population growth, and this will influence the average age of the population structure towards the younger end of the spectrum (Urdal, 2005).

In terms of populations rather than individuals, fertility is usually expressed using the proxy measure of birth rate, either crude or standardised for age and sex. Worldwide, there are significant differences between birth rates. A major study in the 1980s, carried out by the Population Division of the Department of International Economic and Social Affairs of the UN Secretariat, studied the relationship between population age and sex distribution and crude fertility rates for twenty one countries in the developing world. They concluded that the higher the birthrate the more markedly the birthrate is depressed by the age structure. All other things being equal, fertility should decline more rapidly in the countries where it is currently lowest since the age structure appears to favor such a course. The mean number of children ever born also ranged widely among the twenty one countries. Differences in completed family size range from 8.6 children in Jordan to 5.2 children in Indonesia. In the developed world, though, there is a global tendency for family sizes on average to be smaller than the replacement level. This is true of every country in the European Union (United Nations, 2016).

Effect of net migration on population growth

This has been less studied. In areas where natural disasters or politico-military concerns lead to entire populations being displaced the initial population structure will be unchanged,

though post-migration the population will have altered to reflect those who have survived the process, typically showing increases in older children and younger adults. Opportunistic migration tends to occur mostly among younger adults, and may be permanent or temporary. Some studies have shown increased fertility levels in migrants, So the effect of migration on population structure is to deplete the population emigrated from in the young adult groups, to augment this group in the immigrated-to population, and to increase the fertility/birthrate in the new population (Worldwatch, 2017).

Immigration to European countries has drastically increased during the last decades. Around 2008, 15 percent of the population of the European Union were foreign-born or had at least one foreign-born parent. This proportion is projected to increase to 30 percent towards 2061 (Lanzieri, 2010). This inflow of people has a multi-faceted effect on European populations. Immigrants increase populations and thus support population growth. A majority of immigrants is aged 20-30 years upon arrival and hence mitigates to some extent negative effects of population ageing and declining labour force. Beyond these and other demographic effects migrants contribute to a changing social environment.

Migrants are usually of a different culture, ethnicity and religion. When they become naturalized citizens they do not need to reject their original lifestyle, religion and habits: the topic of assimilation in contemporary times is not as crucial as it has been a couple of decades ago. Demographic effects of migration interact with societal effects: a higher proportion of migrants in a population increase its cultural, ethnical and religious diversity leaving homogeneity in the past. Migrants usually differ from the local population in their fertility level and patterns of family formation and thus change its overall demographic characteristics. The significance of these changes is underlined by Coleman (2006) who sees them constituting the third demographic transition (Coleman, 2008).

2.4 Related studies

Any successful population forecasting model must put into consideration all the three components of demographic change that is mortality, fertility and migration. Mortality forecasting has particularly received considerable attention in recent years mainly because it is a basis for the pension systems in insurance companies. Methods for forecasting fertility and migration are far less well developed as compared to the mortality: as with human behavior in general, these demographic behaviors are difficult to forecast. A further problem for demographic forecasting is the estimation of uncertainty: estimates may vary considerably depending on the method of estimation (Keilman, 2008).

There are biological reasons for supposing high levels of mortality will not constitute a barrier to population growth. The death of an infant will lead to a cessation of breastfeeding meaning that the mother is able to fall pregnant again sooner than if the child had survived. Further, if a large family size is desired for cultural or economic reasons, parents may take into account high levels of mortality by having more children in order to ensure that they reach their desired family size. Reducing mortality may actually decrease population growth. If mortality is high, then parents will choose to have more children to try to increase the odds that at least some of them reach adulthood. However, if mortality is lowered, parents will have more confidence that their children will reach adulthood. We should not be confident that reducing mortality will always reduce population growth. Methods other than reducing mortality seem more effective in reducing population growth (Phipps, 2015).

The effect of mortality on population structures is to reduce the component of the population in which the mortality occurs. Historically, the most dangerous ages were infancy and old age (variously reckoned accord to circumstances). In addition, some epidemics of infectious diseases (eg Spanish 'flu) had their highest mortality among young adults, whose immune systems were presumably insufficiently primed. It is expected that the forecast bird 'flu

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process, typically showing increases in older children and younger adults. Opportunistic migration tends to occur mostly among younger adults, and may be permanent or temporary. Some studies have shown increased fertility levels in migrants, so the effect of migration on population structure is to deplete the population emigrated from in the young adult groups, to augment this group in the immigrated-to population, and to increase the fertility/birthrate in the new population (UN, 1982).

Increased fertility rates and migration can have remarkable effects on the overall structure of populations. In the United States the combination has led to the Hispanic ethnic group becoming the largest ethnic minority in the country. The rapid growth of the Hispanic population in the last three or four decades has in effect rejuvenated the aging U.S. population by adding children and working-age adults, at the same time making it more ethnically diverse. The size of the Latino population doubled between 1980 and 2000, and Latinos also accounted for 40% of the country's population growth. That rapid growth has continued since 2000, accounting for almost half the increase of the U.S. population (Rodriguez & Massey, 2007).

