

# ECONOMY AND POPULATION IN ETHIOPIA: A SEARCH FOR RELATIONS

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*This article uses national datasets to find out the relations between economic and population indicators in Ethiopia. It follows a time-series method and acknowledges the endogeneity of population in economic growth dynamics while considering Gross Domestic Product (GDP) growth as a driving force in bringing changes in population indicators, which is a reversal of the often followed approach where population becomes a driving force. Evidences show that the growth of GDP negatively interacts with population indicators such as population growth, total fertility rate, infant mortality rate, child mortality rate and unemployment. On the other hand, it positively interacts with enrollments in primary and secondary schools, technical and vocational education and training (TVET), undergraduate studies and health coverage though to varying levels. The evidences contribute to efforts made to narrow the gap of understanding in the literature on the relations between economy and population in a broader perspective in Ethiopia and beyond. The evidences further explicate that future research could make better contributions to policy-making efforts and create greater impacts if they focus more on the human capital dimension of economic growth.*

**Keywords:** Growth of GDP, growth of population, relations, population indicators, endogeneity of population in growth, demographic transition.

## INTRODUCTION

In this article, the term ‘relations’ broadly represents all the terms used in the literature, namely relationships, interactions, correlations, links, effects and impacts. These terms are sometimes used interchangeably as they fit to the issue being dealt with in the article. The most customary way of studying the relations between population and economy is a ‘unidirectional approach’, examining the impact of population growth on economic growth. Studies that deal with the converse of ‘unidirectional approach’ are rare indeed. Some studies have carried out a ‘bidirectional’ analysis on the relations between population and the economy. The main focus of these kinds of studies is on the impact of population growth on the growth of the economy. The hitherto conception of population as a determinant force in influencing economy seems to have originated from the viewpoint that a growing population causes problems related to the economy, ecology and eventually to society.

The other observed gap in the available studies on the relations between population and economy has to do with the impact of population growth on economic growth – the growth of gross domestic product (GDP). As the review of empirical literature shows, this kind of focus appears to be monotonous making the studies devoid of diversity and insightfulness with limited contribution to policy-making and actions.

This article attempts to fill the aforementioned gaps through examining the relations between economic growth (the growth rate of GDP) and population indicators in Ethiopia. There are various population indicators that receive immediate impact in the economy, and vice versa, which could be appropriate candidates in the studies of the relations between population and economy. However,

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the article focuses on the growth rate of GDP and selected population indicators. In essence, the correlations between the growth rate of GDP and specific population indicators are worked out on the basis of secondary national longitudinal datasets. The purpose is to generate evidences on the extent to which the growth rate of GDP interacts; either virtuously or viciously with population indicators, and to give some insights to the gaps of knowledge observed in the literature.

The evidences generated resonate with the expected relations between growing economy and population in such a way that as the economy grows, the health, education, employment, and human conditions improve although at varying levels. Interestingly, the evidences reveal the relations between the growth of GDP and related population indicators over time.

The article is structured as follows: section two briefly describes background information on Ethiopia, section three deals with the theoretical and empirical accounts, section four discusses data and method, section five deals with the results and discussions, and the final section presents the summary and conclusions.

## BACKGROUND

Being the second most populated country in Africa, Ethiopia's past development trajectory shows ominous problems related to population growth, food insecurity, poverty, environmental degradation, and political malfunctioning. Population is construed as a potent cause and bedrock for the prevailing problems mainly because of its growth dynamics, size and concentration in a relatively small fragile highland ecosystem. Recently, such a labeling instigated new interest in population as an issue in influencing both the ecology and economy and also with strengthened efforts as an area to improve the economy and reduce poverty in the country (World Bank, 2007). This new interest appeared to have created initial ground for the consideration of population matters in development processes (Federal Democratic Republic of Ethiopia, 2012). Hence, the relations between population and economy received particular thought in Ethiopia's development planning and other actions (Ministry of Finance and Economic Development (MoFED), 2007, 2010a,b; Damien and Meles, 2012).

Moreover, the Ethiopian population, being dominated by the youth age group, features fast growth. Nonetheless, population was not accurately known in terms of growth, size and distribution until the 1980s. The first national population and housing census was carried out in 1984 and came up with an estimated total population of 42.6 million. The census result revealed a serious underestimation of the previous population size. The subsequent censuses of 1994 and 2007 revealed a total population of 53.5 million and 73.5 million, respectively. Again the 2012 Inter-Censal Population Survey estimated 83.8 million. A declining trend in the rate of population growth is noted during the first three census years and a stalled growth during the last census year (3%, 2.9%, 2.6% and 2.6%, respectively (Central Statistical Agency (CSA) (1991, 1999a, 2010).

A reduction in the growth rate of the population results mainly from a reduction in fertility, which can be subscribed largely to contraceptive prevalence rate (CPR), that increased from 4% in 1990 to 33.7% in 2014 (CSA and ORC Macro, 2001, 2006; CSA and ICF International, 2012; PMA2014/ Ethiopia, 2014). Likewise, unmet need for family planning decreased to 25.6% from its high level of 36% in 2000 (CSA and ORC Macro, 2001; 2006; CSA and ICF International, 2012; and PMA2014/ Ethiopia, 2014). The average number of averted births as a result of contraception increased from 0.39 in 2000 to 1.68 in 2011 (Yared, 2012). Achievements made in increasing CPR and decreasing unmet need for family planning reveal the successful efforts made by the government and stakeholders in

the past decades (Ramsay, 2014; World Bank, 2007).

