The Effect of Human Capital Accumulation on Economic Growth: An Empirical Analysis in Ethiopia.

BY:

YAHYA ABAZINAB SHEBESHIR

A Thesis Submitted to the School of Graduate Studies of the University in Partial Fulfilment of the Requirements for the Degree of Master of Science in Economics (Economic Policy Analysis)

JIMMA UNIVERSITY

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Certificate

This is to certify that the thesis entitles "The Effect of Human Capital Accumulation on Economic Growth: An Empirical Analysis in Ethiopia", was submitted to the Jimma University for the award of the Degree of Master Science of economic policy analyses (M.Sc.), and is a record of research work carried out by Mr. Yahiya Abazinab under our guidance and supervisions .

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I Yahiya Abazinab Shebeshir declare that the thesis entitled ‘’The Effect of Human Capital Accumulation on Economic Growth’’: An Empirical Analysis in Ethiopia is the result of my personal work and the entire sources or materials used in this thesis are duly acknowledged. This thesis is submitted in partial fulfilment of the requirements for the Masters of Science degree in Economic Policy Analysis. I also declare that this thesis is not submitted to any other organizations for the award of any academic degree, diploma, or certificate. Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgement of source is made.

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Abbreviations

AIC: Akakie Information Criterion

ARDL: Autoregressive Distributed Lagged Model

ADF: Augmented Dickey Fuller

DF: Dickey Fuller

EPRDF: Ethiopian People‘s Revolutionary Democratic Front

FDRE: Federal Democratic Republic of Ethiopia

GDP: Gross Domestic Product

WHO: World Health organization

UNDP: United Nations Development Program

GCF: Gross Capital Formation

ECT: Error Correction Term

MOE: Ministry of Education

MOFEC: Ministry of Finance and Economic Cooperation

VECM: Vector Error Correction Model

NBE: National Bank of Ethiopia

HSDP: Health Sector Development Program

ODA: Official Development Assistance

OECD: Organization for Economic Cooperation and Development

TGE: Transitional Government of Ethiopia

MOH: Ministry of Health

TVET: Technical and Vocational Education Training

WDI: World Development Indicator

ABSTRACT

The study aimed at examining the long run and short run effect of human capital accumulation on economic growth in Ethiopia (using real growth domestic product per capita growth, as a proxy for economic growth) over the period 1975/76-2016/2017 and uses these period to get three different economic policy changes between these periods. The ARDL approach to co-integration and Error Correction Model is applied in order to investigate the long-run and short run effect of human capital accumulation on economic growth. The stationary test was undertaken and its result shows real growth domestic product per capita growth, growth rate of import of goods and services, labor force growth rate and average inflation were stationary at level while the ratio of public education expenditure to real growth domestic product, the ratio of official development assistance to real growth domestic product, the ratio of public health expenditure to real growth domestic product and ratio of real gross capital formation to real growth domestic product were stationary at their first difference. The finding of the bounds test shows that there is a stable long run relationship between real gross domestic product per capital, the ratio of public education expenditure to real growth domestic product, the ratio of public health expenditure to real growth domestic product, labor force growth rate, ratio of real gross capital formation to real growth domestic product, imports of goods and services, average inflation and the ratio of official development assistance to real growth domestic product. The estimated long run model revels that human capital in the form of education (proxies by the ratio of public expenditure on education to real growth domestic product) is the main contributor to real growth domestic product per capita growth followed by health human capital (proxies by the ratio of public expenditure on health to real growth domestic product). In the short run, the coefficient of error correction term is -0.293979 suggesting about 29.40 percent annual adjustment towards long run equilibrium. This is another proof for the existence of a stable long run relationship among the variables. But, unlike their long run significant effect, health and education have no significant short run effect on the economy. The findings of this paper imply that economic performance can be improved significantly when the ratio of public expenditure both on health and education to growth of domestic product increases. Hence, the government have a duty to channel its expenditure to create institutional capacity to improve education and health services delivery in the country.

Key words: Human capital, Economic Growth, ARDL, Ethiopia

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

With its large reserves of human and natural resources, Ethiopia should have been a prosperous economy. However, it is one of the poorest countries in the world manifested by high population growth, low per capita income, and low Human Development Index. According to the World Bank, the country is the second most populous country in the sub-Saharan Africa with a population of 112 million and population growth rate of 2.63% in 2015(World Bank, 2019). The United Nations estimate of the population shows that the population has further grown to about 103.6 million in 2016 with growth rate of 2.73% and 106.4 million with growth rate of 2.89 in 2017(world meters, 2019).

In line with the rapid population growth, millions of people are subject to the problems of food insecurity and malnutrition. According to Abdulsalam (2017), food insecure population was estimated to 2.9 million in 2014 and 4.5 million in August 2015. By the end of 2015, this figure has more than doubled to 10.2 million food insecure people. The figures show that the victims are increasing from time to time. The possible causes are identified to be drought and land degradation, population pressure, instability and armed conflict (Abdulaslam, 2017). The country is also one of the countries with the lowest per capital income and Human Development Index. Per capital income of the country was about $550 in 2012/13, and it is ranked 173rd with a Human Development Index of 0.396 out of 187 countries in the world (World Bank, 2015). Per capita income of the country has grown to about $721 in 2015/16 and $850 in 2016/17(World Bank, 2017).

The cutting edge hypothesis of financial development contends that human capital; particularly instruction and wellbeing have the foremost part on accomplishing financial development and advancement (Gyimah et al., 2005). But experimental discoveries are blended. Some empirical findings have found negative while the others have found the positive relationship between human capital and economic growth, and it may be either because the proxies that have been used do not capture key elements of human capital, or because the data on the proxies are incorrect. This means that a major reason for the mixed evidence may be that human capital has been poorly measured (Le et al., 2015).

In Ethiopia, different education and health policies are designed to create skilled and competent citizens. In

the country, Long-term trends indicate that encouraging progress in educational attainment has been made. The national human development data shows that there are about 1852 average annual construction of public schools with an average growth rate of 10.5 percent per annum and 177 average annual constructions of private schools with average growth of 15.1 percent per annum. Expansion of education has taken place at all levels, with particular efforts towards universal primary education (UNDP, 2015).

In primary school, gross enrollment rate is 98.2 percent for boys and 92.4 percent for girls in. Currently, 85.7 per cent of Ethiopian primary age children are attending primary school. This shows that there is an enormous and rapid increase in enrollment in primary education which has contributed to reducing the gender imbalance within education with gender ratio of 0.94. But, the National Human Development data shows that grade eight completion rates are only roughly about half the rate of the general enrollment rate (Ibid).

Secondary school enrollment has also expanded rapidly, roughly fivefold from an enrolled population of 371,000 in 1994/95 to almost 2 million in 2013/14. But, the problems like urban favoring supply of school, poverty, lack of transport, the need to work (time and economic restrictions), early marriage (gender biases), lack of accommodation near schools (financial, cultural and social) and disability has affected the demand of the secondary schools. The net enrollment rate for first cycle secondary school is 20% and 6% for second. The Education Sector Development Program data also reveals that around half of students are over-age and half are in the grades on time. Gender equity in secondary education has greatly improved (MOE, 2015). Concerning the tertiary education, a total of 237,877 students were studying in second technical and vocational institutions (TV ET) in2012/13. In the same year, 79,786 students were graduated from government and private higher education institutions. Besides the increase in the access, some indicators of education quality have begun to show progress and total expenditure to finance education was 4.6 billion birr in 2005/6. This figure has increased to 33.1 billion birr in 2013/14 which may show that the investment in education has increased about seven-fold between 2005/6 and 2013/14(UNDP, 2015).

As one portion of its financial measures, FDRE government has too created national wellbeing arrangement and comprehensive Wellbeing Segment Advancement Plans in 1996/97(Gidey, 2015). Government health expenditure as a proportion of total government expenditure has increased in the country. Absolute government expenditure on health has risen dramatically in the last decade, from US$ 5.6 per capita in 2000 to US$ 20.77 per capita in 2010. Ethiopia was also the fourth-largest recipient of official humanitarian aid in

2010, receiving US$ 3.5 billion in total aid, which is US$36 per capita (MOH et al., 2015). National health expenditure has increased substantially between 2004/05 and 2010/11 in both absolute and per capita terms. Per capita national health expenditure almost tripled from US$ 7.14 per capita per annum in 2004/05 to USA$ 20.77 in 2010/11. But this is still far short of the US$ 34 recommended by WHO in 2001 or the 2015 target of US$ 60 per capita. Generally, current spending is not adequate to buy good health for all Ethiopians (Ibid).

1.2 Statement of the problem

Ethiopia nearby its Sub-Saharan partners has progressively been contributing much to the human capital advancement (Health and Education) for the final few decades. There shows up to be in spite of the fact that a proceeding wrangle about whether a return on venture in these recognized segments is worth noticing, seeing it from a brief and long run viewpoint whereas quality issues stay to be zones of concern. Whereas this being a subject to wrangle about, holding on questions as to which level of health and education circumstance are more responsive to financial development are unfurling. In this respect, whereas the relative significance of the level of instruction and wellbeing condition is given small consideration, much of the center of this think about would lie on their long and short run causality and clarification of financial development communicated in real GDP.

Benhabib and Spiegel (1994) have attempted to empirically distinguish between considering human capital as an ordinary input in the production process and the growth of total factor productivity as a function of the level of human capital. They have considered human capital as level of education attained only. They used estimates of physical and human capital stocks to examine cross-country evidence on the determinants of economic growth. Noting what has been cast by Nelson and Phelps (1966), they have shed their doubt on the specification of treating human capital simply as another factor in growth accounting. In their assumption, the level of human capital affects productivity by determining the capacity of nations to innovate new technologies suited to domestic production. Furthermore, they adopted the Nelson and Phelps (1966) model to allow human capital levels to affect the speed of technological catch-up and diffusion. Hence, they assumed that the ability of a nation to adopt and implement new technology from abroad is a function of its domestic human capital stock.

On the opposite, Mohan (2010) treated human capital as an independent production function using the human capital expanded development demonstrate and found human capital as playing an important part on financial development primarily as a motor for advancement of yield level. A few other observational ponders, counting Schultz (1960, 1963), Denison (1962, 1974), Becker (1961), Harbison and Myers (1964), Mankiw, Romer and Weil (1992) and numerous others to a few degree have appeared expanded human capital shows up to clarify a considerable portion of the development of yield in both developed and developing countries.

Many modern economists have disagreed that investment in education is undertaken primarily for return and should be considered as investment in human capital, which improves human capital arrangement. Likewise, all of the empirical studies were concentrated only on education as a proxy of human capital. Otherwise, those economists who took both education and health as proxy for human capital development use expenditure on public health and education in order to see their impact on economic growth, but I use the ratio of public education and health expenditure to real growth domestic product per capita one by one. This study motivated by what amount the ratio of public education expenditure to real growth domestic product per capita of education human capital were more important than amount the ratio of public health expenditure to real growth domestic product per capita of health human capital have contribution to economic To the best of my recognition no one have used education human capital which proxies by the ratio of public education expenditure to real growth domestic product per capita and health human capital which proxies by the ratio of public health expenditure to real growth domestic product per capita and their contribution amount to economic growth rather than using (primary school enrollment, secondary school enrollment, student-teacher ratios, tertiary school enrollment, training) to RGDP for EHC and (number of medical doctors, hospital beds, life expectancy) to RGDP for HHC together. Therefore, to my study, I used education human capital which is proxies by the ratio of public education expenditure to real growth domestic product per capita and health human capital which is proxies by the ratio of public health expenditure to real growth domestic product per capita to empirically analyze their contribution amount to affect economic growth in Ethiopia.