Although migration has lee been less studied, in areas where natural disasters or politico-military concerns lead to entire populations being displaced the initial population structure will be unchanged, though post-migration the population will have altered to reflect those who have survived the process, typically showing increases in older children and younger adults. Opportunistic migration tends to occur mostly among younger adults, and may be permanent or temporary. Some studies have shown increased fertility levels in migrants, So the effect of migration on population structure is to deplete the population emigrated from in the young adult groups, to augment this group in the immigrated-to population, and to increase the fertility/birthrate in the new population (Acevedo-Garcia *et.al.*, 2008).

Reduced mortality has been the predominant cause of the marked global population growth over the last 3/4 of a century. While improved child survival increases motivation to reduce fertility, it comes too little and too late to forestall substantial population growth. And, beyond motivation, couples need effective *means* to control their fertility. It is an inconvenient truth that reducing child mortality contributes considerably to the population growth destined to compromise the quality of life of many, particularly in sub-Saharan Africa. Vigorous child survival programming is of course imperative. Wide access to voluntary family planning can help mitigate that growth and provide many other benefits (Shelton, 2014).

2.5 Research gap

Most previously completed studies and researches on population growth mainly focus on investigating the population growth using a linear method without factoring in the aspects of mortality, fertility and net migration. All previous forecasting methods have mainly relied on using population figures for previous years for making future population growth figures and this will be addressed in this study since these forecasts will be made basing on the three basic constructs of population growth identified in this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter deals with practical procedures which were used in carrying out this study. It gives details of the research design adopted, theoretical framework, research techniques, data collection and data source, data analysis, testing for stationarity, diagnostic tools, unit of measurements, ethical consideration, and limitation of the study.

3.2 Research Design

Webster (2014) defines a research design as a plan or protocol for carrying out or accomplishing something. This study followed a quantitative research design to identify, analyze and describe the effects of mortality rates, fertility rates and net migration rates on population growth rates in Uganda. The quantitative approach (a research method based on analyzing the figures, comparing such figures and considering on the effects and relationships produced) has provided a confirmation of the impact of independent variables on population growth rates in Uganda. The use of the quantitative research approach to analyze information assisted in the validation of the data gathered during the course of this study. This comprehensive measure allowed for a successful review of the research problem and the critical analysis of the impact of the mortality rate, fertility rate and net migration on population growth in Uganda.

3.3 Theoretical framework

This study uses Malthus theory of population growth. In his theory, Malthus argued that if fertility rates are allowed to grow unchecked, there will be excess population thus people will begin to starve (mortality) and the rising population will go to war over increasingly scarce resources thus end up moving from country to country in search of resources (net migration). Malthus thus warned that without any fertility, mortality and net-migration checks, the

population would theoretically grow to an exponential rate, rapidly exceeding its ability to produce resources to support itself. In his theory, he predicted that factors like FDI and GDP growth would come in place to relate with population growth because of peoples' movements from country to country. Therefore, the model intended to establish a linkage between mortality rate, fertility rate and net-migration on population growth rate is given below;

$$Pop_t = f(FERTILITY, MORTALITY, \text{NETMIGRATION}, \text{FDI}, \text{GDP})$$

The above compressed equation can also be expanded to come up with the following regression equation for instance;

$$Pop_t = \alpha + \beta_0 FERTILITY_t + \beta_1 MORTALITY_t + \beta_2 \text{NETMIGRATION}_t + \beta_3 \text{FDI}_t + \beta_4 \text{GDP}_t + \varepsilon_i \quad (4) \qquad (3.2)$$

Pop_t = Population at time t

$FERTILITY_t$ = Fertility rate at time t.

$MORTALITY_t$ = Mortality rate at time t

$\text{NET} - \text{MIGRATION}_t$ = Net migration at time t

FDI = Foreign Direct Investment at time t

GDP = Gross domestic Product at time t

t = The subscript is used to represent the time component in the regression model summarizing the year when the data was collected.

α, β =These regression coefficients represent the relationships between the dependent variable and each of the independent variables in the model.

ε =The error term also called the stochastic error term is used to represent all the other variables that may not be directly represented in the model due to the scope but could have an inference on the model.

3.4 Research Techniques

The study followed Johansen (1988) and Johansen and Juselius (1990) Cointegration technique. The technique establishes the long run relationship between variables. The first task is to make sure that the data is integrated of the same order.

This was done by using unit root tests to examine the stationarity of data sets. Thus, the variables are subjected to the Dickey Fuller (DF) and the Augmented Dickey-Fuller (ADF) unit root tests.

3.5 Data collection and Data sources

According to Polit and Hungler (2009), data can be defined as information obtained during the cause of an investigation or study. In this study, secondary data was obtained in consideration of its relevance to the study's objectives. The purpose of this study was to determine the effect of mortality rate, fertility rate and net migration on population growth of Uganda from 1985 to 2015. For this purpose, data on variables considered relevant to the study's objectives were obtained and analyzed. The data was collected from World Bank for Mortality rates, Fertility rates, and Net migration while for population growth in Uganda was obtained from UBOS.