Total fertility rate (TFR) showed an incessant decline from 5.48 (2001) to 4.4 (2014) (CSA and ORC Macro, 2001; 2006a; CSA and ICF International, 2012), which is projected to decline to 3.1 in 2032 and 1.8 in 2050 with the projected total population steadily increasing from 83.7 million in 2012 to 171.8 million in 2050. Such growth dynamics initially appeared to shorten the doubling time of the population but the consequent declines in fertility lead to longer doubling time; 28 and 83 years in 2012 and 2050, respectively. During the same periods, the percentage of working-age (ages 15–64) increased from 56% to 68% of the total population, with a corresponding decrease in the young and old age groups; from 44% to 32%. The projection shows that the dependency ratio, which is the ratio of young (ages 14 and below) and old (ages 65+) age groups to the working-age population, will decrease from 77.4% (2012) to 47% (2050) (Alemeyehu and Yihunie, 2014). Hence, the prevailing demographic dynamics appears to have created the necessary age structure that will permit Ethiopia to reap demographic dividend provided that favorable social, economic and political institutions and policies are designed and implemented.

In the case of the economy, Ethiopia recorded a remarkable growth during the past decade which was more than achievements made by the low-income and sub-Saharan African countries (World Bank, 2016a). Ethiopia's GDP has shown revival after being truncated during the first few years of the last decade. As a result, a remarkable annual average growth rate of 11% between 2005 and 2013 (MoFED, 2013a,b), and an increased per capita GDP from US\$170.60 in 2005 to US\$550 in 2013 (Ministry of Finance and Economic Development (MoFED), 2013a,c) were recorded. The real average GDP growth was 10.9% between 2004 and 2014 where an annual population growth rate of 2.4% was accompanied by an average annual per capita real GDP growth of 8%. Although the average Ethiopian household is assumed to obtain benefits from the recorded growth in terms of better living standards, the country faces challenges because of lack of adequate employment and fair wealth distribution (World Bank, 2016a). On the other hand, a decade of notable double digit growth rates helped the economy to survive drought and the impacts of political instability challenges encountered in 2015/16 and achieved a growth rate of 8% (World Bank, 2016b).

The growth of the GDP obviously includes the growth of the three sectors of the economy, namely agriculture, industry and services, even though their growth rates vary over time. The share of agriculture sector in the GDP decreased from 55% in 2000 to 42.4% in 2013, while the share of industry increased concomitant with the services though the services show a faster growth (Table 1).

**Table 1: Trends of Percentage Share of the Three Broad Sectors in the Ethiopian Economy (GDP)**

Sectors	Years		
	2000	2005	2013
Agriculture	55	52.3	42.4
Industry	9	10.2	12.4
Services	36	37.5	45.2
Total	100	100	100

Source: MoFED (2013a,b).

In spite of the above, the description of the structure of the Ethiopian economy in terms of its capacity to generate employment opportunities obtains a startling result. The National Labor Force Surveys conducted in 1999, 2005 and 2013 revealed that the share of employment in agriculture increased from 79.8% in 1999 to 80.2% in 2005, but decreased to 72.7% in 2013. Whereas the share of employment in industry increased thinly, the share of the services sector declined in the same years, attesting to the overburdened situation of agriculture as compared to the services sector (CSA, 1999b, 2006, 2014). The latter, given its elevated contribution to the GDP, is expected to have generated more employment opportunities as much as industry could generate. In other words, there is structural imbalance among the three sectors of the economy in the generation of employment opportunities and in terms of the production of material goods and services that add up to the GDP.

More recent evidences demonstrate fast changes in the structural balance of the three sectors of the economy each measured by the proportions of the growth of real GDP produced in a short period of time. For instance, the growth of real GDP in agriculture changed from 5.4% in 2014 to 4.7% in 2016, that of industry from 17% in 2014 to 13% in 2016, and the services from 13.1% in 2014 to 10.7% in 2016 (World Bank, 2016b). Arguably, such fast changes in the sectors, except services sector, create a caveat in the efforts to strengthen the macroeconomic situation of the country.

The above evidences show the fact that both population and economy grow concurrently in Ethiopia. At a face value, one tends to understand the existence of positive relations between the Ethiopian population and economy. However, in the known rhetoric, increasing population along with its attendant agricultural practices and resource constraints is noted to have caused land degradation that, by and large, leads to poor farmers harvest and possibly to low economic performance (Grepperud, 1996; Josephson et al., 2014). A study based on the vector-error-correction analysis illustrates the existence of bidirectional causality between demographic and economic variables whereby rises in per capita income reduces the growth rate of population and enhances the growth rate of employment, and vice versa. Similarly, slow growth rate of the population and/or faster growth rate of employment improves real income per person. Short-run relationships turned out to be weak and non-robust. Whereas descriptive analysis makes obvious the inverse relationship between population growth and landholding, forest coverage and human development index (Hassen, 2012).

Moreover, in-depth analysis of the relations between population and economy shows that population growth has a significant negative impact on economic performance in the short-run but positive impact in the long-run in Ethiopia (Kassahun, 2014). Again, the application of vector-error-correction model, based on the 1981-2011 data, demonstrates a unidirectional long-run causal relationship between economic development and population in that the former influences the latter, whereas there exists no long-run relation between population and economic development regardless of the existence of short-run causality between population Granger-causes economic development in the absence of reverse short run causality between the two (Gidisa and Haile Gabriel, 2015).