1.3 Research questions

- ⇨ Is there any long-run co-integration between human capital and economic growth in Ethiopia?
- ⇨ What are the significant effects of human capital accumulations on economic growth in Ethiopia in the short run and long run?
- ⇨ Is there a causal relationship between human capital accumulation and economic growth?
- ⇨ Are health and education indicators equally affecting economic growth in the long run in Ethiopia?

1.4. Objective of the study

1.4.1 General objective

The general objective of the study is to assess the effect of human capital accumulation on economic growth in Ethiopia.

1.4.2 Specific objectives:

- ➢ To investigate the co-integration relationship between human capital accumulation and economic growth in Ethiopia.
- ➢ To analyses the effect of human capital accumulation on economic growth in both short run and long run in Ethiopia.
- ➢ To analyses the causal relationship between human capital accumulation and economic growth in Ethiopia.
- ➢ To compare the effect of education and health indicators on economic growth in the long run in Ethiopia

1.5 Significance of the Study

This study is expected to be significant in respect of the following aspects: first, it will provide information on the relationship between human capital accumulation and economic growth for the researchers and any concerned body in the area of the study. It will also serve as a reference for further studies on the areas of human capital. At the same time, it will also generate empirical evidences for policy implications with regard to the effect of human capital accumulation on economic growth.

1.6. Scope of the study

The study has made use of annual data covering from 1975/76 to 2016/2017. In Ethiopian history, the time period before 1974/75 is the period of the imperial regime. The imperial regime was characterized by a fairly market oriented environment for growth. And the period from 1974 to1991 is the period of socialism where markets were pressed and production and distribution were controlled by the government. The third period (1992 to date) is the EPRDF period. This period is characterized by the liberalized environment for the growth. Generally, we see that there are three policy regimes (fairly market oriented, highly controlled and liberalized) (Ndulu et al., 2008). Therefore, the researcher believes that this start year helps to simplify the measurement of policy change dummy (only with Derg regime and EPDRF). This particular study did not include comparative analysis with other countries. In order to empirically analyses the long run and short run effect of human capital accumulation on economic growth (real GDP per capita growth), the ratio of public education expenditure to real GDP is used as a proxy for the education human capital while the ratio of public health expenditure to real GDP is used as a proxy for health human capital indicator (Abidemi, 2015; Gidey, 2015; Peter and Lucas, 2017 and Seshamani and Righteous, 2017). This particular research did not include the effect of private expenditures on education and health. For the reason that most of the basic education and health service is provided by the government, government expenditure on education and health can explain the human capital created in education and health sector in Ethiopia.

1.7. Limitation of the study

This particular study has only used the public expenditure in health and education, which may have a sort of crowding out effect (effect that occurs when government involvement increased in a sector). But, since most of the education and health investments are covered by the government, the researcher believes it is fair to use only public expenditure. Furthermore, it is difficult to find the data for every variable from the same source and a mixed source of data may have little impact on the quality of the results.

1.8. Organization of the Study

The whole paper is organized in to five chapters. The first chapter contains: introduction of the study, objective of the study, statement of the problem, significance of the study scope of the study and the organization of the paper itself. Chapter two contains theoretical, conceptual and empirical literatures on the areas of human capital. The methodology part of the study is organized in chapter three and Chapter four contains result and discussion of the study while chapter five deals with conclusion, recommendation and policy purpose of the study

CHAPTER TWO

LITERATURE REVIEW

This chapter was discussing literatures which are relevant to the study. It discusses the current theories and practices that are relevant to the study. The chapter revealed the conceptual, theoretical and empirical backgrounds done by different scholars and authors on issues of effect of human capital accumulation on economic growth. Areas covered in this chapter include the definitions of key terms, overview of concepts, theoretical perspective, empirical reviews, and conceptual framework of study

2.1 Theoretical literature review

Maintaining economic growth and improving its quality in the globalized world is becoming a necessity issue now days (Perepelkin, Perepelkina and Morozova, 2016). And this requires renovation of the international and national economies. For this reason, one of the priority lines of the scientific research should be the study of sources and consequences of structural changes, which cause transition to a post-industrial stage of development of society and knowledge economy. The basis for successful implementation of this kind of transformation can be ample development of the human capital (Perepelkin et al., 2016).

The history of human capital is traced back to the works of the Chicago school of economics, where the idea of human capital was first developed in the 1960s (Iyar and Aibieyi, 2014). Before this time, a given economy is mostly believed to depend only on physical capital (land, machinery and equipment) and raw Labor. Venture in capital gear was generally expected the prevailing figure of yield. For occasion, the classical scholars have much centered on the misuse of work by capital (Marimuthu et al., 2009).

2.1.1. Neoclassical growth theories

Schultz (1961) and Becker (1962) are among the first human capital theorists (Marimuthu et al., 2009). They have contended that instruction expands person‘s expertise and so his or her human capital. A better expertise levels within the workforce increments the generation capacity. On the other hand, Spence (1973) gathered instruction as a showcase flag for the potential efficiency of specialists. It moreover serves as a choice device to choose potential labourers that can be

prepared for particular occupations more rapidly and at a lower taken a toll than their partners. But their argument was not practically incorporated into economic growth theories until the standard neoclassical growth model was revised by Mankiw, Romer, and Weil in 1992. These researchers have used a Cobb Douglas production function to reconsider the Solow growth model. For the most part, neoclassical development hypothesis contends that long-term financial development is decided exclusively by the amassing of calculate inputs such as physical capital and work. Thinks about uncover a critical commitment from specialized advance, which is characterized as an exogenous calculate. Solow (1956) and Cass (1965) are among those who to begin with illustrated this. They propose the joining hypothesis of which treats innovation as the sole long run determinant of development.

For the most part, they theoretical that, within the long run, supported positive development rate of yield per capita is only clear in the event that there's proceeds progresses in innovative information within the form of unused products, unused markets, or unused forms. In the event that there's no innovative advance, at that point the effects of reducing returns would eventually cause financial development to end. When we proceed to supply individuals with increasingly of the same capital merchandise without designing modern employments for the capital, at that point the additional capital merchandise ended up excess and so the marginal product of capital will ended up insignificant. This thought is captured formally by accepting the negligible item of capital to be entirely diminishing within the stock of capital (Aghion and Howitt, 2009). In other words, expecting decreasing returns to scale, they said that as capital per laborer increments, development of the economy moderates down until it comes to the relentless state and the lower the beginning level of wage per capita the higher is the

2.1.2. Endogenous Growth Theories

In arrange to address the impediments of the neoclassical hypothesis and reply the long-run determinants of financial development, within the mid-1980s, endogenous development models were created. Lucas (1988) and Romer (1990) are the famous proponents of this theory. They deliberately created technological changes as an explanatory variable in their growth model. For endogenous growth theorists, it is not only technology which determines the growth of a given nation but also other factors such as human capital that are not captured by the neoclassical growth model.

Lucas (1988) considers human capital as a partitioned input within the generation work shaped basically by specialists through education or on-the-job preparing. Within the Lucas (1988) show, the rate at which human capital is being amassed was seen as the basic determinant of efficiency development. On the other hand, Romer (1990) treats human capital as a figure influencing development that have a positive impact on the long-run rate of efficiency development, rather than treating human capital as a coordinate input to the generation of merchandise. Meaning, for Romer endogenous development is caused by accumulating innovation /information whereas for Lucas it is the non-decreasing negligible returns of human capital that makes endogenous development. By and large, they conclude that having a expansive populace isn't adequate to create development, or maybe stock of human capital and investigate and improvement are sources of financial development. Agreeing to these models, the law of reducing returns to scale may not be genuine since the returns on physical and human capital merchandise don't essentially reduce through time. In case the proprietor of the capital utilizes a talented and solid specialist, the efficiency of the capital and the innovation will progress.

Similarly, Mankiw, Romer, and Weil (1992) has also formulated an augmented Solow model, in which human capital enters as a factor of production with those of physical capital and raw labor. They conclude that differences in human capital, saving and population growth determines cross-country differences in income per capita. The model has implied that accumulation of physical capital and population growth has greater impacts on income per capita when human capital is included in the model. This shows that exclusion of human capital from the model results biased outcome.

2.1.3. Investment in education and rate of returns to education

The main investments in education may include time and money spent in formal schooling, on-the job-training and off-the-job training. These ventures include coordinate educational cost expenses, predestined profit amid tutoring time, and decreased compensation amid preparing that are brought about in arrange to pick up a return on this speculation within the future. (Becker 1993, cited in Gidey, 2015) contends that ventures in human capital may incorporate not as it were tutoring but moreover uses on restorative care, on work preparing and others. In general, the key determinants of private returns to education are costs of education and the employment

opportunities after education. Accordingly, human capital investment is only undertaken if the expected return from the investment is greater than the market rate of interest. That means schooling investment is undertaken expecting future income for individuals who receive it. The return to education comes through increased earnings for the worker and higher productivity for the firm, as well as the likelihood of increased employment (Ibid).

The size of the individual human capital stock determines wages return of a worker (Mincer, 1981). As a result, wage differential among the workers is mainly due to the disparity in the sizes of human capital stocks, not because of the raw labor. But, the returns to education are not solely private. There may be spill over from education to other individuals, in which case the social benefits would be higher than the sum of private returns. McMahon argues that returns to education can be classified as monetary and non-monetary, as well as private and social (McMahon, 1998). Compensation is the coordinate private and money related returns from the instruction. The effects of education on GDP growth and on the earnings of others are also other forms of monetary social returns. Individual's non-monetary return may include health effects, professional household management, lifelong adaptation and use of technology and non-monetary job fulfilment. Better citizenship, democracy stability, poverty reduction and lower crime rates and community services are some of non-monetary social benefits. Education may also facilitate the development of democratic institutions, human rights, political stability, lower state welfare costs, lower public imprisonment costs, contributions to social capital, to the generation of new ideas and so forth (Ibid).

2.1.4. Health Human Capital

Health is also another aspect of human capital development in addition to educational human capital. Health status affects the human capital level of individuals and also the growth of a given country. It affects economic growth all the way through productive efficiency, life expectancy, wisdom capacity, creativity and so forth (Howitt, 2005). Healthier workers will become strong, energetic, creative and attentive than unhealthy workers. This health capital makes them more effective in the production process with any given combination of skills, physical capital and technological knowledge. That means better health enhances the effective and sustained use of the knowledge and skills that individuals acquire through education.

As with investment in education and training, the quantity and quality of the human-capital stock can be increased through investment in the prevention and treatment of illness (Gardner 2009). Due to this some scholars includes stock of health in their model and argued that health determines the total working hour an individual wants to spend to generate income (Basov, 2002).

2.1.5. Measurement of Human Capital

Human capital measurement approach can be broadly divided into three which include output, cost and income-based approach. In output-based approach, human capital is measured in terms of school enrolment as a proxy while cost based approach is an indirect approach which sums up amount invested for one 's human capital formation. The other approach is income-based approach. This approach depends on the returns which an individual obtains from a labour market throughout education investment (OECD, 2009).

Some researchers have only used output-based approach (enrolment rate, literacy rate). For instance, Mankiw, Romer and Weil (1992), and Barro and Lee (1993) have used (average year of schooling) educational attainment as a proxy for human capital. Kifle (2006) and Ketema (2006) have also used the same measure. But using this proxy as measures of human capital has some limitations. First, it undermines the quality of schooling which may be affected by educational infrastructures, access to educational services. Second, it assumes that productivity among workers varies with levels of education and it is proportional to their years of schooling (Mulligan and Sala-I-Martin, 2000).