3.6 Data Analysis

In this study, time series data was used to analyze the relationship between mortality, fertility, net migration, FDI, GDP and population growth in Uganda for the period 1985-2015. In econometric analysis, when time series data are used, the preliminary statistical step is to determine the order of integration of each time series used. A time series Y_t is stationary if its probability distribution does not change over time, that is, if the joint distribution of (Y_{s+1}, $Y_{s+2...}$, Y_{s+T}) does not depend on s; otherwise, Y_t is said to be non-stationary. If the series is not stationary, then inference procedures are invalid. Results derived from the regression models would produce spurious results if non-stationary data is used. Therefore, the first task

was to check for the existence of stationarity property in the series of mortality, fertility, net migration and population growth. To check the stationarity of the data the Augmented Dickey-Fuller (ADF) test is applied. After the ADF tests were carried out, a regression model was run directly in the computer using advanced statistical software for instance STATA to report the various statistics of the regression model as well as the diagnostics tests. Using the different statistics obtained from regression model, the objectives stated in the previous sections was answered separately on the basis of the coefficients of the regression model obtained. The other measures of model fit and specificity for instance the R^2 values and the F-statistics were used to determine how the independent variables fit well with the dependent variable in the model. Furthermore, the various T statistics associated with the regression coefficients were used to test the significance of the causal relationships obtained as well as testing the hypothesis stated in the research. All the respective conclusions regarding the how each of the independent variables identified in the model as well as the dependent variables in the model were made and inferences thereof using a generalized regression model.

3.7.1 Testing for Stationarity

The assumptions of the Classical regression model necessitate that both the dependent and independent variables be stationary and the errors have a zero mean and finite variance. The decision rule is that reject the null hypothesis if the test statistic value is greater than their respective critical values at 5% level of significance and if the p-value is less than 0.05 otherwise we fail to reject the null hypothesis. Non stationary variables results in spurious regression and as Granger and Newbold (1974), argued they are characterized by a high R^2 and a low Durbin-Watson (*dw*) statistic, t-and F-statistics that appear to be significant, but the results derive no any economic sense (Verbeek,2000). The results "looks good" because the least-squares estimates are not consistent and the customary test of statistical inference do not hold (Enders, 1995).

In addition, a series is said to be integrated and is denoted as *I* (d), where d is the order of integration. The order of integration refers to the number of unit roots in the series, or the number of differencing operations it takes to make a variable stationary (Takaendesa, 2004). In particular, as shown in Phillips (1986), the ordinary least squares estimator does not converge in probability as the sample size increases, the t-and F- statistics do not have well-defined.

3.7.2 The Augmented Dickey-Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) test for autoregressive unit root tests the null hypothesis

H_0: $\mu=0$ against the one sided alternative H_1: $\mu< 0$ in the regression

$$\Delta Y_t = \beta_0 + \mu Y_{t-1} + \delta_1 \Delta Y_{t-1} + \delta_2 \Delta Y_{t-2} + \cdots + \delta_p \Delta Y_{t-p} + u_t \quad (1)$$

Under the null hypothesis $\mu=0$, Y_t has a unit root; under the alternate hypothesis, Y_t is stationary. The ADF statistic is the OLS t-statistic testing $\mu=0$ in the equation above. If instead the alternate hypothesis is that Y_t is stationary around a deterministic linear time trend, then this trend t (the period number), must be added as an additional regress or in which case the Dickey-Fuller regression becomes

$$\Delta Y_t = \beta_0 + \alpha t + \mu Y_{t-1} + \delta_1 \Delta Y_{t-1} + \delta_2 \Delta Y_{t-2} + \cdots + \delta_p \Delta Y_{t-p} + u_t \quad (2)$$

Where

t is the time index,

α is an intercept constant called a *drift*,

β is the coefficient on a time trend,

γ is the coefficient presenting process root, i.e. the focus of testing,

p is the lag order of the first-differences autoregressive process,

u_t is an independent identically distributes residual term.

3.8 Diagnostic Tools

3.8.1 Normality Test

Normality in a regression model is a situation where the error terms associated with the regression model are normally distributed with a histogram that is approximately bell-shaped. It is imperative that data is normally distributed before conducting a regression analysis because violation of this will invalidate the overall results. The study used Shapiro-Wilk Test to study the normality of the data.

3.8.2 Auto-correlation

Auto correlation is a situation where the error terms associated with the regression model are correlated with each other at different periods. Violation of this basic assumption makes the resulting Standard errors and variances over estimates of the regression coefficients which would in the end affect results of estimation. Autocorrelation studied using the Breusch-Godfrey LM statistic.

3.8.3 Heteroscedasticity Test

Heteroscedasticity is an assumption in regression that asserts that the error terms associated with the regression model possess a constant variance. Violation of this assumption does not necessarily invalidate the regression coefficients but the associated standard errors will be erroneous leading to improper estimates of the model. To see if no instances of heteroscedasticity are present in the data Breusch-Pagan tests was used.

3.8.4 Multicollinearity Test

Multicollinearity arises when the independent variables in the model are correlated to each other. In the presence of multicollinearity, the regression estimates will be wrongly estimated and the associated standard errors will be erroneous resulting into wrong conclusions. Using the VIF statistics, variables that have very high statistics (VIF > 10) will be handled and respective statistical remedies will be adopted in the analysis.

3.9 Units of Measurements

This measured as mortality rates, fertility rates, net-migration rates, FDI rates, GDP growth rates and population growth rates.

3.10 Ethical Consideration

Several strategies were adopted to ensure the moral justification of the investigation. Firstly, the principle underlying research ethics regarding confidentiality, honest, and respect for individual rights were highly observed. Secondly, Authors quoted in this study were recognized through citations and referencing.