As noted in the introductory section, studies on the relations between population and economy in Ethiopia, as elsewhere, solely focused on ‘unidirectional approach’ – the impact of population on the economy. These studies concentrate on limited population indicators as interacting with even more limited economic indicator(s). This article thus seeks to make contributions to these two observed gaps of knowledge based on the Ethiopian case. Firstly, contrary to hitherto followed approach, it examines the impact of the changing economy on changing population. Secondly, it investigates the relations between the economy – the growth rate of GDP and selected population indicators (see data and method section). It is believed that both the change in approach and the empirical evidences

generated broader understanding on the relations between the economy and population.

Since theories and empirical evidences regarding the impact of economy on population that could lend support to the approach followed in this article are not robust, those related to the customary way of studying the impact of population on economy are utilized trusting that conceptual and contextual frameworks in both approaches remain similar. The following section takes up these theories and empirical evidences as ways of establishing frameworks for the article.

## **THEORETICAL AND EMPIRICAL ACCOUNTS**

Theoretical frameworks that could provide guidance in studies of the relations between population growth and economic growth seem to be diverse and wide ranging. Most theories focus on the context of endogenizing both population and economy within a unified model of growth and development holding the fact that causal relationships governing the covariance of population and economy go neither from population to economy nor vice versa - both are determined by differences in their initial conditions. Therefore, a fuller grasp of population as endogenous to the economy in a comprehensive dynamic paradigm requires that population variables be treated as endogenous components (Ehrlich and Lui, 1997).

Additional theoretical justifications are that in developing countries population growth occurred because death rates fell (Hagen, 1959) whereby without growth in per capita income 'population growth is really income-depressing' (Spengler, 1956:85). In developed economies, the increase in per capita income results from a larger decline in birth rates than in death rates (Lee, 1987), which in turn leads to an increase in the size of working-age population. The latter often contributes to the growth of income contrary to the cases of developing countries overwhelmed by young-age dependency. Also, a negative association noted between increasing prosperity and mortality decline noted by Dennis and Cessan (2008) substantiates the endogeneity of population factors in the process of economic growth.

The extent to which population growth affects the pace and structure of economic growth in developing countries is a worthwhile area to study since it sheds light to the question of endogeneity of population issues. In this regard, indisputably, demographic transition plays pivotal role in economic growth and development (Mason, 2003) for it usually accompanies development process that transforms societies from one stage to another being intertwined with science and technology, cultural change as well as social and political processes (Bongaarts, 2009; Willekens, 2014). In these processes, through investment or dependency effects, high birth rates reduce economic growth in the short-term but have positive medium-term and long-term impacts on per capita income growth (Brander and Dowrick, 1994). Hence, rapid population growth has a significant negative effect on economic growth in developing countries (Sachs, 2008; Headey and Hodge, 2009). The effect is so much in the cities of developing countries that are frequently portrayed as engines of growth (Beall and Fox, 2009), while a decline in mortality and urbanization affect economic growth (Dyson, 2010). In other words, there is positive association between urban growth and per capita GDP growth (Fox and Dyson, 2008).

These theoretical stipulations render credence and ascertain the central role of population in the economy of countries in both production and consumption processes. Accordingly, there are various empirical supports to these theoretical stipulations that reveal the endogeneity of population in the process of economic development. However, these empirical evidences are mixed and inclusive. With regard to the direction of population and economic growth nexus, a one-way Granger causality

running from population growth to economic growth operates for some countries whereas a one-way Granger causality running from economic growth to population growth and a no causal relation between the two operates for some other countries studied (Chang et al., 2014). Moreover, negative relation is also noted between population growth and economic growth (Galor and Weil, 2000; Li and Zhang, 2007). Since economic growth increases women's relative wages, which in turn increases the opportunity costs of raising children, the situation apparently leads to fertility reduction (Galor and Weil, 1996). Conversely, conflicting outcomes are noted on the relations between population growth and economic growth, and situations also exist where high economic growth causes population to grow either through increased birthrates or migration (Huang and Xie, 2013; Yao et al. 2013; McNicoll, 1984). Nonetheless, there are indications that demography seriously affects the age structure of the population, where the size of the working-age group and the policy mixes that create opportunities and incentives for this group to work, save and invest do matter quite obviously (Prskawetz and Lindh, 2007; Admassu, 2015).

In quantitative terms, there is a conclusion that demographic change between 1965 and 1990 accounted for about one-third of the growth in per capita income in developing countries (Bloom and Williamson, 1998), while it accounted for 28% of Taiwan's growth in per capita output (Mason, 2001). Fertility and mortality changes have each contributed about 22% of changes in output growth in developing countries during the same period (Kelley and Schmidt, 2001). On the other hand, increased fertility contributed negatively to economic growth in 35 sub-Saharan Africa countries between 1970 and 2005 (Akintunde et al., 2013). On the basis of a panel of 30 of the most populated countries of the world, a study reveals long-run relations between population and economic growth providing strong support to the hypothesis that population growth is positively related to economic growth. The results of tests show a bi-directional causality when causality is assumed to run from population to real per capita or vice versa in the long run (Pegou et al. 2016).