Income-based approach is another alternative which value human capital stock using the earnings of the individual obtained from a labour market. Mulligan & Sale-I-Martin (2000) argued that the aggregate stock of human capital is the sum of individual incomes. The income-based approach has been the most popular approach in recent applications. It is recently employed to measure human capital in China, the United States, the United Kingdom, Australia, New Zealand, Sweden and Norway (Christian, 2011). But wage differences which vary for many reasons may not truly reflect differences in productivity. In addition, data on earnings are not widely available, especially in developing countries whose wage rate is often not observable (Le et al 2003).

Cost-based (conventional) approach is one alternative measure of the stock of human capital. It is an indirect measure of human capital which relies on summing costs or inputs invested for human capital. A number of OECD countries have implemented this cost-based approach to the measurement of education (OECD, 2009). And the stock of health capital can be measured in terms of outcome indicators or input indicators. Though it is difficult to apply it, the best way of outcome indicators is measuring through self-reported health status of the population. Since this measure is difficult to apply, health human capital can also be measured by resources devoted to the health system either by government or by the individuals (Ibid).

2.2. Health and education sector in Ethiopia

2.2.1 Education sector in Ethiopia

Education be implies through which man transmits his encounters, modern discoveries, and values gathered over the long time, in his battle for survival and development. It empowers individuals and society to create all-rounded support within the improvement handle by procuring information, capacity, aptitudes and states of mind. Instruction empowers man to recognize hurtful conventions and supplant them by valuable ones. It makes a difference man to progress, alter, as well as create and preserve his environment for the reason of an all rounded improvement by diffusing science and innovation into the society. Instruction moreover plays a part within the advancement of regard for human rights and equitable values, creating the condition for correspondence, common understanding and participation among individuals. Instruction does not work in confinement, or maybe it needs to be coordinates with inquire about, hone and improvement to contribute towards an all- adjusted advancement of the society (TGE, 1994).

In Ethiopia, education dates back to the Sixth Century, when the Sabean alphabet was introduced along with Christianity. Beginning in the early years of the Christian era, the churches of Ethiopia developed a school system which over the centuries served not only as focal points for learning but also prepared the nation's religious and governmental leaders (Gebru, 2015). Church educations remained the predominant form of education until the beginning of modern secular education in Ethiopia. The religious systems of the bibles school and the Quran schools of the Muslims have laid the foundational ground for the beginning of the modern educational system in the country (Kifle, 2006). This shows that it has laid the foundational ground for the beginning of the modern educational system in the country.

Advancements within the field of advanced instruction can be seen in three stages within the nation: instruction amid the majestic time, instruction during the Derg and instruction amid the EPRDF. Within the majestic period, the instruction system's disappointment to meet the requirements of individuals included in statecraft, discretion, commerce, and industry driven to the presentation of government-sponsored mainstream instruction. Hence the more planned and coordinated expansion of education has been done after 1941. The primary objective of education in that day was to produce trained manpower that could run the emergent state bureaucracy. After 1941, the government's main concern was to replace foreigners worked at various levels in the state machineries by Ethiopian nationals. In this respect the perspective of education was very limited. This leads to the establishment of the first public school in Addis Ababa in 1907, and a year later a primary school opened in Harar. Outside dialects, rudimentary arithmetic, and simple science were instructed in French to some understudies, in conjunction with Amharic and devout subjects (Ketema, 2006).

The Italian occupation (1936-1941) and the Second World War seriously disrupted the development of modern secular education started during the Menelik era. It was after 1941 that a series of concrete educational policies were introduced for the promotion of education in the country. The Ethiopian Government continued to believe that education held the key to Ethiopia's development. To meet this need, reconstruction began with the reestablishment of the Ministry of Education in 1942. To enhance expansion, a Board of Education was established in each region and an educational tax was also introduced to partly finance education. Private and voluntary organizations were encouraged to open schools and missionaries were also officially invited to participate in providing educational services. From this time onwards, the education system in the country has got a due emphasis and the government has also begun to spend on education. Non formal education in the form of adult education and literacy programs were coordinated and sponsored by the adult Education and Literacy Department of the Ministry of Education (Gebru, 2015).

In 1974 the imperial regime was dismantled and replaced by the socialist system. Hence, the educational system of the country was reformed in accordance of consistency to the socialism. The goals of education during this time were (1) education for production, (2) education for scientific consciousness, and (3) education for political consciousness. The military regime worked toward a more even distribution of schools by concentrating its efforts on small towns and rural areas that had been neglected during the Imperial regime. With technical assistance from the Ministry of Education, individual communities performed all primary school construction. A move towards expansion of non-formal education was also made by the Socialist regime. Two main programs were launched which include the National Work Campaign for Development through Cooperation, and the Ethiopian National Literacy Campaign. The national literacy campaign began in early 1975 when the government mobilized more than 60,000 students and teachers, sending them all over the country for two-year terms of service. This experience was crucial to the creation in 1979 of the National Literacy Campaign Coordinating Committee and a nationwide effort to raise literacy levels. The literacy rate, fewer than 10 percent during the Imperial regime, increased to about 63 percent by 1984, according to government figures. However, the Derg failed to build on what was already achieved in the past. Particularly, Private sector development and the development of the market incentive structure both in the education sector and in the labour, market were highly discouraged (Ketema 2006).

With the coming to power of the EPRDF, old educational system was replaced by the new one. The new strategy presupposed the overall lack of coordination between education, training, research and development efforts in the country. The structure of the Ethiopian education system in this regime encompasses formal and non-formal education. But it is not clear how the non-formal education will be implemented. For this reason, it is viewed as open-ended in terms of training program and in terms of institutional arrangement. The new policy has also addressed the issues of technical Vocational training. Thus, it is stipulated in the document that Parallel to general education, diversified technical and vocational training will be provided for those who leave school from any level of education for the development of middle level manpower (MOE,)

2.2.2. Health Sector in Ethiopia

The main cause of numerous Ethiopia's health problems is the relative isolation of large segments of the population from the modern sector. Additionally, widespread illiteracy prevents

the dissemination of information on modern health practices. A shortage of trained personnel and insufficient funding also hampers the equitable distribution of health services. Moreover, most health institutions were concentrated in urban centred prior to 1974 and was concerned with curative rather than preventive medicine (HSDP, 2010.

The current government (EPRDF government), therefore, accords health a prominent place in its order of priorities and it is committed to the attainment of these goals utilizing all accessible internal and external resources. In particular the government fully appreciates the decisive role of popular participation and the development of self-reliance in these endeavours and is, therefore, determined to create the requisite social and political conditions conducive to their realization (TGE, 1994). The Government also believes that health policy cannot be considered in isolation from policies addressing population dynamics, food availability, acceptable living conditions and other requisites essential for health improvement and shall develop effective inter sectoriality for a comprehensive betterment of life. So, health development shall be seen not only in humanitarian terms but as an essential component of the package of social and economic development as well as being an instrument of social justice and equity.

2.3. Empirical literature review

Despite their conclusions are controversial, different scholars have tried to analyse the relationship between human capital and economic growth. Mankiw, Romer, and Weil (1992), on their cross-country regression analysis, have shown that human capital as one of the reasons for the income variation across countries. That means they found a positive and significant correlation between human capital and per capita income growth.

Although earlier studies (Lucas 1988; Romer 1990) analysed the importance of education and human capital development in the growth process, it was Barro (1991) that brought to the public interest the link between educational expenditures and economic growth. The study found a positive relationship between the growth rate of real per capital output and the level of school enrolment. The study argued that an increasing rate of investment in human capital development would help to close the development gap between the developing and developed countries.

Barro (2013) have measured human capital using average years of schooling in primary and secondary school. He found a positive and significant relationship between per capita income growth and human capital from 1960 to 1990. Based on his simple panel regression analysis, Barro reported that the process of catching up was firmly linked to human capital formation: only those poor countries with high levels of human capital formation relative to their real GDP tended to catch up with the richer countries.

Wang and Liu (2016) used a panel data model to investigate the effect of education human capital on economic growth, using the latest education data of 55 countries and regions from 1960 to 2009. By subdividing education human capital into higher education, secondary education and primary education, they examined the effect of different education level on economic growth. Furthermore, by introducing health human capital into the model, they explored the influence of different economic development level and some important historical events. The result shows that in general, education human capital has a significant positive impact on economic growth. The positive impact of higher education on economic growth is especially significant, however, the primary education and secondary education does not have a significant impact on economic growth; as for human capital, life expectancy and per capita GDP growth also showed a significant positive correlation as to their paper.

Gyimah and Wilson (2003) examined the impact of health human capital by using an expanded Solow growth model, panel data, and a dynamic panel estimator in Sub Saharan and OECD countries and found that the growth rate of per capita income is strongly and positively influenced by the stock of health human capital after controlling for other variables. The stock of health human capital affects the growth rate of per capita income in a quadratic way: the growth impact of health human capital decreases at relatively large endowments of health stock. The estimates suggested that 22% and 30% of the transition growth rate of per capita income in Sub-Saharan African and OECD countries respectively can be attributed to health. They have also found that the structure of the relationship between health human capital and the growth rate of income in Sub-Saharan African countries is similar to the structure of the relationship in OECD countries, means increased stocks of health human capital leads to higher steady state income.

Tassew (2001) investigated the impact of education on the farmer's choice of activities and household welfare and to alleviate poverty by using farm household data for rural Ethiopia. The study has found that human capital has both direct and indirect effect on income poverty (household welfare). As to this study, schooling affects poverty through its effects upon increasing the adaptation of innovation and the other way through which schooling reduces poverty is by enabling the farmers to enter into profitable non-farm activities. The study has found that one extra year of schooling raises the welfare of the farmers by 8.5% other things remaining constant.

Kifle (2006) investigated the impact of human capital on economic growth in Ethiopia over the period 1971-2005 using an error-correction methodology. Contrary to microeconomic studies, the macroeconomic evidence from this study shows that the human capital variable in the form of schooling has an insignificant impact on the level of output.

Gebru (2014) studied the relationship between (education and health) which are accepted as an indicator of human capital and economic growth. The study was aimed at decomposing the relationship between human capital (using health index and education index as a proxy) and economic growth using time series data from 1971- 2011 in Ethiopia using modern econometrics technique. In the study, the long-run relationship among variables is confirmed through Johnson co-integration analysis whereas the long-run and short-run dynamics are observed by VECM specification. For causality purpose VECM based causality tests are employed. The finding has indicated that in the long run investment in education and health would affect further economic growth.

Yushi (2015) used the empirical econometric model to analyze the impact of education and health (human capital) on economic growth from 1980-2013 in Ethiopia. Human capital was proxied by primary, secondary and tertiary school enrolment. Human capital investment is proxied by expenditure on education and health. They have used Johansen's Co-integration technique and to validate co-integration among variables, respectively. The findings of the study have shown public expenditure on health and education, primary and secondary

school enrollment have a positive statistically significant effect on economic growth both in long run and short run. However, tertiary school enrolment has an insignificant effect on economic growth both in the long run and short run.

Gidey (2015) studied the impact of human capital on economic growth in Ethiopia by using the ARDL approach to co-integration. The finding of the study has indicated that there is a stable long run relationship between real GDP per capita, education human capital, health human capital, labour force, gross capital formation, government expenditure and official development assistance. The estimated long run model also indicated that human capital in the form of health has a big positive impact on real GDP per capita rise followed by education human capital.