Thirdly, the researcher accuracy was also attributed to the sources of information in an effort to celebrate the works of past scholars or researchers. This ensured that no plagiarism occurred.

The researcher also worked according to generally acceptable norms of research.

3.11 Limitations of the study

- The researcher was limited by the availability of data on the websites of Uganda Bureau of Statistics and World Bank.
- The researcher used only data of 31 years' period to prevent the biasedness of the correlations and time series tests of the variables under study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter consisted of the data presentation, discussion and conclusions of the findings got from the study. It reflected the methodology used for generating the data that was analyzed, and internalized in the study. The first sub-section of this chapter dealt with descriptive summary of the data. This was used to evaluate the scores of each variable for more advanced statistical analysis and that the data could easily be understood in the form of tables and graphs. In the next sub-sections of the chapter, unit root tests were performed using the Augmented Dickey Fuller (ADF) test and the Phillips (1988) test. The last sub-section of this chapter deals with regression model as well as diagnostic tests and hypothesis testing.

4.1 Descriptive Statistics

The descriptive statistics reveal variability of the data, on the study variables within the country, justifying the inclusion of these variables in the econometric analysis. Table 4.1; present a summary of descriptive statistic for the variables considered for analysis namely population growth rate, mortality rate, fertility rate and net migration. It describes the distribution of each variable with respect to mean, standard deviation, median, variance, kurtosis, skewness minimum and maximum values for the 31 observations form year 1985 to 2015.

Table 4.1 Showing Descriptive Statistics of the Study Variables

Stats	Poprate	NetMig	Fertrate	Mortrate	GDP rate	FDI rate
Mean	3.270	1.233	6.688	0.0192	6.116	2.593
Median	3.292	1.600	6.865	0.0193	6.383	2.645
St dev.	0.138	1.391	0.438	0.00163	3.010	2.035
kurtosis	2.661	1.317	2.202	1.714	1.729	2.129
Skewness	-0.544	-1.369	-0.788	-0.104	-0.921	0.0572
Max	3.509	3.140	7.103	0.0218	11.52	6.480
Min	2.987	-2.920	5.775	0.0165	-3.306	-0.517
Sum	101.4	38.21	207.3	0.596	183.5	77.79

Source: Researcher 2017

Descriptive statistics analysis was used to compare the means, standard deviation, skewness, kurtosis and normality of population growth rate, mortality rate, fertility rate, and net migration. As can be observed in the above table, the mean value of population growth rate is 3.27 and its corresponding median value is 3.29. a closer look atthese variables indicates that they are close to one anotherthus minor symmetry with the variable.

The findings of descriptive analysis also indicate thatthe means and medians all the remaining variables in the above table are very closer to one another. This is also an indication that that there is minor symmetry in each of the variables above.

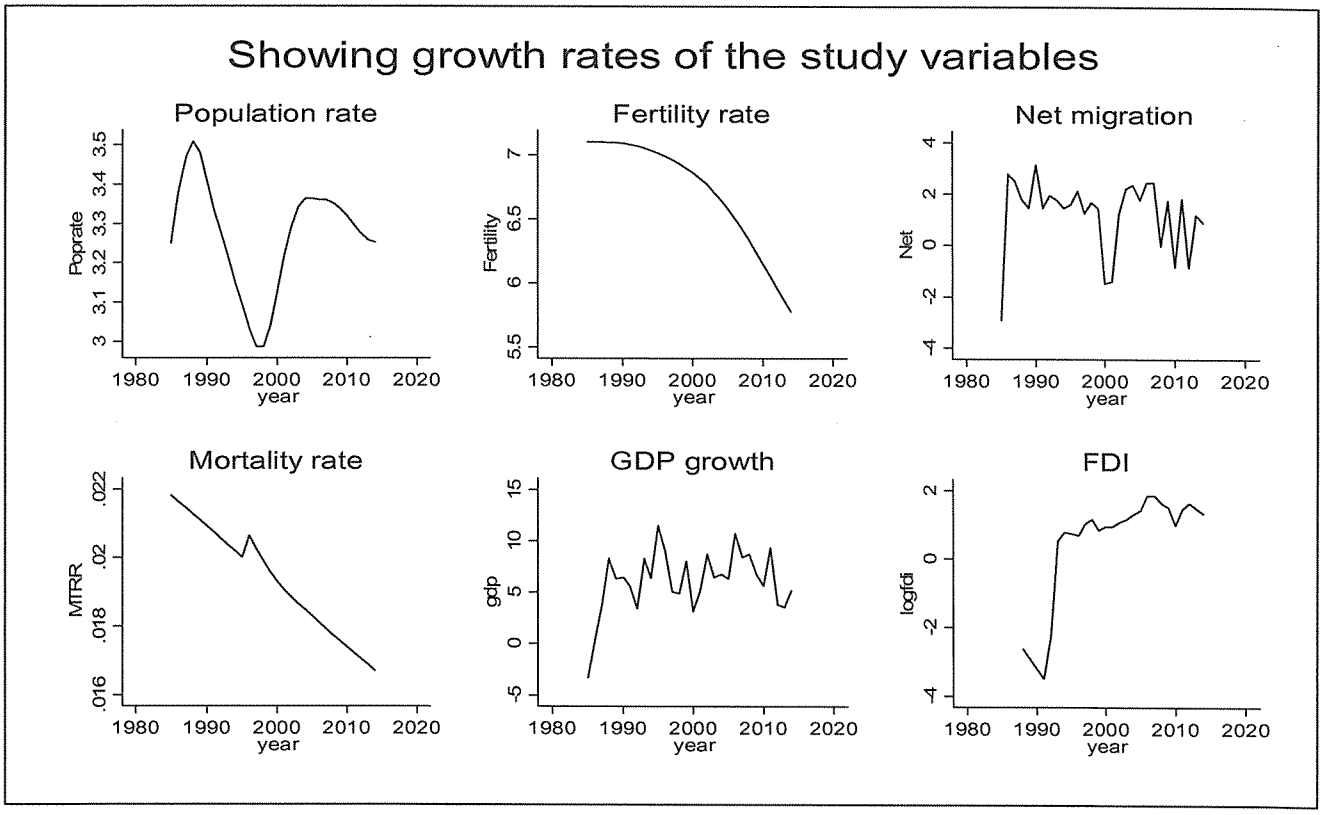
Standard deviation measures the dispersion around the mean in the series. The results of the standard deviation show that a distribution with smaller standard deviation exhibits less dispersion and larger standard deviation shows higher dispersion. Accordingly, to the above table, mortality rate is a less dispersed series with the value of 0.00163while GDP growth has the highest dispersion with a value of 3. 010.