The bounds testing approach examining the relationship between population growth and economic growth based on time-series data in Thailand (1961-2003) finds a unidirectional causality between population growth and economic development (Fumitaka, 2009). Whereas results obtained for Pakistan applying the Granger causality test based on time-series data (1951-2004) depict that population growth positively influences economic growth but not the other way round (Fumitaka and Munir, 2010:35). Results from several econometric analyses in Singapore show the contribution of population growth to economic growth that in turn stimulate population growth which highlights dynamic relationship between population and the economy during 1960-2007 (Fumitaka and Munir, 2011). In India, the Granger causality test based on 51 years time series data finds that population growth causes neither GDP growth nor GDP causes population growth (Singha and Jaman, 2012:90). A study that employed linear cointegration and nonlinear cointegration tests reveals a long-run equilibrium relationship between population and real per capita income and a unidirectional population-driven economic development in Indonesia (Fumitaka, 2013). Taken together, these evidences of Asian countries show diverse and conflicting relations between population growth and economic growth.

Through a structural break cointegration analysis in Mexico for the period 1960-2014, a study finds a bi-directional causality between population growth and economic growth, which in the short run however indicates a negative effect that economic growth cause on population growth, and in the long-run a positive effect population has on per capita GDP and vice versa (Jorge et al., 2016:97). Earlier study asserted that an increase in population size has not led to malnutrition and impoverishment and also that economic development has not automatically reduced population

growth in Mexico (Coale, 1978). A study conducted using cointegration and causality analyses, to test the existence of a long-run relation between population and per capita GDP in Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela over the period 1900-1994 indicates that there is no long-run relations between the variables in any of the seven countries (Thornton, 2001). If one considers this study as a microcosm of Latin American countries, population growth seems to be benign for economic growth.

Evidences on the relations between population growth and economic growth in Uganda and Botswana stand at unequivocally opposite direction. High population growth in Uganda not only puts a considerable break on per capita growth prospects and a factor of inequality, but also significantly contributes to low achievements in education, health, and poverty reduction making future measures to improve the situation difficult (Klasen, 2005). In the case of Botswana, there is a long run relations between population change and economic growth in that population growth engenders economic growth (Anoruo and Habtu, 2003: 124). The Kenyan case which uses annual time-series data for the period 1963-2009 and also applies on vector auto regression estimation technique indicates that population growth and economic growth are positively correlated and that population growth promotes economic growth and vice versa (Thuku et al., 2013).

A study using the vector error correction mechanism based on a time-series data (1982-2012) points out that population growth has no significant impact on economic growth in Nigeria within the specified study period (Joseph et al., 2015). Alternatively, a study based on descriptive statistics and regression analysis during 1980-2010, identifies positive relationship between GDP growth, and population, fertility and export growth, and negative relationship between GDP growth and life expectancy and crude death rate in Nigeria (Tartiyus et al., 2015). Again, the results generated using Granger causality test show that neither economic growth caused population growth nor vice versa during 1970-2013 in Nigeria (Hakeem et al, 2016). The variations observed might attest differences in the nature of data used, methods applied or the accuracy of tests conducted. In any case, these conflicting evidences make generalization on the relations between population and economic growth difficult for Nigeria.

The reviewed literature, both theoretical and empirical, address the relations between population and the economy based on the studies of a group of the countries as well as individual countries. As mentioned earlier, the literature nonetheless deals more or less with the effects or impacts of the relations between population and economy in countries they address focusing mainly on the size and growth rates of population and economy. Yet, one can talk of a study that indicates a one-way Granger causality running from economic growth to population growth for some countries (Chang et al., 2014), that finds that economic growth increases the relative position of women leading to a fall in fertility (Galor and Weil, 1996). Such a situation appraises the positive relations between population and the economy in general (Thuku et al., 2013), and in Botswana in particular (Anoruo and Habtu, 2003). It also shows a bi-directional causality between the growths of population and economy in Mexico (Jorge et al., 2016), reveals no impact of the economy on population in Pakistan (Fumitaka and Munir, 2010), and in India (Singha and Jaman, 2012). However, such studies that deal with relations between other population indicators and GDP growth that could have generated interesting empirical evidences are rare and limited in scope and coverage. This is an observable gap in the literature towards which this article attempts to make contribution.

## DATA AND METHOD

The article depends on various secondary national datasets obtained from different secondary sources including census, sample surveys, government reports, and scientific publications. Both population and economic subjects undoubtedly have various indicators upon which the meanings and interpretations of the dynamics of population and the progress of economy are established and their relations explored. These indicators have often been generated from databases and have strong computational foundations. In this article, however, population and economic indicators that could illuminate empirical evidences on the main features of the changing population and the economy are selected to explain the relations between population and economy. In other words, since the main focus of the article is to analyze and explain the relations between population and the economy in a broader and longitudinal perspective, relevant population/demographic indicators were selected that include TFR, infant mortality rate (IMR), child mortality rate (CMR), life expectancy, unemployment rate, level of poverty, enrollment rates in elementary and secondary schools, enrollment in technical and vocational education and training (TVET) and undergraduate level, primary health care coverage and human development and in particular human development index (HDI), while economic indicator is limited to the growth rate of GDP. The selected population and economic indicators are interpreted individually to verify their consistency and explanatory features.

After verifying them in such a context, further analysis is made to figure out their relations with other relevant indicators. It is to be noted however that other intervening variables may exist which alongside the growth rate of GDP, directly or indirectly, interact with or influence population indicators and therefore caution needs to be exercised in considering the evidences. In other words, inclusion and further exploration of the intervening variables are required to get a clearer picture of the population and development relations. In such exercises, a time-series analytical method that attends to longitudinal data was utilized which simplified not only the analytical work but also made the results which are presented either in graphic or tabular forms, easy to comprehend and explain.