2.4 Conceptual Framework of Study

Conceptual framework is a basic structure of a research consisting of a certain abstract ideas and concepts that a researcher wants to observe or analyse (Mbogo, et al., (2017)). This study involved eight important variables to assess effect of human capital accumulation on the economic growth. The independent variables in the study include: growth capital formation, education human capital, health human capital, inflation, labour force, Official development assistance and import of goods and services while real GDP per capita is dependent variable. Therefore, the conceptual framework showed below shows either positively or negatively relationship between dependent and independent variables.

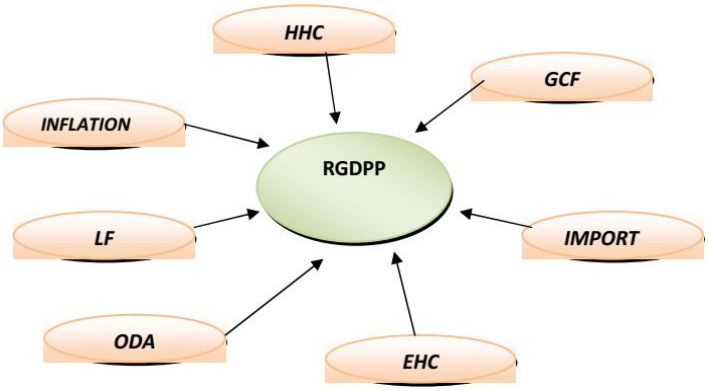


Figure 1: Conceptual Framework of the Study

From the above figure 1 economic growth depends on RGDPPC which in turn depends on growth

in capital formation, education human capital, health human capital, inflation, labour force, Official development assistance as well as import of goods and services.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Theoretical framework and model specification

Different scholars have designed diverse conceptual frameworks that incorporate human capital as one of the determinant aspects of economic growth. Amongst the many, (Mankiw et al) have accommodated human capital as an independent factor of production in their empirical analysis in defence of the neoclassical Solow model.

Benhabib and Spiegel (1994) has used Cobb-Douglass production function where GDP per capital was used as dependent variable while labour force, physical capital and human capital were used as independent variable. Oluwatobi and Ogunrinola (2011) have also used school enrolment and the capital and recurrent expenditure on health and education as a determinant of real gross domestic product. Endogenous growth theorists have also used human capital as one of the determinant aspects of economic growth. For instance, Romer (1990) has incorporated human capital in his endogenous technological change. At the same time, Lucas (1988) has also incorporated human capital in the study of on the mechanics of economic development.

3.1.1. Data Source and Measurement of the Variables

The study has used annual data from 1975/76-2016/2017. The data is collected from World Bank development indicators (WDI), from Ministry of Finance and Economic Cooperation (MOFEC), National plan commission, ministry of education, ministry of health and National Bank of Ethiopia (NBE).

Types of Variable	Unit/Proxy	Sources
Real GDP Per Capital	Real Gross Domestic Product Per Capital	NBE
Physical Capital Stock	Ratio of real gross capital formation to real GDP	NBE
Labour force	Labour force growth rate	MOFEC
Education Human Capital	The ratio of public education expenditure to real GDP	MOFE
Health Human Capital	The ratio of public health expenditure to real GDP	NBE
Official development assistance	The ratio of official development assistance to real GDP	World Bank
Inflation	Average inflation	NBE
Imports of goods and Services	Growth rate of imports of goods and services	NBE
Dummy Variable	0 and 1	---

Table 1 Data Source and Measurement of the Variables

The descriptions and measurements of the dependent and the explanatory variables that are included in the model of this paper are explained as follows:

a) Real GDP Per Capita growth ($RGDPPCG_t$)

Like the studies made by Mankiw, Romer and Weil (1992), Barro and Lee (1993), and Barro and Sala-I-Martin (2004), Real GDP per capita that indicate the total amount of the market value of all domestically produced final goods and services divided by total population is taken as a proxy for economic growth (dependent variable). Real GDP per capita can also be used as proxy in the growth rate form.

b) The Ratio of Real Gross Capital Formation to real GDP (GCFt)

It is a proxy for physical capital stock in the economy, and it is derived by dividing the gross capital formation adjusted through GDP deflation to real GDP. Barro and Sala-I-Martin (2004) has shown that the sign expected from the coefficient GCF is positive, because the accumulation of the capital is supposed to favour the growth of the real GDP by promoting further production of new goods and services. Other empirical findings like Wilfred and Adeleke (2013), Ali (2018), and Bojoro and Yushi (2018) have also found the positive sign

.**c) Labor**

Theoretically, labor force is a major element for sustainable rate of economic expansion. It could be the engine of growth for labour-intensive economies like Ethiopia. But if it is not used efficiently and if it is less productive, it may be a burden for the economy because of high rate of unemployment. It is incorporated in the model in its growth rate (bloom et al., 2017).

d) **Human Capital**

Human capital is a factor that influences the productivity of the labor force (Acemoglu, 2009). Because it facilitates the absorption of new technology, increases the rate of innovativeness and promotes efficient management. Therefore, this variable is included in the model to represent the knowledge, skills, competence and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being. The variable is represented by the ratio of public health expenditure (recurrent and capital) to real GDP as a proxy for health human capital and the ratio of public education expenditure (recurrent and capital) to real GDP as a proxy for education human capital. Therefore, higher level of human capital accumulation in the form of education and health are expected to have a positive effect on economic growth.

e) Ratio of Official Development Assistance to Real GDP

There are three views on the relationship between official development assistance aid and economic growth. The first view argues that aid has a positive contribution to the socio-economic status of the recipient nation. The second argument rests on the idea that aid might lead to poor or negative productivity by discouraging alternative development policies (Porter, 2009) and institutions (Rajan and Subramanian, 2005). The other argument is that the marginal contribution of aid depends on the institutional environment of the recipient country. If there is

good economic policy environment, it is crucial for the efficient allocation of aid to investment which has a positive impact on the economy. However, it will have little or no impact on economic growth if there is institutional destruction and capacity constraints (Hansen and Tarp, (2000) as cited in Gidey, 2017). Therefore, since Ethiopia is among the main aid recipient countries in Africa; it is entered into the model as one control variable.

f) Average Inflation

Much is written about the relationship between inflation and economic growth with conflicting empirical results. This shows that Economic growth is essentially affected by inflation but the sign of this impact is empirically unpredictable (Singh and Singh, 2017). Moderate inflation is expected to have positive impact on economic growth although with less agreement on the issue, but there is no doubt that high inflation adversely affects economic growth (kasidi and Mwakanemela, 2017).

g) Growth Rate of Imports of Goods and Services

Import of goods and services can be seen as one of the determinants of economic growth (Kogid et al, 2017 and Getachew, 2018). Import can contribute positively to the economy in the way like, increasing in market choices and developing the competitive spirit in the domestic producers and hence contributing to the growth of trade and in turn economic growth (Tareke, 2017). It may also discourage economic growth by substituting domestic goods and eliminating domestic producer from the market and it may also lead to high inflation when trade deficit occurred (Kogid et al, 2017).

h) Policy Variable

Changes in economic policies can influence the performance of the economy through investment in human capital and therefore, policy change dummy (D) is added into the model. The Derg regime (1975/76- 1991/92) is known by its hard control of production and distribution in the economy while the EPRDF (1992 to date) is known for its redistributive pattern in the economy (Ndulu et al, 2017). Therefore, dummy for changes in economic policies take zero for the period 1975/76-1991/92 and one otherwise.

3.1.2. Stationarity of the time series data

Stationarity is concerned with the stochastic processes. A time series of data is said to be

stationary if the mean, variance and covariance of the series are time independent. In another way, the process is said to be a stationary stochastic process if it generates finite and time independent mean and variance (Gujarati, and Porter, 2009). The non-stationary process is the reverse, i.e. if the stochastic process has either a time-varying mean or a time-varying variance or both mean and variance are time dependent (varies with time), the stochastic process is said to be non-stationary. In case a time series is non-stationary, it results in spurious (nonsense) regression outcome in which the coefficients are statistically significant showing the statistical relationship between the variables (dependent and independent) where in fact there is no any statistical relationship between the variables under consideration (Ibid). This kind of problem (unit root problem) can be solved by differencing the data set (Verbeek, 2004). If the variable is stationary without differencing, then it is integrated of order zero, I (0) and integrated of order one, or I (1), if it is stationary after differencing once, or integrated of order two, I (2) if differenced twice. To determine the degree of stationarity, a unit root testing will be carried through the Augmented Dickey-Fuller (ADF) test.

3.1.2.1. Testing a Unit root

The widely used approach to unit root testing is an Augmented Dickey-Fuller (ADF). To test stationarity autoregressive model of order one, AR (1) is the simplest starting point. And the DF test can be estimated in three different forms of AR (1) model as specified below (Gujarati and Porter, 2009).

Y_t is Random walk: $Yt = \rho Y_{t-1} + ut$..... (1)

Y_t is a random walk with drift: $Yt = \beta 1 + \delta Y_{t-1} + ut$……..…… (2)

Y_t is a random walk with drift and trend: $Yt = \beta 1 + \beta 2t + \delta Y_{t-1} + u_t$……..... (3)

Where t is the time or trend variable and u_t is a white noise error term.

If we consider equation (9) for simplicity which is random walk autoregressive model, a convenient technique for carrying out the unit root test is to subtract Y_{t-1} from both sides of equation (9). Subtracting Y_{t-1} from both sides of equation (9) gives:

$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t$..... (4)

$\Delta Y_t = (\rho - 1) Y_{t-1} + u_t$

$\Delta Y_t = \delta Y_{t-1} + u_t$ ..... (5)

Where $\delta = (\rho - 1)$, Δ is the first difference operator and ut ~IN $[0, \delta^2]$.

The basic idea behind the Dickey-Fuller (DF) unit root test for stationarity is to simply regress ΔY_t on one period lagged value of Y_t and find out if the estimated δ is statistically equal to zero or not. Then, the null hypothesis Ho: $\delta = 0$ against the alternative hypothesis Ha: $\delta < 0$ will be tested.

In equation (13) if $\delta = 0$ or $\rho = 1$, the process will become a random walk which is a non-stationary process i.e. there is a unit root problem. But, if $\delta < 0$ or $(\rho < 1)$, the series Y_t is stationary (Gujarati and Porter, 2009).

The decision to reject or not to reject the null hypothesis is based on the Dickey-Fuller (DF) critical values of the τ (tau) statistics and the test procedure for unit root is shown as follows:

- Hypothesis testing:

Null hypothesis: Ho: $\delta = 0$

Alternative hypothesis: Ha: $\delta < 0$

- Calculating the test statistics by using

$$F = \frac{\delta}{SE(\delta)}$$

Where SE (δ) is standard error of δ.

In order to calculate the critical values of the τ (tau) statistic, Dickey-Fuller assumes that the error terms (u_t) are not correlated (Ender, 1996 cited in Gidey, 2017). But the error term in the Dickey-Fuller test usually has autocorrelation, which needs to be removed if the result is to be valid. In addition, the critical values of τ (tau) statistics do not follow the normal distribution function and in general, the critical value is considerably larger than its counterpart of t- distribution. Therefore, using such critical values can lead to over-rejection of the null hypotheses when it is true (Ibid). Consequently, Dickey and Fuller have developed a test known as the Augmented Dickey-Fuller (ADF) test to solve this kind of difficulty (Green, 2015). In the ADF test, the lags of the first difference dependent variable are added in the regression equation until the autocorrelation problem will be resolved. The

regression equation is presented in the following form:

$\Delta Y_t = \delta Y_{t-1} + \beta \Delta Y_{t-t} + u_t$……. (6)

Since a random walk process may have no drift, or it may have drift or it may have both deterministic and stochastic trend, let us include an intercept β1 as well as a time trend t in the model.