Symmetry of the distribution of the series around the mean is measured by skewness. For a distribution to be considered Symmetric it should have a zero skewness value. Thus, by observing the row of skewness from table 4.1 above,all the study variables are negatively skewed except FDI, an indication that the variables need to be transformed.

Flatness and peakedness of the distribution is measured by kurtosis of a series. For a distribution to be considered normal it should have a kurtosis value of 3 and hence all our variable under study have digits that are not close to three, again an indication that our variable need to be transformed to reduce the problems of outliers in the data set. The maximum and minimum values of the series are also given for each series under the row maximum and minimum, respectively

Figure 4.2: Graphical presentation of the growth rates of the study variables

To visualise the trends and variations of the study variable, graphical representaions were performed on each study variable and the results have been shown in the figure below.



Source: Researcher 2017

Results summarized in the above graph indicate that generally, there has been a marked increase in the population by year. With an average population growth rate of 3.270 (SE = 0.025) per year between 1985 and 2015, Uganda has one of the fastest growing populations.

The year 1988 recorded the highest increase in the population (3.508) whereas the year 1998 recorded the lowest population increase (2.9869) as portrayed in figure 4.1.1 above.

Similarly, the data for mortality indicates that there has been a marked reduction in the mortality rates between 1985 and 2015. The data indicates that between these years, the average mortality rate was recorded as0.0192.

Furthermore, the data for fertility indicates that there has been a marked reduction in the rates between 1985 and 2015. The data indicates that between these years, the average fertility rate was recorded as 6.688 (SE = 0.079). With such a high figure, Uganda stands out as one of the countries with the highest level of fertility in the world. The maximum fertility rate was recorded in the year 1985 (Max = 7.103) and the minimum in the year 2015 (Min = 5.075). These years are the two extreme further indicating that the fertility rates have been decreasing as shown in figure 4.1.3 above.

For Net-Migration, the data indicates Uganda has experienced an average positive Net-migration between 1985 and 2015 Mean = 1.233. Since the Net-Migration indicates the difference individuals that enter the country and those that leave, the data indicates more people are entering the country, and this could be due to increased number of refugees in the country. On the other hand, the graphs of GDP and FDI indicate that on average, the two variables have been increasing for the period under study.

In the next sub-sections of the chapter, unit root tests are performed using the Augmented Dickey Fuller (ADF) test and the Phillips (1988) test. However, before unit root tests analysis were conducted, the variables under study were transformed in time series analysis, it is necessary to transform variables so as to stabilize the variance of a series and reduce the problem of outliers in the data set. In other words a logarithmic transformation is often employed to obtain a more homogeneous variance of a series.

4.2 Unit Roots Test

In studying time series data sets and economic relationships, one of the problems faced is spurious regression. This problem can be solved by checking if a unit root exists among variables and further investigating if the variables are co-integrated so that a long-run relationship exists between them. A unit root test is an important test in the determination of whether there exists a unit root or no, and also guides in the making conclusions if the data set is either non-stationary or stationary. To confirm whether the variables are stationary or not, the unit root tests were conducted on all the variables using both the Augmented Dickey-Fuller and Philips Perron test. In each case, the null hypothesis is that the variable has unit root and accepting it would imply the data is non-stationary. The alternative hypothesis is that the data has no unit root (stationary).

Table 4.2: ADF and PP tests of unit roots among variables

	In level		In first difference	
Variables	ADF	PP	ADF	PP
Log Pop rate	-1.028**	-1.705**		
Log Mort rate	0.475***	0.662***		
Log Fert rate	17.354***	9.778***		
Log Net Mig	-3.383**	-3.286**		
Log FDI rate	-6.328***	-7.936***		
Log GDP rate	-8.141***	-8.302***		

Source: Researcher 2017

Notes: Values marked with ** represent a stationary variable at 5% significance level and *** represent a stationary variable at 1% significance level.