## RESULTS AND DISCUSSIONS

This section seeks to link the growth rate of GDP with selected population indicators noted elsewhere to find out the extent to which they interact in Ethiopia in the historical context. Some key results are corroborated with the theoretical stipulation and empirical evidences noted in the preceding section.

Following the trend in GDP growth, it is observed that the growth rate of annual average per capita GDP increased by 5.6% during 2001-2007, and by 7.9% on average annually during 2008-2012 and by 7.4% in 2013, showing a sharp rise until 2008 and then a slight decline afterwards. The growth rate of the population has demonstrated only a little decline over 2001-2013 (Table 2). In general, as can be seen from the rising per capita GDP and the declining growth rate of the population, the growth rates of GDP and population seem to have a negative correlation, which informs the existence of the interaction between the two by some means. It goes with the established wisdom of understanding that as income increases the growth of population decreases (Galor and Weil, 1996, 2000; Fernández-Villaverde, 2001), evidence which runs contrary to other findings (Thuku et al, 2013; Chang et al., 2014).

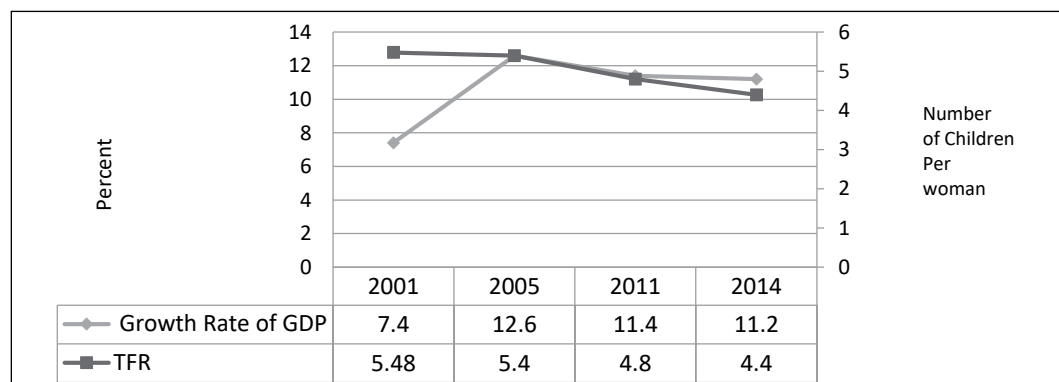


**Table 2: Trends in the Percentage Growth Rate of GDP, Population and Per Capita GDP, Ethiopia, 2001-2013.**

Trends in the Growth Rate of	Years		
	2001	2005	2013
GDP	7.4	11.2	9.7
Per capita GDP	4.8	8.69	7.39
Population	2.6	2.51	2.31

Source: CSA (2010; 2013; 2013a,d).

Regarding the relation between the growth rate of GDP and TFR, although fertility is decreasing in Ethiopia, it is still high when seen in relation to the potential of the economy to absorb and make use of the ever burgeoning workforce. TFR has decreased from 5.5 children per woman to 5.4, showing an average annual decline of 0.02% child per woman during 2005-2011, while it decreased further to 4.8 (an annual average decline of 0.1 child per woman) during 2000-2005 and to 4.4 by 2014 (an annual average decline of 0.13 child per woman). Annual average GDP has grown by 6.4% during 2001-2005 and by 10.6% during 2006-2014. This means that a 1% increase in GDP is related to 0.056% decrease in TFR during 2000-2005, 0.089% decrease in TFR during 2005-2011 and a 0.26% decrease during 2011-2014. It becomes visible that as GDP increases TFR decreases over time, implying that as economic growth takes afoot, the base of high fertility gets eroded (Figure 1). This evidence obtains support (Galor and Weil, 1996; 2000).

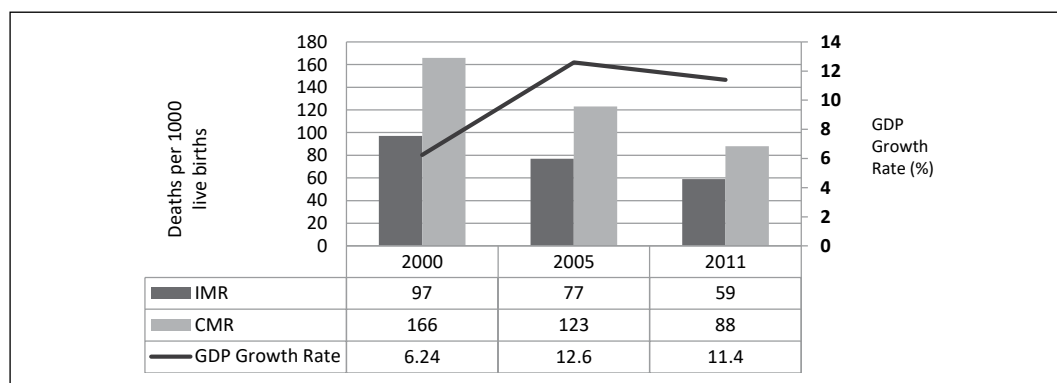
**Figure 1: Trends in the Growth Rate of GDP and TFR, Ethiopia, 2001-2014**

Source: CSA and ORC Macro (2001; 2006); CSA and ICF International (2012); MoFED (2013a,c); and PMA2014/Ethiopia, 2014).