$\Delta Y_t = \beta 1 + \beta 2t + \delta Y_{t-1} + \beta \Delta Y_{t-1} + u_t$…… (7)

Where β2 the coefficient on a time trend series**;** δ is the coefficient of Y_{t-1}; p is the lag order of the autoregressive process, $\Delta Y_t = Y_t - Y_{t-1}$; Y_{t-1} is lagged values of order one of Y_t; ΔY_{t-i} are changes in lagged values; and ut is the white noise.

The parameter of interest in the ADF model is δ and the null and alternative hypotheses that are tested are as follows:

Ho: $\delta = 1$

Ha: $\delta \# 1$

The ADF test procedure for unit roots is similar to statistical tests for hypothesis and it can be tested on three possible models as specified in equations (9), (10) and (11). But, the critical values of the tau test to test the hypothesis that $\delta = 0$, is different for each of the three specifications (Gujarat, 2004). Hence, due to the above advantages over DF test, the researcher used the ADF test of stationarity. In addition, the lag-length of the ARDL model is determined by Akakie Information Criterion (AIC).

3.1.3. Co-integration Analysis and Error Correction Model

If a group of variables is individually integrated of the same order and at least one linear combination of these variables is stationary, then the variables are said to be co- integrated. This concept does mean that there could be a long run relationship between the variables and co-integration test implies the test of the existence of such long run relationship. The test could be undertaken through the Engle-Granger procedure, the Johansen's co-integration procedure, Autoregressive Distributed Lag (ARDL) method of co-integration and etc.

Engle-Granger Approach, a residual based test of co-integration, is one of the widely used tests

of co - integration. In this testing method, the variables are expected to be integrated of the same order. In case the variables are found to be integrated of the same order, the next step is to estimate the co-integrating parameter through OLS and test for co-integration (Mandala and Kim, 2016). T h e augmented Dickey Fuller (ADF) test can be used to test the existence of co-integration. This is done by calculating the residuals from the estimated equation and testing its stationarity and the stationarity of the residual implies the existence of the co-integration in the series (Ibid).

The step which follows from the above test procedure is the formulation of the error correction model where the error correction term is the residual from the co-integrating relationship, lagged once. The error correction model tells the speed of adjustment to the long run equilibrium (Verb eek, 2016). However, this method has some weaknesses. For instance, the residual-based test tends to lack power because it does not exploit all the available information about the dynamic interactions of the variables (Ibid). The other problem with this method is that it only finds out one co-integrating vector, i.e. it cannot be applied in case we have more than one co-integrating vectors. Again, in this method, the results of the tests are sensitive to the left-hand side variable of the regression i.e. to the normalization applied to the co-integrating vector (Ibid).

In addition, in view of the fact that Engle-Granger's method is a two-step estimation procedure, there is a probability that an error occurred in the first step could be carried over to the second step making the result unreliable (Enders, 1996 cited in Gidey, 2017).

Johansen maximum Likelihood (2017) co-integration method technique solves the above shortcomings of Engle-Granger procedure (Mandala and Kim, 1999). This method can estimate more than one co-integrating relationship if there are two or more time series in the data set. It heavily relies on the rank of the matrix and its characteristic root (Verb eek, 2004). However, the application of the Johansen technique will fail when the underlying regressors have different order of integration, especially when some variables are I (0) Pesaran, Shin, and Smith, 2001), that means the trace and maximum Eigenvalue tests may lead to wrong co-integrating relations with other variables in the model when I (0) variables are present in the data set.

To overcome this problem, the superior method was developed (Pesaran and Shin (1997, 1999, and 2001) which is called Autoregressive Distributed Lag (ARDL) model. This method has advantages over Johnson co-integration approach. First, ARDL approach can be applied with the regressor of different order of co-integration. It also has a small sample advantage where Johansen co-integration Method requires large data samples for validity (Pesaran and Shin, 1997; Pesaran and Shin, 1999). Furthermore, ARDL procedure provides unbiased and valid estimates of the long run model even when some of the regressors are endogenous (Pesaran and Shin, 1999). It is also possible to include a dummy variable in the co-integration test process, which is not permitted in Johansen‘s method (Rahimi and Ashkhabad, 2011). Therefore, due to the above-mentioned advantages, the researcher has employed ARDL method of co-integration to investigate the effect of human capital accumulation on economic growth.

ARDL approach involves two steps for estimating the long-run relationship (Pesaran, Shin, and Smith, 2001). The first step is concerned with examining the existence of a long-run relationship among all variables in an equation, while the second step is concerned with estimating the long-run and short run coefficients of the model. But, the second step takes place only if co-integration relationship is found in the first step. Therefore, depending on the ARDL approach proposed by Pesaran and Shin (1997, 1999) and Pesaran, Shin, and Smith (2001), the following model is specified in order to test the long-run co-integration relationships between variables.

$$\Delta \mathrm{In}\,(GDPPCG)_{t-i} = \beta 0 + \lambda 1 LnGDPPCG_{t-i} + \lambda 2 LnLAB_{t-i} + \lambda 3 LnGCF_{t-i} + \lambda 4 LnEHC_{t-i} + \lambda 5 LnHHC_{t-i} + \lambda 6 LnODA_{t-i} + \lambda 7 LnIMP_{t-i} + \lambda 8 LnAI_{t-i} + \beta 1 \sum_{i=0}^{n} (\Delta LnGDPPCG)_{t-j} + \beta 2 \sum_{i=0}^{n} (\Delta LnLAB)_{t-j} + \beta 3 \sum_{i=0}^{n} (\Delta LnGCF)_{t-j} + \beta 4 \sum_{i=0}^{n} (\Delta LnEHC)_{t-j} + \beta 5 \sum_{i=0}^{n} (\Delta LnHHC)_{t-j} + \beta 6 \sum_{i=0}^{n} (\Delta LnODA)_{t-j} + \beta 7 \sum_{i=0}^{n} (\Delta LnIMP)_{t-j} + \beta 8 \sum_{i=0}^{n} (\Delta LnAI)_{t-j} + \beta 9t + \beta 10D + e_t \ldots\ldots\ldots (8)$$

Where:

$\Delta lnGDPPCG$ t-i = Natural logarithm of real GDP per capita growth at time t.

lnLABt-i = Natural logarithm of labor force growth rate at time t.

$lnGCF_{t-i}$ = Natural logarithm of gross capital formation at time t.

$lnEHC_{t-i}$ = Natural logarithm of education human capital at time t.

$lnHHC_{t-i}$ = Natural logarithm of health human capital at time t.

$lnODA_{t-i}$ = Natural logarithm of official development assistance at time t.

$lnAI_{t-i}$ = Natural logarithm of average inflation

$lnIMP_{t-i}$= Natural logarithm of import of goods and services

D = is a dummy variable for a policy change

λ1, λ2, λ3, λ4, λ5 λ6, λ7 and λ8, are the coefficients that measure long run relationships.

β1 β2, β3, β4, β5, β6 β7and β8 are coefficients that measure short run relationships.

$\mathcal{C}_t$ = is an error term and n denote the lag length of the AR process and t is the time trend.

To test whether there is a long run equilibrium relationship between the variables; bounds test for Co-integration is carried out as proposed by Pescara and Shin (1999) and Pescara, Shin, and Smith (2001). The hypotheses are shown below:

Ho: λ1 = λ2=λ3=λ4= λ5= λ6 = λ7 = λ8 =0 there is no long run relationship among the variables.

Ha: λ1≠λ2≠λ3≠λ4≠λ5≠λ6≠λ7≠λ8≠0 means there is a long run relationship among the variables.

The non-standard F-statistics is used to test the above hypothesis. The critical values of the F-statistics for this test are available in Pescara, Shin, and Smith (2001). They provide two sets of critical values namely the upper bound values and the lower bound values. If the computed F-statistics is higher than the appropriate upper bound of the critical value, the null hypothesis of no co-integration will be rejected. If it is below the appropriate lower bound, the null hypothesis cannot be rejected, and if it lies within the lower and upper bounds, the result would be inconclusive. In this paper, the computed F-statistics is compared with both critical values provided by Pesaran, Shin, and Smith (2001).

After confirming the existence of long-run relationship between the variables, the following stable long-run model is estimated:

$$\text{In (GDPPCG)}_{t-i} = \beta 1 \sum_{i=0}^{n} (\Delta \text{LnGDPPCG})_{t-j} + \beta 2 \sum_{i=0}^{n} (\Delta \text{LnLAB})_{t-j} + \beta 3 \sum_{i=0}^{n} (\Delta \text{LnGCF})_{t-j} + \beta 4 \sum_{i=0}^{n} (\Delta \text{LnEHC})_{t-j} + \beta 5 \sum_{i=0}^{n} (\Delta \text{LnHHC})_{t-j} + \beta 6 \sum_{i=0}^{n} (\Delta \text{LnODA})_{t-j} + \beta 7 \sum_{i=0}^{n} (\Delta \text{LnIMP})_{t-j} + \beta 8 \sum_{i=0}^{n} (\Delta \text{LnAI})_{t-j} + \beta 9t + \beta 10D + e_t \quad \ldots\ldots (9)$$

The next step is to estimate the vector error correction model that indicates the short run

dynamic parameters (adjustment parameters that measure the speed of correction to long-run equilibrium after a short-run disturbance). The standard ECM is estimated as follows:

$$\Delta \text{In (GDPPCG)}_{t-i} = \beta 0 + \beta 1 \sum_{i=1}^{a} (\Delta \text{LnGDPPCG})_{t-j} + \beta 2 \sum_{i=0}^{b} (\Delta \text{LnLAB})_{t-j} + \beta 3 \sum_{i=0}^{c} (\Delta \text{LnGCF})_{t-j} + \beta 4 \sum_{i=0}^{d} (\Delta \text{LnEHC})_{t-j} + \beta 5 \sum_{i=0}^{e} (\Delta \text{LnHHC})_{t-j} + \beta 6 \sum_{i=0}^{f} (\Delta \text{LnODA})_{t-j} + \beta 7 \sum_{i=0}^{f} (\Delta \text{LnIMP})_{t-j} + \beta 8 \sum_{i=0}^{f} (\Delta \text{LnAI})_{t-j} + \beta 7 t + \beta 8 D + \delta ECT_{t-1} + \mathcal{E}_t \quad (10)$$

Where;

β0, β1, β2, β3, β4, β5, β6, β7 and β8 are coefficients that represent the short run dynamics of the model

D = dummy variable for policy change

ECT_{t-1} = error correction term lagged by one period and δ is the error correction parameter that measures the speed of adjustment which is derived from the corresponding long run model whose coefficients are obtained by normalizing the equation.

$\mathcal{E}_t$ = vector white noise and (a-f) denotes the optimal lag length of each variable in autoregressive process.

3.1.4. Diagnostic tests of the Model

After estimating the long run and short run model, misspecification test, normality test, serial correlation test, and heteroscedasticity test and test for stability of the model are undertaken to check the robustness of the model. CUSUM and CUSUMSQ test of stability are undertaken to check the stability of the coefficients. In order to estimate the models specified in equation (16), (17) and (18) above and to perform the pre estimation and post estimation diagnostic tests, stata14 and eviews10 statistical packages are used.