The result of ADF and Phillips-Perronunit root test are summarized in Table 4.3. Both tests are tested at a, 5% and 1%level of significance. The null hypothesis is that the variable has

unit root or the variable is not stationary. Decision rule; reject the null hypothesis if the test statistic value is greater than their respective critical values at 5% level of significance and if the p-value is less than 0.05 otherwise we fail to reject the null hypothesis

Using the ADF and PP tests, the findings revealed that the all variables of population growth rate, mortality rate, fertility rate, net migration,FDI rate and GDP growth rate are found to be stationary in their level forms.

4.3 Correlation Analysis

To establish various relationships that exited among variables, correlation analysis was used with stationary variables. Correlation analysis was chosen as it was the appropriate method that could provide answers to the stated objectives in chapter one

Table 4.3: Correlation table for mortality, fertility, net migration and population growth

	logpop~e	logmor~e	logfer~e	lognet~e	logfdi~e	loggdp~e
logpoprate	1.0000					
logmortrate	-0.3002	1.0000				
logfertrate	0.2275	0.9436	1.0000			
lognetmigr~e	0.2752	0.2966	0.4191	1.0000		
logfdirate	-0.2141	-0.5750	-0.4546	0.0132	1.0000	
loggdprate	0.0785	0.1271	0.1642	0.3780	0.2377	1.0000

Source: Researcher 2017

4.3.1 Relationship between mortality rate and population growth in Uganda

Correlation analysis was used to establish the relationship that exists between mortality rate and population growth in Uganda. The findings as can be observed in the above correlation table indicate that there is a strong negative relationship between population growth rate and mortality rate in Uganda. The implication for these findings is that mortality rate increases in the country, the population keeps on reducing.

4.3.2 Relationship between fertility rate and population growth rate in Uganda

Basing on the correlation findings in the above table 4.3, the outcome of the results show that there is a strong positive relationship between population growth and fertility rate in Uganda with a Pearson's R-value of 0.2275. The findings are an indication that fertility rate in Uganda increases population growth rate.

4.3.3 Relationship between net migration and population growth rate in Uganda.

Likewise, correlation analysis of this variable was used to discover the nature of the relationship that exists between these two study variables. The outcome of the analysis are presented in the table 4.3 above. As can be observed from the above table 4.3, the findings show that there is a strong but positive relationship between population growth rate and net migration in Uganda. This means that there are more people moving it the country as compared to those departing the country and this has resulted to an increase in population growth of Uganda.

4.4. Regression output for the variables understudy

To examine the extent to which the independent variables of mortality rate, fertility rate, net migration, FDI and GDP effect population growth, regression analysis was used as this provides the R-squared value that is used to measure the joint effect of all this independent variable on population growth rate in Uganda.

Table 4.4: showing regression output analysis model of all the variables under study at 5 % level of significance

Source	SS	df	MS
Model	.025266321	5	.005053264
Residual	.014631506	15	.000975434
Total	.039897826	20	.001994891

Number of obs	21
F(5, 15)	5.18
Prob > F	0.0059
R-squared	0.6333
Adj R-squared	0.5110
Root MSE	.03123

logpoprate	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logmortrate	-.1854524	.0692958	-2.68	0.017	-.3331528	-.0377519
logfertrate	.3149992	.2810227	1.12	0.280	-.2839865	.913985
lognetmigrate	.0642454	.0314497	2.04	0.059	-.0027881	.1312788
logfdirate	-.0261771	.0064939	-4.03	0.001	-.0400186	-.0123356
loggdprate	.0316286	.0247705	1.28	0.221	-.0211685	.0844257
_cons	1.305442	.2723218	4.79	0.000	.7250018	1.885882

Source: Researcher 2017

The above regression model was used to examine the joint effect of mortality rate, fertility rate, net migration, FDI and GDP growth on population growth rate. The findings as can be observed from the above regression table indicate that the R-squared value is 63.3%. The implication for this R-squared value is that the independent variable of mortality rate, net migration and fertility rate account for 63.3 percent variation or changes in Population growth rate in Uganda.

Furthermore, the coefficient values for the independent variables confirm the findings of the correlation analysis discussed earlier. The regression equation as derived from the above regression table is as below;

$$POPRATE = 1.305\ constant - 0.8145\ MORT + 0.3149\ FERT + 0.0642\ NET\ MIG - 0.0262\ FDI + 0.0316\ GDP$$

The interpretation for the above regression equation is that,a unit change in fertility rate increase population growth rate by 0.3149 units, while a unit change in net migration also increases population growth by 0.0642 units and a unit increase in GDP growth increases population growth by 0.0316 units. On the other hand, unit change in mortality rate leads to

decrease of population growth by 0.8145 units while a unit increase in FDI decrease the rate of population growth by 0.0262 units. Therefore, based on the above findings, this study firmly confirms that fertility rate, net migration rate and GDP growth rate affect population growth rate positively while mortality rate and FDI rate affect population growth rate negatively in Uganda.

The overall p-value of the model (p=0.0059) which is less that the p-value of 0.005 at 5% level of significance indicates that the model is statistically significant.

4.5 Post Estimation Diagnostic Tests

For the regression model above, four diagnostic tests are employed to check the problem of serial correlation, and non-normal distribution, heteroscedasticity and multicollinearity. The Breusch-Godfrey lagrange multiplier (LM) test is used to check for the problem of serial correlation, and to check if the error terms are normally distributed, Shapiro-Wilk test is employed while variance inflation factor is used for multicollinearity andBreusch-Pagan is used for the test of constant variance.