A remarkable relation is also observed between the growth of GDP and Infant mortality (IMR), and Child Mortality Rate (CMR). IMR has declined by 4 children per annum (an annual average decline of 4.7%) during 2000-2005 and by 3 children (an annual average decline of 4.5%) during 2005-2011. On the other hand, CMR (Under 5 Mortality Rate) has declined by 8.6 children per annum (an annual average decline of 6.1%) during 2000-2005 and by 5.8 children (an annual average decline of 5.7%) during 2005-2011. This means that a 1% increase in GDP is related to 0.75% decrease in IMR during 2000-2005 and an annual average reduction of 0.42% IMR during 2005-2011. Likewise, a

1% increase in GDP is related to 0.98% decrease in CMR during 2000-2005 and a 0.54% decrease in CMR during 2005-2013 (Figure 2). These evidences also reveal the inverse relationship between the growth of GDP and the death of infants and children, indicating the fact that as economy improves more of the young people will survive to adulthood, a fact that obtains support from the theoretical underpinnings of endogeneity of population factors in economic growth dynamics (Ehrlich and Lui, 1997; Dennis and Cessan, 2008).

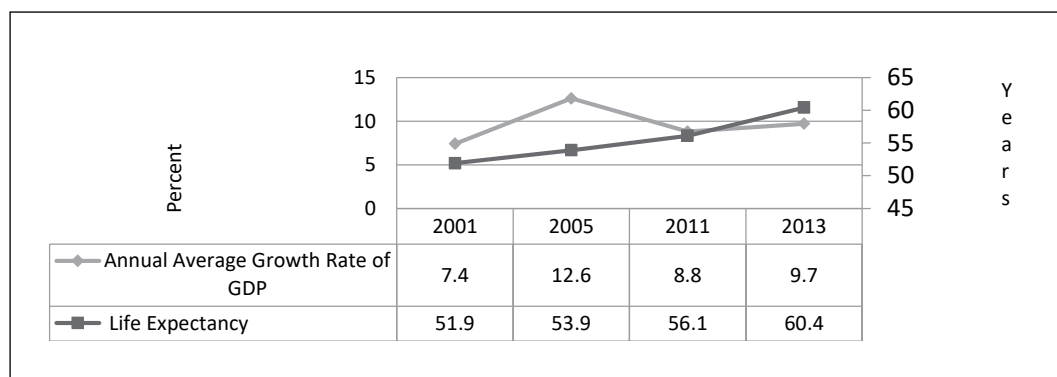
**Figure 2: Trends in Growth Rate of GDP, IMR and CMR, Ethiopia, 2000-2011.**



Source: CSA and ORC Macro (2001; 2006); CSA and ICF International (2012); MoFED (2013a,c).

Being one of the most important measurements of socio-economic development, life expectancy is influenced by improvements in health services, reduction in mortality, and enhanced human capital. In Ethiopia, life expectancy has increased from 51.9 years in 2001 to 53.9 years in 2005 (an annual average increase of 1.15%) and to 60.4 years in 2013 (an annual average increase of 1.5%). It means that a 1% average annual growth rate of GDP seems to have related to about 0.18% increase in life expectancy during 2001-2005 and a 0.14% increase during 2005-2013 (Figure 3). In other words, a one year increase in life expectancy appears to have contributed about 6.3%, 4%, and 2.26% to a growth rate of GDP during 2001-2005, 2005-2011 and 2011-2013, respectively, that show a positive relation between improvement in the economy and longevity.

**Figure 3: Trends in Growth Rate of GDP and Life Expectancy, Ethiopia, 2001-2013.**



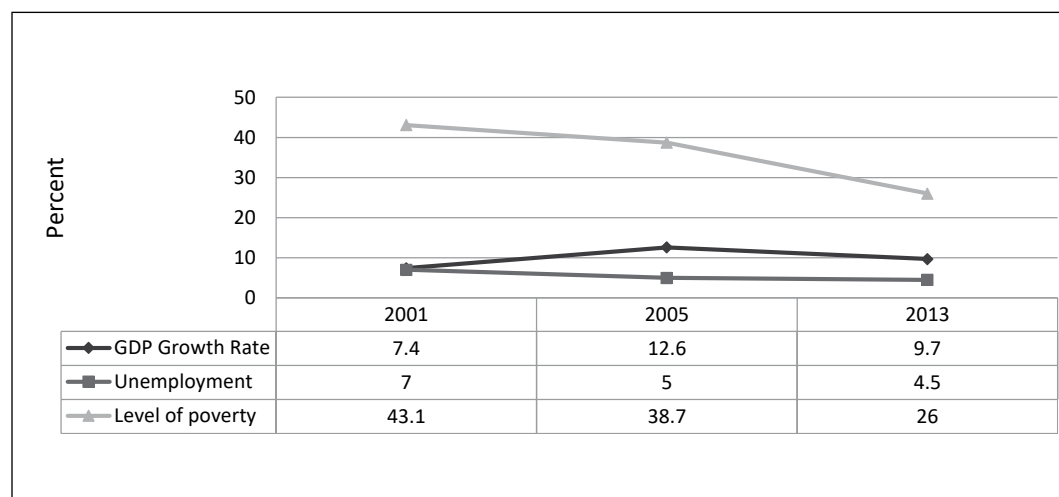
Source: CSA and ORC Macro (2001); CSA and ICF International (2012); MoFED (2013a,c,d).