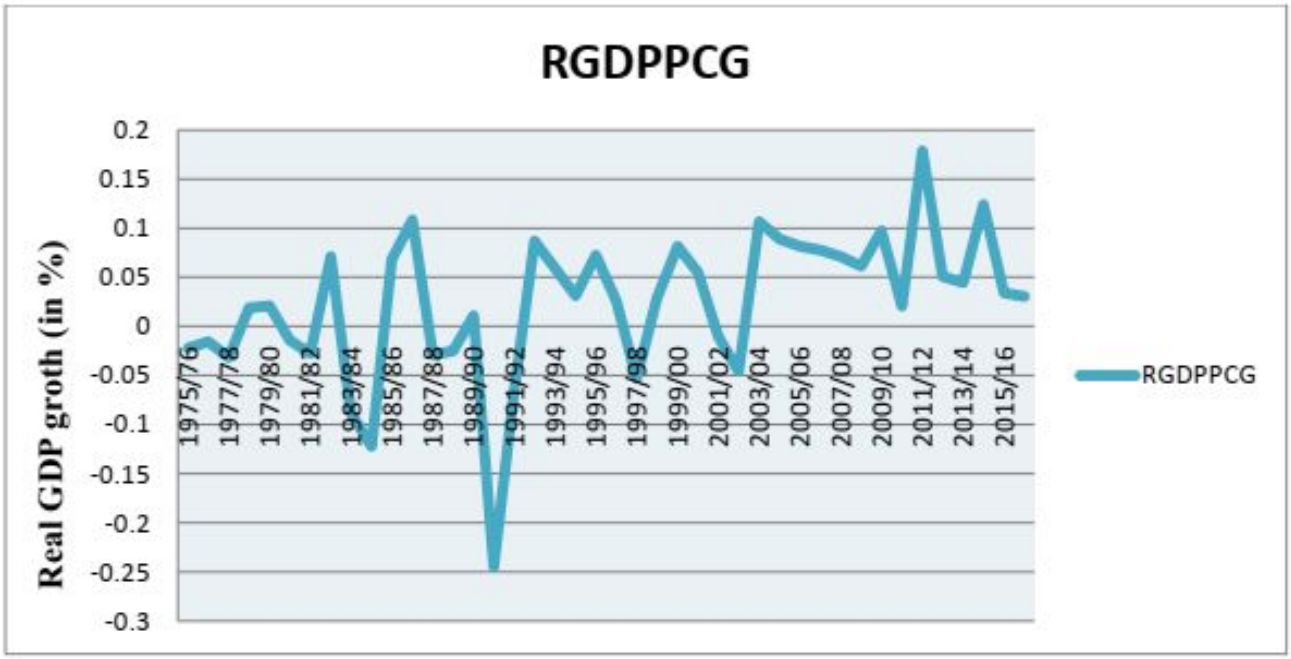
CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Descriptive Analysis

4.1.1. The Trend of Real GDP per capita Growth (1975/76 - 2016/17)

Economic growth in Ethiopia as it is measured by GDP per capita growth rate as shown below in figure 2, real GDP per capita had about 2.2% negative rate of growth in 1975/76. This means that real GDP per capita growth of the country has declined by 2.2 percent from the previous year. There was a regime change in 1973/74 in the country and that might have adversely affected the real GDP per capita growth of the country. However, the economy has started to recover, and real GDP has grown by 2% in 1979/80 which has further grown to about 7.1 percent in 1982/83. The growth has further fluctuated and real GDP per capita has scored a 12 percent negative growth in 1984/85. The trend also shows that the real GDP per capita growth declined by 6.4 percent in 1991/92, and it has shown greater progress in 1993/94 by showing a 5.9 percent growth. It also has deteriorated by scoring a 5.3 percent decline in the real GDP per capita growth in 1997/98. General trend shows ups and downs in the real GDP per capita growth in the time under consideration and average growth is 2.4 percent.

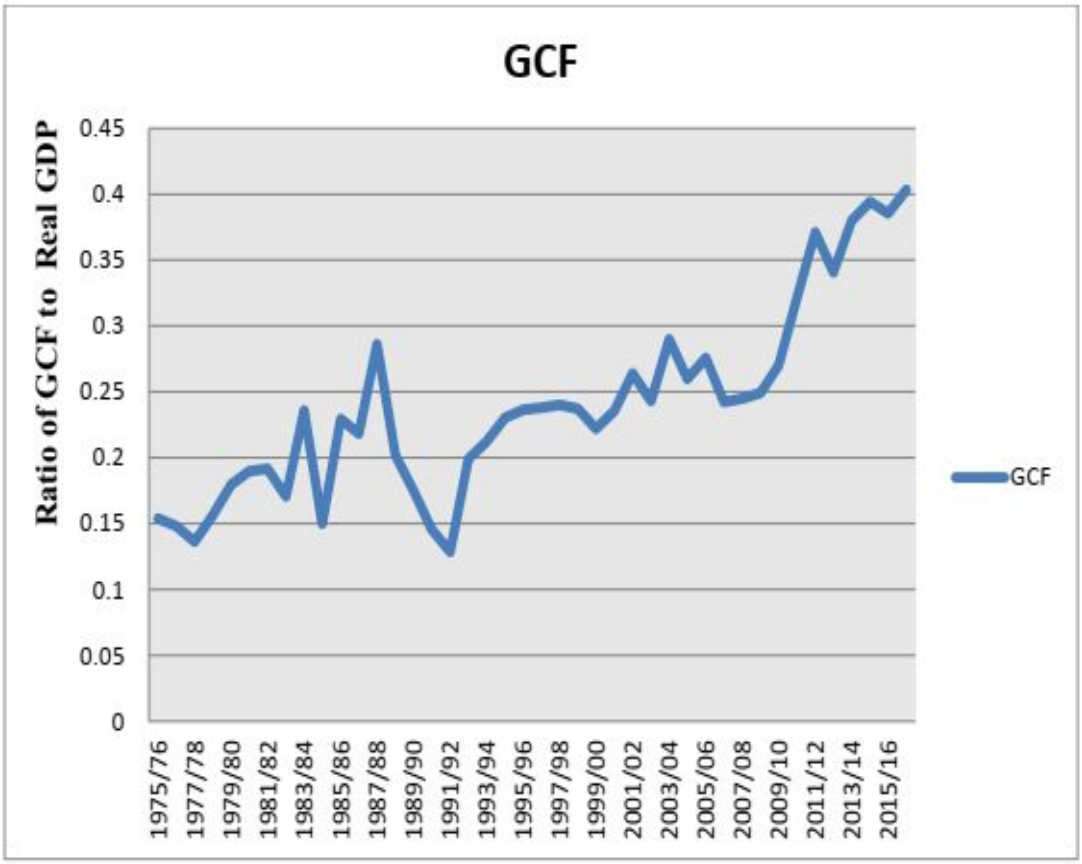


Source: Own Computation, 2021

Figure 2: The Trend of Real GDP per capita Growth.

4.1.2. The Trend of Real Gross Capital Formation (1975/76-2016/2017)

As shown below in Figure 3, the ratio of real gross capital formation to GDP has an increasing overall trend with ups and downs in the meantime. It had about a 15 percent share to real GDP in the year 1975/76 percent which has increased to about 18.9 in the year 1980/81. The trend shows that the average share of real gross capital formation to real GDP is 18.5 percent for the period 1975/76-1990/91 (Derg regime). The share of GCF has reached the minimum of 12.8 percent in the transitional period from Derg to the EPRDF regime (1991/92). From this time onwards, the ratio of GCF to real GDP has started to rise and reached about 40 percent in 2015/16. However, it is observable that it has shown a sort of swinging (up and down) patterns. The average for the EPRDF regime is about 27.4 percent, while the overall ratio of the period under consideration is 22.9 percent.

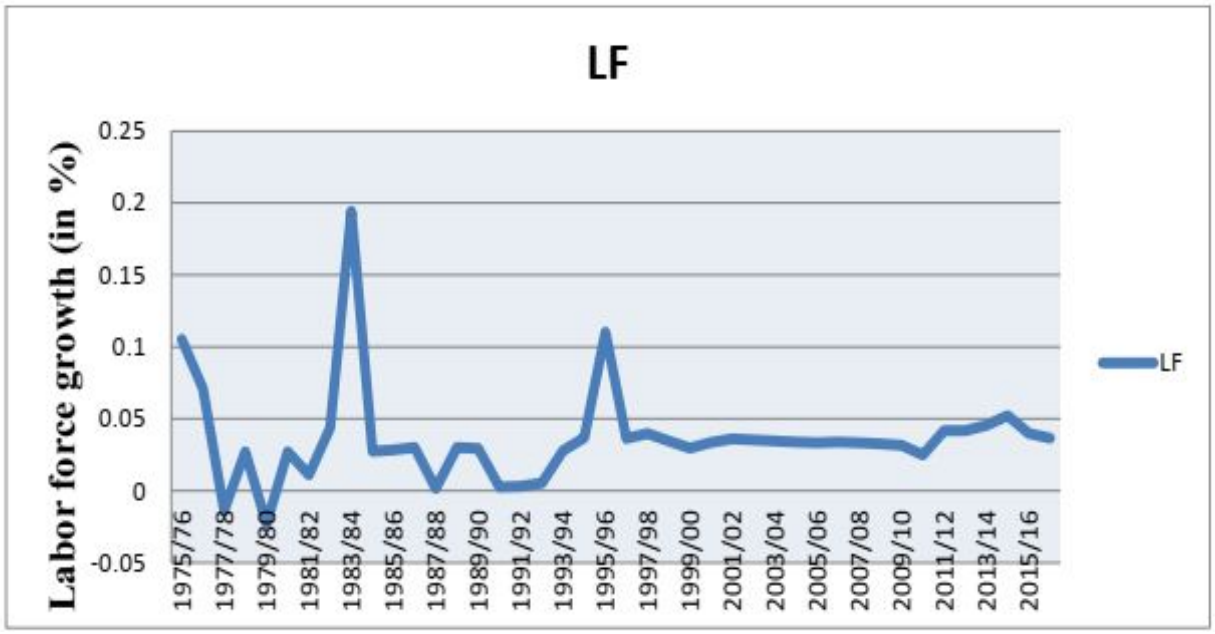


Source: Own Computation, 2021

Figure 3: The Trend of Real Gross Capita Formation

4.1.3. The Trend of Labour Force Growth (1975/76 - 2016/17)

Labour force is seen as the one aspect that can affect economic growth. As shown in Figure 4, labor force growth in 1975/76 was about 10.5 percent. This growth has started to decline and reached a negative of 1.3 percent in labour force growth in 1977/78 and has further declined to a negative of 2.2 percent growth in labor force in 1979/80. The growth of labor force reached its maximum in 19983/84 with a growth rate of 19.4 percent. The growth of labor show ups and downs in the period under consideration, and the average over the period is 3.67 percent.