4.5.1 The Shapiro-Wilk Test for Normality

Table 4.5: Showing Shapiro-Wilk Test for Normality

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
resid	21	0.96919	0.755	-0.568	0.71513

Source: Researcher 2017

Null hypothesis of normality is Ho: Residuals are normally distributed. We reject the null hypothesis for normality if the p-value is less than 0.05. In our model the outcome of the normality test showed that the residuals of the model are normally distributed because we

failed to reject the null. So we conclude by saying that the residuals of the model are normally distributed.

4.5.2 Test for Autocorrelation;

Table 4.6: Breusch-Godfrey LM test for autocorrelation results

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
1	6.230	1	0.0126

H0: no serial correlation

Source: Researcher 2017

From table above, p-value of the chi2 is greater than the p-value of 0.05 level of significance therefore, we fail to reject the null hypothesis and conclude that there is no serial correlation in the model which is desirable of our model.

4.5.3 Test for heteroscedasticity

Table 4.7: Breusch-Pagan for heteroscedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logpoprate

         chi2(1)      =     0.09
         Prob > chi2  =   0.7614
```

Source: Researcher 2017

The findings from the Breusch-Pegan test for heteroscedasticity above indicates that the model does not suffer from the problem of non-constant variance. This is because the p-value of 0.7641 is greater than 0.05 thus we fail to reject the null hypothesis of constant variance and conclude that there is no heteroscedasticityin the model.

4.5.4 Test for Multicollinearity

Variance inflation factor is used to test the existence of multicollinearity among the independent variables of the model. A mean VIF that is more than 10 implies that the independent variables are related to each other.

Table 4.8: Multicollinearity table

Variable	VIF	1/VIF
logmortrate	13.35	0.074930
logfertrate	12.28	0.081450
logfdirate	1.92	0.520294
lognetmigr~e	1.54	0.651452
loggdprate	1.33	0.752704
Mean VIF	6.08	

Source: Researcher 2017

In the above table, the mean VIF is less than 10 implying that there is no multicollinearity among the independent variables of the study which is desirable of the regression model.

4.6. Hypotheses testing

The research hypotheses of this study were that there is no significant relationship between mortality and population growth, there is no significant relationship between fertility and population growth, and there is no significant relationship between net migration and population growth in the period from 1985 to 2015. Looking at the findings of the model between the variables, the p-value of 0.017 for mortality rate, which is less than 0.05 makes us to reject the first stated null hypothesis above and conclude that there is a significant relationship between mortality rate and population growth rate in Uganda at 5% level of significance. Also the findings from the regression model showed that the p-value of 0.280 for fertility rate is way greater than the 0.05 thus we failed to reject the second stated null hypothesis and conclude that there is a non-significant relationship between fertility rate and population growth rate in Uganda at 5% level of significance. On the other hand, basing on the p-value of 0.059 for net migration, which is also slightly greater than 0.05 we failed to reject the third stated null hypothesis and the study concludes that there is a non-significant relationship between net migration and population growth rate in Uganda at 5% level of significance.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Discussion of Findings

This chapter presents a discussion of the findings in chapter four as well as the conclusions. It also makes recommendations as per the findings and the suggestions for future research. The discussion and conclusion will be objective based. It is worth noting that before the analysis on objectives were carried out, the study variables were tested for presence of unit root and later co-integration tests were also carried out. The findings have been exhaustively discussed below.

5.1.1 Relationship between mortality and population growth in Uganda

Correlation analysis was used to examine the nature of the relationship that exists between mortality rate and population growth. The findings from the correlation analysis indicated that there is a weak negative relationship between population growth and mortality rates in Uganda. The data also indicates that the level of mortality in Uganda has been on a decline for the time scope of this study. This could be associated to improvements in medical policies in the country and mass immunization campaigns that have helped reduce death rates most especially among the infants in Uganda. This findings of this analysis match with literature and theory (Phipps, 2015). The theory indicates that mortality exerts a negative push on the population by reducing it. Furthermore, since Uganda is still a developing country with less in-migrants, the dynamics of population change are mostly influenced by biological factors like mortality and fertility.

5.1.2 Relationship between fertility and population growth in Uganda

The findings of the trend analysis indicated that fertility rate in Uganda has been decreasing significantly over the past years. This can be associated the increased adoption of family planning methods among many families across the country. On the other hand, correlation analysis was used to examine the relationship between fertility rate and population growth rate. The findings of the correlation analysis indicated a strong positive relationship between fertility rate and population growth rate with a Pearson's r-value of 0.2275. The implication for this data is that as fertility rates in the country increase, the population growth increases as well. Similarly, as the fertility rates in the country decrease, the population growth rate also increases. These results are in line with the theory (Svizzero&Tisdell, 2014) because according to the findings of their study, an increase in fertility rate is expected to lead to an increase in population The continuous growth of population in Uganda can be explained by factors like a growing number of men who own polygamous families, early marriages and reduced mortality rate has all these contribute to continued population growth in the country. This results are also backed by the findings in the regression table were the coefficient of fertility rate is positive (β=0.315), implying that when fertility rate increases, population growth also increases by 0315 units.

5.1.3 Relationship between Net-Migration and Population growth

The difference between the number of people who enter the country and those who leave the country is called Net migration. When there more people leaving the country than those coming in the country the figure is always negative, but when there more people coming into the country than those leaving the figure is positive. In the correlation analysis employed in this study, the findings indicated that there is a strong positive relationship between net migration and population growth in Uganda. The implication for this is that there more people who come into the country than those leaving the country. The reason for increased