Interestingly, some models of endogenous economic and population growth have recognized the role of longevity in economic growth and have reached a generally optimistic assessment of the relationship between population aging and economic growth. More complete insights into this relationship could be obtained by treating longevity itself as an aspect of economic growth and development (Ehrlich and Lui, 1997).

Likewise, unemployment rate has decreased from 8% in 1999 to 5% in 2005 and further to 4.5% in 2013. This means that a 1% increase in GDP growth rate appears to have relates to a 0.01% reduction in unemployment rate between 1999 and 2005 and a 0.001% decline in unemployment rate between 2005 and 2013 (Figure 4). As it appears, the relation between the growth of GDP and unemployment is negative but quite small. Hence, this evidence less likely demonstrates the fact that the growth of GDP resonates with enhanced employment opportunities as is already noted (World Bank, 2016a), which is also contrary to what is put forward for Ethiopia (Hassen, 2012).

Similarly, poverty level in Ethiopia measured in terms of severity has decreased from 44.2% in 2000 to 38.7% in 2005 and further to 26% in 2013, showing that a 1% increase in the growth rate of GDP relates to 0.4% decrease in the level of poverty during 2000-2005 and a 0.38% decrease during 2005-2013, which still makes sense as compared to that of employment situation (Figure 4). However, this positive impact of the growth of GDP in reducing the level of poverty in Ethiopia needs to have a similar positive impact on employment since the foundation of poverty reduction is employment generation. On the other hand, the Ugandan evidence (Klasen, 2005) does not support the Ethiopian case.

**Figure 4: Trends in Growth Rate of GDP, Unemployment Rate and Level of Poverty, 2001-2013.**



Source: CSA (1999b, 2006, 2014); MoFED (2013a,c,d).

In regard to the growth rate of GDP and elementary and secondary school enrollments, Ethiopian education sector has shown some successes during the past few decades. Notable evidence in education sector can be captured from the gross primary school enrollment that has increased from 79.8% in 2005, to 93.4% in 2010 and to 95.1% in 2013. Hence, a 1% increase in GDP relates to 1.55% increase in annual average growth rate of elementary school enrollment during 2001-2005 and a 0.23% during 2005-2013. Although the increase is not as high as that of the elementary

school, gross enrolment rate in secondary education also increased from 15.6% in 2005 to 22.6% in 2010 and further to 24.2% in 2013. This means that a 1% increase in GDP corresponds to 0.67% increase in annual average growth rate of secondary school enrollment during 2000-2013 (Table 3), indicating that growth in GDP has observable roles to play in increasing student enrollment at secondary school level in Ethiopia, which is supported by the Ugandan experience (Klasen, 2005).

**Table 3: Trends in Percentage Growth Rate of GDP, Elementary and Secondary School Enrolment Rates; 2001-2013.**

Growth Rate of	Years			
	2001	2005	2010	2013
GDP	7.2	12.6	10.6	9.7
Elementary Enrollment School	57.4	79.8	93.4	95.1
Secondary Enrollment School	13.44	15.6	23.56	24.4

Source: Ministry of Education (MoE) (2013); MoFED (2013a,c).

The size of students enrolled in the Ethiopian TVET increased from 25,000 in 2001 to 371,347 in 2011 and declined to 238,884 in 2013. The size of students enrolled in undergraduate programmes of study in the universities increased from 34,589 in 2001 to 444,553 in 2011 and further to 553,848 in 2013 (Table 4). These growth trends show mixed relations in the sense that while the growth rate of GDP declines in the same way as enrollment in TVET, enrollment in undergraduate level increases. This has to do with some intervening positive actions made by the government to expand university studies as compared to the TVET (Ministry of Education, 2013).

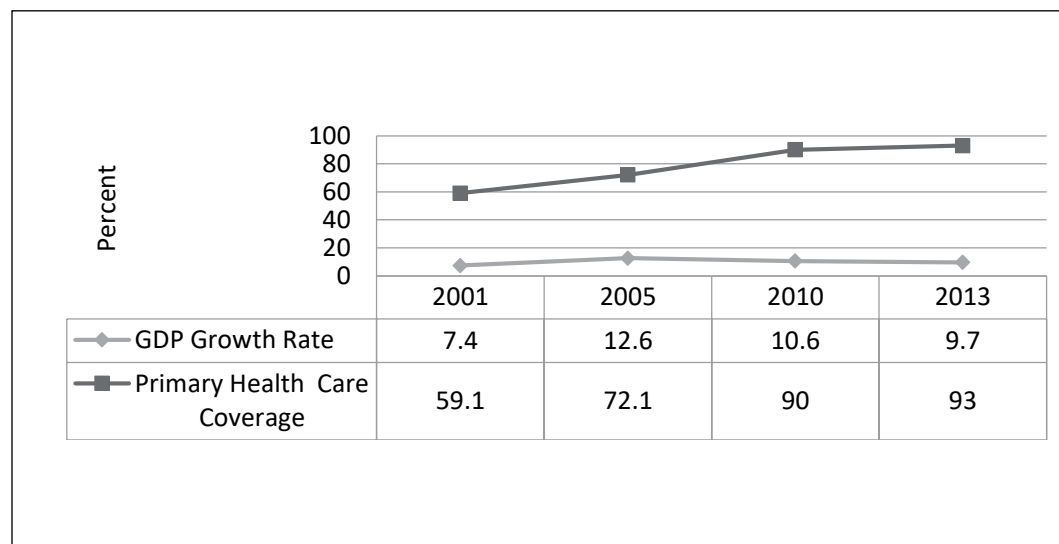
**Table 4: Trends in the Growth Rate of the GDP and Size of Students Enrolled in TVET and Undergraduate Programmes, 2001-2013**

Growth	Years			
	2001	2005	2011	2013
Rate of GDP	7.2	12.6	11.4	9.7
Size of students enrolled in TVET	25,000	106,336	371,347	238,884
Size of students enrolled in the undergraduate programmes	34,589	138,159	444,553	553,848

Source: MoE (2013).