Source: Own computation, 2021

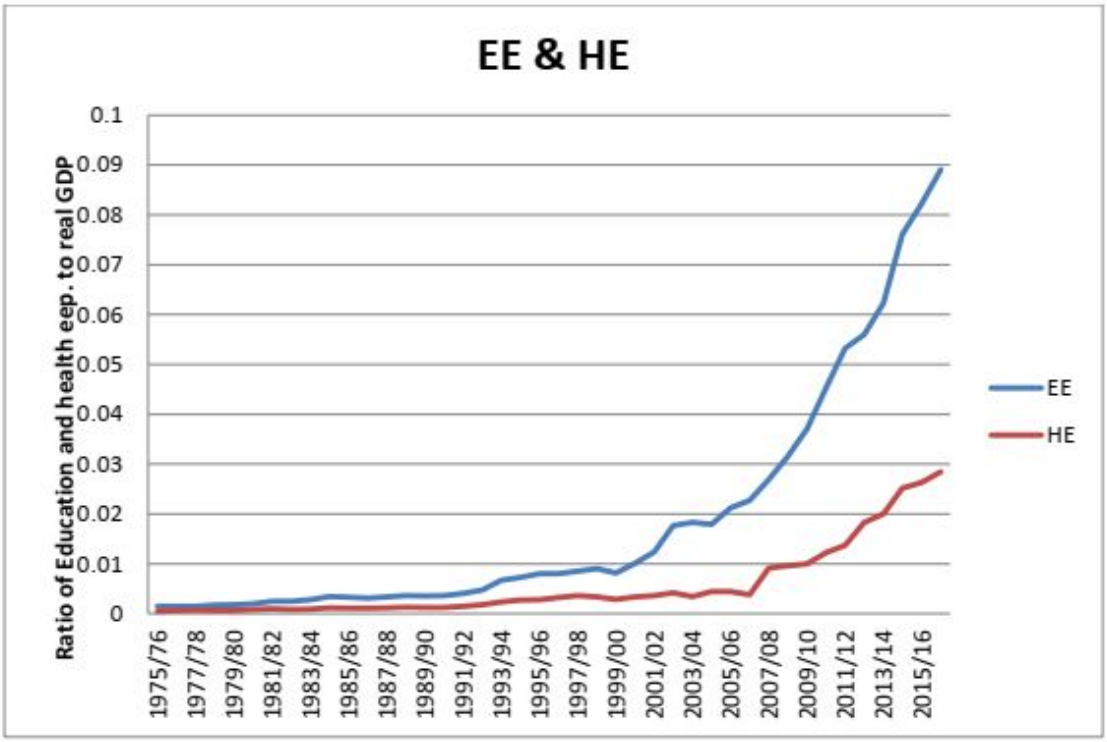
Figure 4: The Trend of Labour Force Growth Rate

4.1.4. The Trend of Education and Health Expenditure (1975/76-2016/2017)

As shown below in Figure 5, the share of total expenditure on education to GDP slightly increase from average of 0.164 percent in years 1975/76-1980/81 to average of 0.289 in years 1981/82-1985/86. During 1986/87-1990/91, the share has also increased to an average value of 0.344 percent. However, there were forward and backward movements in the yearly values of the educational indicator. After 1990/91, total expenditure on education as a percentage of GDP has continued to increase. As it is depicted in Figure 4, between the year 1991/92 and 1997and 98, the average share of total expenditure on education to GDP was 0.68 percent. Then, it has increased from an average of 1.64 percent in years 1998/99-2007/08 to an average of 5.9 percent in year 2008/09-2016/17

On the other hand, the average value of expenditure on health as a percentage of GDP was 0.011 percent between 1975/76-1982/83. In the next eight years (1983/84-1990/91), it has increased and recorded an average value of 0.11 percent. Between 1991/92-2000/01, health expenditure as a percentage of GDP has showed almost a constant trend, recording an average value of 0.28 percent. At the same time, it has shown an average value of 0.39 percent between 2001/02-2006/07 and 1.73 percent between 2007/08-2016/17. The figure also shows that the overall average share of education and health expenditure to real GDP over the period under

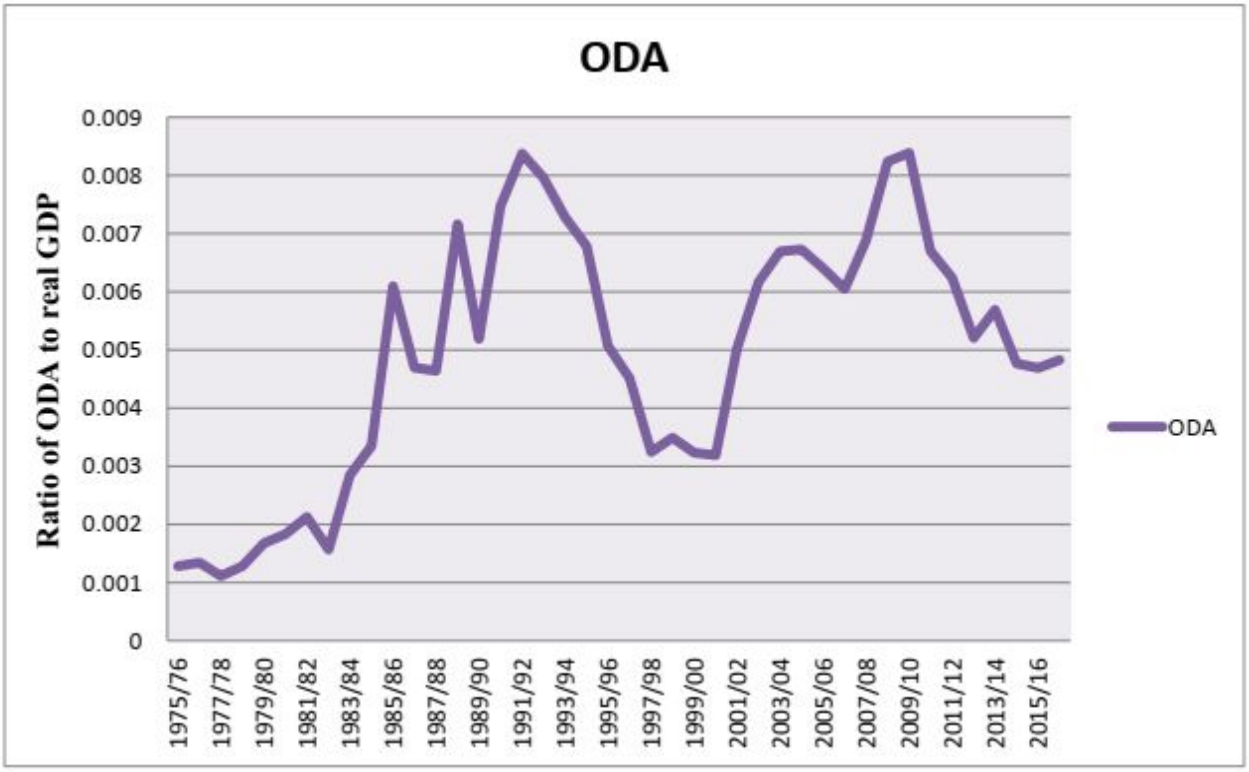
consideration are 1.87 percent and 0.57 respectively.



Source: own computation, 2021
Figure 5: The Trend of Education and Health Expenditure

4.1.5. The Trend of Official Development Assistance (1975/76 - 2016/17)

Ethiopia is among the main aid recipient countries in Africa. The trend of the official development shows 0.49 percent average share of ODA to real GDP over the period 1975/76-2016/17. As shown in Figure 6, the share of ODA to real GDP was about 0.13 percent in 1975/76 and 1976/78. It has declined to about 0.11 percent in 1977/78. The figure shows that the share of ODA to real GDP has shown a sharp increase from 1982/83 to 1985/86. After showing a series of fluctuation, it has shown a highly significant change in 1990/91 by a scoring a 0.84 percent share of real GDP. It has further experienced a swinging pattern and has reached the maximum for the period under consideration in 2009/10 which is about 0.85. From this time onwards, the trend has shown a declining pattern with the ups and down in the meantime.



Source: own computation, 2021

Figure 6: The Trend of Official Development Assistance

4.1.6. The Trend of Average Inflation (1975/76 - 2016/17)

Based on the data from figure 7, average inflation has a swinging (up and down) pattern over the period under this study. The maximum rate was recorded in 2009/10 which has the value of 36.4% and the lowest in 2002/03 which has the value of -10.6 percent. The average for the year under consideration is about 9.56 percent, which is a moderate rate of average inflation.

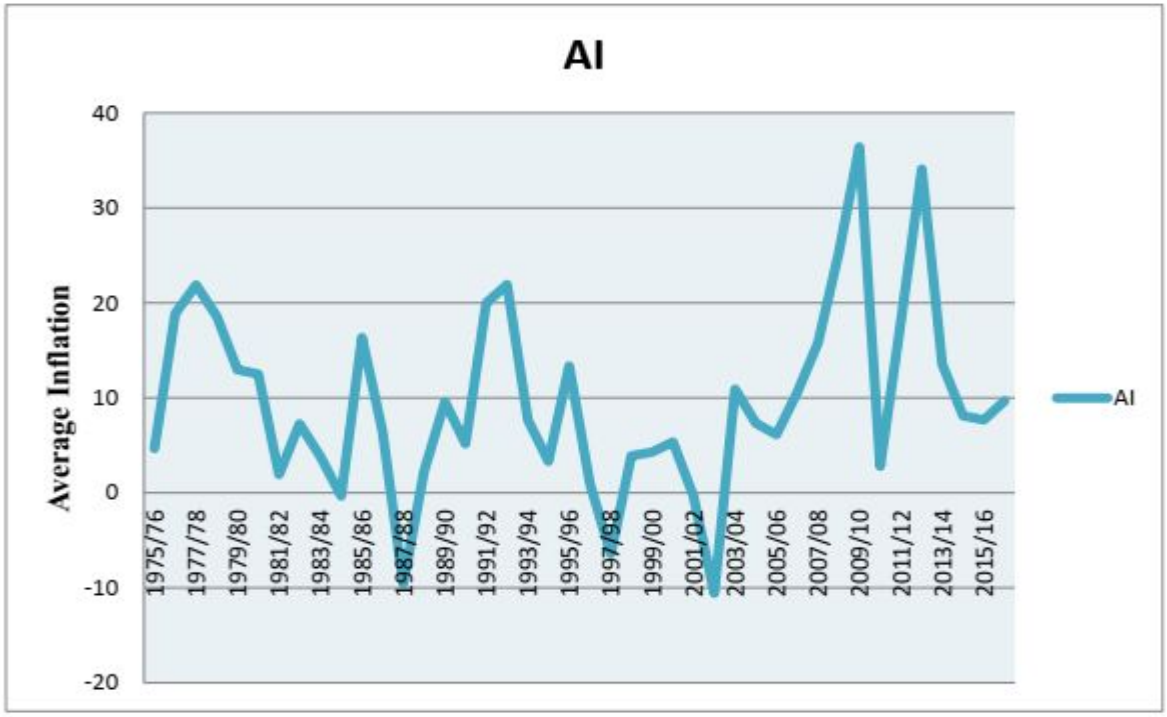
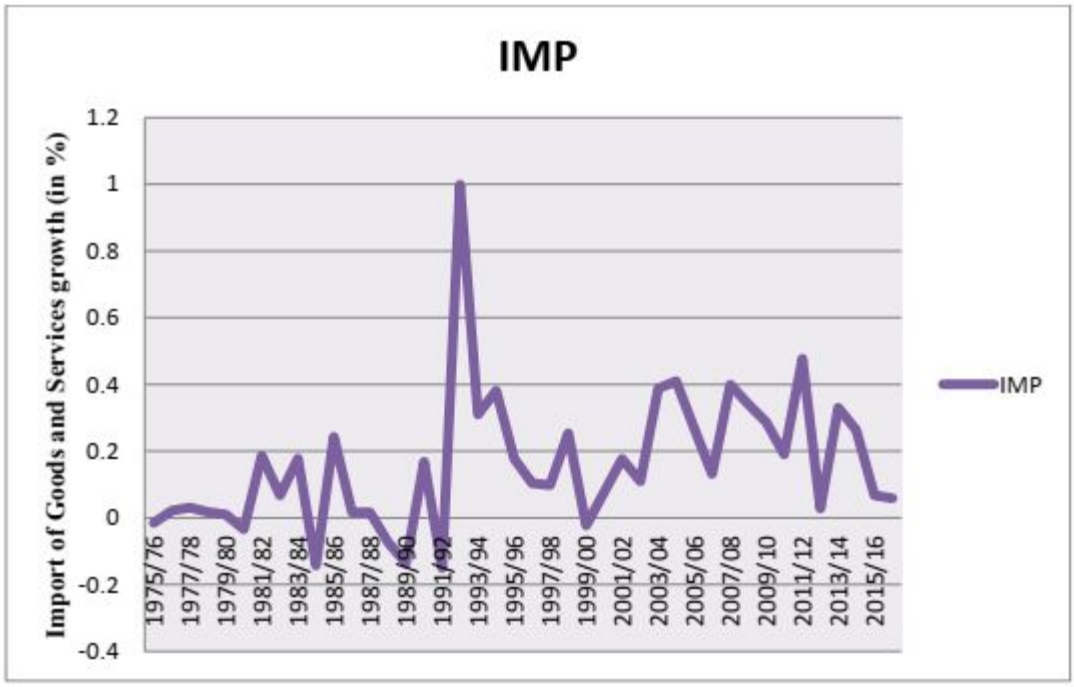