population growth as a result of net migration can be explained by the fact that several refugees enter the country undocumented because the country has got so many illegal entries and exist avenues and yet authorities do not take note of them. The number of refuges of recent as increased in Uganda due to political instability of Uganda neighboring countries like South Sudan. This kind of political instability has forced a number of people to flee to Uganda in search of peace food for their daily leaving. The findings in the regression model also indicate that net migration has a positive significant impact on population growth in Uganda.

5.2 Conclusion

5.2.1 Relationship between mortality rate and population growth in Uganda

The findings of the correlation and regression analysis in the previous chapter indicated a Pearson correlation r-value of -0.30 and regression coefficient of -0.185 respectively. Basing on those findings, this study concludes that there is a strong negative relationship between mortality rate and population growth in Uganda. The implication of this weak relationship is that as mortality rate increases in the country, population growth rate decreases. The study further concludes from the regression findings that a unit increase in mortality rate decreases population growth by -0.185 units.

5.2.2 Relationship between fertility rateand Population growth in Uganda

Basing on the findings this study can conclude that the population of Uganda has been increasing drastically ever since 1985 despite measures put in place to reduce the rate at which it grows for instance family planning. The figures indicate that the population of Uganda was 14 million people in 1995 and is approximated to be 39 million people in 2015. On contrary, the study conclude that fertility rates of Uganda have been declining from 6.75 in 1995 to around 5.07 in 2015. This could be due to numerous efforts by government to educate people on the need to have manageable families. On the results of correlation

analysis, the current study concludes that there is appositive weak relationship between population growth and fertility rate in Uganda implying that increase in fertility rate increases population growth.

5.2.3 Relationship between Net-Migration and Population growth in Uganda

The conclusion for this objective basing on the findings of correlation r= 0.275 and analysis is that there is a strong positive relationship between the two study variables of population growth and net migration. Also basing on the regression analysis β= 0.064 the study concludes that a unit increase in net migration in Uganda increases population growth rate by 0.064 units. The interpretation for this conclusion is that there seem to be more people entering the country as compared to those leaving for abroad. The higher number of people entering the country could be explained by factors like increasing number of refuges as a result of insecurity among neighboring countries like DRC, South Sudan among others.

5.3. Policy Recommendations

In line with the findings, a number of recommendations are made. The problem of high mortality in Uganda is a reflection of the lack of health facilities and personnel. Thus study recommends that there should be improvements on the health facilities across the country as a way of reducing infant and child mortality and that the policy makers must ensure that there is equitable and proportional distribution of resources to all geographical locations whether urban or rural in the country. These should include maternal and child health services to be rendered by qualified personnel. Information on basic good health practices should be communicated to women especially in rural areas in their local dialects. Girls should be encouraged to go to school up to at least secondary level. This will first of all increase age at first birth and therefore reduce child deaths at first birth order. It will also increase the survival of their children.

Furthermore, since fertility is the major factor leading to an increase in the population, this study recommends that the government should develop strategies that aim at reducing the number of children born per person. This can be achieved by methods like Contraception counseling provided by trained family/ general physicians and conducted prior to marriage as this will better inform couples with choices of contraception. This will also contribute to meeting the unmet need for contraception and reducing unwanted fertility.

For Net-Migration, training of border officials and authorities who are likely to come first into contact with migrants is important to ensure more accurate data is collected so that its impact on the population growth can be properly established. Training efforts must be stepped up for border guards. Government should be up initiatives to organize joint trainings, and to develop a specific practical tool on access to immigrants most especially those who enter undemarcated boarders. However, such trainings and tools should make clear that the role of border guards and law enforcement authorities, is to refer individuals to the competent authorities, and not to enter into any assessment of protection needs. Although net-migration is often crowded out by mortality and fertility, having completed data would minimize the inconsistencies in the further studies.

5.4. Limitations of the study

It should be noted that it is not possible to cover all the aspects of a particular field of enquiry in a single study. In this section, the aspects of research that were not covered are highlighted and these will identity priorities for future research.

This study focuses on the impact of mortality rate fertility rate and net migration on population growth rate in Uganda. This means that it is limited to a Ugandan context; and therefore, is not applicable to any other region outside Uganda.

This study used annual time series data from 1985 to 2015 to generate findings of the fertility rate net migration and mortality rate impacts population growth. The data were not enough

because these independent variables even existed in early 1960s thus it would have been good to compare population growth rates in relationship to the independent variables in those early years of 1960s

5.5. Suggestions for Further Research

More research should be conducted in rural parts of Uganda on infant mortality and in specific urban settings such as slums, non-slum and pre-urban areas since they have different mortality rates and could be having different variables that influence mortality differently, thus have data classified into the different categories. Also, further research should be conducted using other methodologies as qualitative studies in urban areas on infant mortality and fertility so as to explore actual causes leading to infant mortality. Also this study used quantitative data thus it will be suitable to use qualitative method because they could show other factors influencing infant mortality, fertility rate and net migration in Uganda.

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