With regard to health, the potential health service coverage in Ethiopia has increased from 59.1% in 2001 to 72.1% in 2005 and to 93% in 2013. This means that a 1% increase in GDP relate to 0.88% increase in health service coverage during 2001-2005 and a 0.41% during 2005-2013 (Figure 5). As depicted in the figure, primary health care coverage has shown a sharper rise than the growth rate of the GDP, indicating the better attention the health sector has enjoyed during the last two decades regardless of the country's economic condition (MoFED, 2013a,c).

**Figure 5: Trends in the Growth Rate of GDP and Primary Health Care Coverage, Ethiopia, 2001-2013.**



Source: MoFED (2013a,c).

As well known, Human Development Index (HDI) is expressed as an index of various factors, such as health, education/knowledge and life expectancy that are very much tuned to peoples' choices and lives (UNDP, 2015). A parallel growth usually expected in GDP and HDI is also observed in Ethiopia. Notably, the Ethiopian HDI improved from 0.316 in 2005 to 0.396 in 2012 (Table 5). A 1% increase in GDP relates to a 0.123% increase in HDI, depicting positive links between the two. In fact, since HDI comes from achievements made in sectors like education health, and longevity, including economic growth, among others, successes attained in those sectors could indeed lead to an enhanced. In other words, Ethiopia claims to have achieved most of the Millennium Development Goals (National Planning Commission and the United Nations in Ethiopia, 2015) that together relate, and contribute, to an enhanced HDI.

**Table 5: Trends in the Growth Rate of GDP and Human Development Index (HDI) in Ethiopia, 2005-2013**

Growth Rate of	Years		
	2005	2011	2012
GDP	12.6	11.4	8.8
HDI	0.316	0.392	0.396

Source: United Nations Development Programme (UNDP) (2013).

As a whole, analyses made to examine the extent to which the growth of GDP relates to population indicators in Ethiopia clarified some of the salient features of the economy and population and generated important empirical evidences. As commonly discussed in literature, as GDP grows,

population growth declines, which is basically the outcome of a declining fertility (TFR). It is noted that IMR and CMR show declining trends, while life expectancy keeps on increasing, following the growth of GDP. Negative relation prevails between the growth of GDP and unemployment, as often expected under normal condition, though a decline in the rate of unemployment is quite small. Enrollments in schools and undergraduate university studies as well as the health coverage show even sharper rises as compared to the growth of GDP. However, enrollment in elementary school remains the sharpest of all education levels while enrollment in TVET has mixed results. The Ethiopian HDI seems to gain a lot from the growth of GDP, which is not surprising given the population factors that made up HDI that reveal the beneficial aspect of the growth of the economy as a whole. As acknowledged elsewhere, however, caution needs to be exercised in interpreting these evidences as there are intervening factors that contribute, along with the growth of the GDP, to changes in the magnitude of population indicators.

## SUMMARY AND CONCLUSIONS

This article attempts to make contribution to narrowing the gap of knowledge on the relations between the economy and population through the analysis of the relations between the growth rate of GDP and selected population indicators in Ethiopia based on various national datasets. Both economy and population are viewed in their naturally changing dynamic processes and because of this a longitudinal perspective is followed in a time series methodical framework in analyzing the datasets obtained from various national sources. Essentially, the analysis rests on the notion of the endogeneity of population and economic (Ehrlich and Lui, 1997; Dennis and Cessan, 2008) and vice versa, and finds out the relations between the growth of GDP and selected population indicators, an approach that reverses the often followed customary way of studying the impact of population (size and growth rate) on the economy (mainly GDP per capita). Such a reversal approach creates a broader and deeper perspective to the relations between economy and population in a situation where economy derives population. Observably, the essence of the relations can be encapsulated in the fundamental concepts of demographic transition that show the transformation of economy and population as an organic whole. As argued, demographic transition by and large goes hand in hand with the process of development (Bongaarts, 2009) and science and technology, the economy, cultural, social and political processes that transforms human population in an intertwined manner.

The key evidences generated are that as GDP grows there is a decline in the rate of population growth, TFR, IMR, CMR and a rise in life expectancy, a decrease in the size of unemployed people, an increase in primary and secondary school as well as undergraduate enrollment, whereas enrollment in TVET displayed mixed results. Likewise, health coverage expanded and HDI increased following the growth of GDP over the years.

One way by which economy relates and influences population indicators is through affecting human capital. Human capital is the health, skills, knowledge, and experiences possessed by an individual or a group of population. The growth of the economy often improves all factors of human capital which in turn, both in short and long terms, affect the growth of population. Experiences of many developed countries indicate such a virtuous cycle. In a nutshell, it is paramount important that future research on relations between the economy and population in Ethiopia considers the human capital dimension of economic growth in the study of the relations between economy and population dynamics as much as policy directions that tend to prioritize on developing human capital (health, education, employment, and related population issues) as the major and initial benefits of the growing economy.

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