Figure 7: Trend of Average Inflation
Source: my own computation, 2021

4.1.7. The Trend of Import of Goods and Services Growth (1975/76 - 2016/17)

Import of goods and services is used in the form of growth rate in this study. As it can be observed from figure 8 below, the trend of the import of goods and services has shown a highly fluctuating pattern in the period under consideration. It has reached a minimum of negative growth of 15 percent in 1991/92 which means that the import of goods and services has shown a 15 decrease from the previous year performance. The maximum growth of import is also scored in 1992/93 which was about 99%. This shows the growth of goods and services is double of its value in the last year.



Source: my own computation, 2021.

Figure 8: Trend of Import of Goods and Services

4.2. Econometric Analysis

4.2.1. Augmented Dickey-Fuller Unit Root Test

It is important to undertake the unit root test to check the degree of stationarity. Accordingly, a unit root test is undertaken through an Augmented Dickey Fuller unit root test. The test is undertaken with two specifications. The first specification is tested, with constant but no trend, while the second specification is tested with both constant and trend.

Table 2: Augmented Dickey Fuller Test Results

Variables (At level and first difference)	t-statistic and corresponding probability (with constant but no trend)	t-statistic and corresponding probability (with Constant and trend)
LNRGDPPCG	-5.122500(0.0001)***	-5.648022(0.0002)***
LNEHC	-0.865577(0.7888)	-2.434597(0.3573)
D(LNEHC)	-8.535183(0.0000)***	-8.451857(0.0000)***
LNODA	-1.498571(0.5243)	-1.831490(0.6710)
D(LNODA)	-6.129583(0.0000)***	-6.180983(0.0000)***
LNIMP	-2.788957(0.0689)*	-6.657116(0.0000)***
LNLF	-5.807620(0.0000)***	-5.760993(0.0001)***
LNHHC	0.724207(0.0013)	-2.158080(0.4996)
D(LNHHC)	-7.662691(0.0000)***	-7.752864(0.0000)***
LNGCF	-1.244474(0.6459)	-3.112406(0.1177)
D(LNGCF)	-9.509358(0.0000)***	-9.446974(0.0000)***
LNAI	-5.179362(0.0001)***	-5.123967(0.0008)***

Source: Own Calculation Using Eviews10 package.

Note: The rejection of the null hypothesis is based on MacKinnon (1996) one sided p-values. AIC is used to determine the lag length while testing the stationarity of all variables. The ***, ** and * sign indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significant level respectively.

The results from ADF test show that four of the variables (RGDPPCG, LF, IMP and AI) are stationary in their levels (for both types of specifications) while the null of non-stationary is not rejected for four of variables (EHC, HHC, ODA, and GCF). And these four variables are stationary at their first differences. In other words, the result indicates that four of the variables are I (1) while four of them are I (0) with both specifications. Such mix of stationarity result would not allow us to use Johansson technique of co-integration, and impliedly it is the main justification for using the ARDL bound test approach of co-integration developed by Pesaran, Shin and Smith (2001).

4.2.2. Long run ARDL Bound Test for Co-integration

The first task in the bound test approach of co-integration is estimating the ARDL model specified in equation (16) using the appropriate lag-length selection criterion. In this paper Akakie Information Criterion (AIC) is used as a guide and a maximum lag order of 2 was chosen for the conditional ARDL model as it is shown in the table 3 below.

Table 3: The Lag Length Selection Criteria

LAG	DF	P	AIC	HQIC	SBIC
0			-3.40136	-3.27923	-3.6358
1	64	0.000	-7.44973	-6.35057*	-4.40975*
2	64	0.000	-7.52576*	-5.44954	-1.78357

Source: my own calculation using eviews10 statistical package

Note: * shows the selected maximum lag length selected

Then an F-test through the Wald-test (bound test) is performed to check the joint significance of the coefficients specified in equation (16). The Wald test is conducted by imposing restrictions on the estimated long-run coefficients of real GDP per capital growth, labor force growth, gross capital formation, education human capital, health human capital, and official development assistance, import of goods and services and average inflation. The computed F-statistic value is compared with the lower bound and upper bound critical values of the bound test statistics.

Table 4: Bound Test Critical Values

LAG	DF	P	AIC	HQIC	SBIC
0			-3.40136	-3.27923	-3.6358
1	64	0.000	-7.44973	-6.35057*	-4.40975*
2	64	0.000	-7.52576*	-5.44954	-1.78357

Source: Pesaran, Shin, and Smith (2001).

As shown in Table 5 below, with an intercept and trend, the calculated F statistics 5.466386 is higher than the Pesaran et. al (2001) both at 1% and 5%level of significance. This implies that the null hypothesis of $\beta1= \beta2= \beta3= \beta4= \beta5= \beta6= \beta7= \beta8=0$ (no long-run relationship) against its alternative $\beta1\neq \beta2\neq \beta3\neq \beta4\neq \beta5\neq \beta6\neq\beta7\neq \beta8\neq0$ (there is long-run relationship) is rejected based on the Pesaran, Shin, and Smith (2001) critical values at both 1% and 5% level of significance.

Table 5: Bounds Test for Co-Integration Analysis

Description	Values
Number of observations	40
Optimal lag length of the model	2
Calculated F-statistic	5.466386

Source: My own calculation using Eviewsversion10 statistical package

4.2.3. Long Run Model Estimation

This result indicates the existence of a long-run relationship between real GDP per capita growth, labor force, gross capital formation, education human capital, health human capital, official development assistance, import of goods and services, and average inflation. After confirming the existence of long-run co-integration among the variables, the estimated long-run relationships between the variables are estimated and reported in Table 6 below.

Table 6: Estimated long run coefficients using the Autoregressive Distributed Lag Approach: ARDL (1, 1, 2, 2, 1, 0, 0, 2) selected based on Akakie Information Criterion.

Dependent variable is lnGDPPCG				
Regressors	**Coefficients**	**S.E**	**T-Ratio**	**Prob.**
lnEHC	0.560294	0.256168	2.187217	0.0402**
lnODA	-0.604304	0.196557	-3.074441	0.0058***
lnIMP	0.670729	0.323291	2.074694	0.7890
lnLF	-0.684191	0.205145	-3.335162	0.0031***
lnHHC	0.026425	0.097507	0.271009	0.0505**
lnGCF	0.669824	0.206415	3.245040	0.0039***
lnAI	0.007825	0.058705	0.133288	0.8952
Policy Change	0.733022	0.274833	2.667154	0.0144***
Constant	-7.547927	3.289894	-2.294277	0.0322**
Trend	-0.062217	0.025996	-2.393325	0.0261**

Source: My own calculation using Eviews10 statistical package

Note: The *** and ** sign indicate the significance of the coefficients at 1% and 5% significant level respectively.

As it is shown in Table 6 above, the estimated coefficients of education human capital, imports of goods and services, average inflation, health human capital, gross capital formation, and policy change dummy have positive signs while labor force and official development assistance have negative signs. The estimated coefficients of the ratio of public education expenditure to real GDP, labor force, official development assistance, the ratio of public health expenditure to real GDP, gross capital formation and policy change dummy are statistically significant while imports of goods and services and average inflation are not statistically significant.

Since growth model are specified in a log-linear form, the coefficient of the dependent variable can be interpreted as elasticity with respect to real GDP per capita growth. The

coefficient of education is 0.56. This indicates that, in the long run, holding other things constant, a 1% increase in the public education expenditure brings about 0.56% increase in real GDP per capital growth, and it is significant at 5% level of significance. The estimation output also shows that public health expenditure has significant long run effect on the Ethiopian economy. A 1% increase in the public health expenditure has resulted in 0.026% increase in real GDP per capita growth, and it is significant at 1% level of significance. As it can be seen from the result, real GDP per capita growth is more elastic to the change in the public expenditure in education than a public expenditure in the health sector. This implies that education is more important than health to enhance the growth in the real GDP per capita in Ethiopia. The findings of this research concerning the long run positive effect of the education and health human capital are consistent with the endogenous growth theories (mainly advocated and/or developed by Lucas (1988), Romer (1990), Mankiw, Romer and Weil (1992)) which argue that improvement in human capital (skilled and healthy workers) leads to productivity improvement that enhances output. With respect to the studies in Ethiopia, the finding of this research is also similar to Ketema (2006) and Gebru (2012) and Gidey (2015).

As depicted in the table 6 above, Gross capital formation and policy change also have positive significant effect on the real GDP per capital growth. The result shows that a 1% increase in the gross capital formation causes about a 0.66% increase in the real GDP per capita growth, and it is significant at 1% level of significance. The effect of gross capital formation is consistent with growth theories. It is also consistent with the works of Barro and Sala-I-Martin (2004), Wilfred and Adeleke (2013), Ali (2015), and Bojoro and Yushi (2015). The Policy change effect is also consistent with the empirical finding of Gidey (2015).

The study has also found that imports of goods and services and average inflation have positive effect on economic growth even though the effects are statistically insignificant. The direction of the effect for imports of goods and service is in line with study conducted by Kogid et al., (2011) and Tareke (2017). And that of average inflation is also in line with the notion that moderate inflation has positive impact on economic growth (kasidi and Mwakanemela, 2013 and Getachew, 2014). Insignificance of the result concerning average inflation and import of goods and services may result from the data problem and, I personally think, we cannot exactly know the reason

behind in this particular research and further study on this issue is needed.

On the other hand, labor force and official development assistance have a significant negative effect on the real GDP per capita growth. A 1% increase in the labor force causes a 0.68% decrease in the real GDP per capita growth, and it is significant at 1% percent level of significance. At the same time, a 1% increase in the official development assistance causes a 0.6% decrease in the real GDP per capita growth, and it is significant at 1% percent level of significance. The significant negative effect of labor force on real GDP per capita growth may be due to the combined effect of high population growth and low productivity of the labor force (bloom et al., 2007). The finding of this research in relation to ODA is consistent with the findings of Rajan and Subramanian, (2005) and Tassew (2011).

4.2.4. Short Run Dynamic Model

After the acceptance of long-run coefficients of the growth equation, the short-run ECM model is estimated. The equilibrium error correction coefficient, estimated -0.294 is highly significant, has the correct sign, and imply a high speed of adjustment to equilibrium after a short run disequilibrium. Approximately 29.4 percent of the disequilibrium from the previous year's shock converges back to the long-run equilibrium in the current year. Such highly significant Error correction term is another proof for the existence of a stable long run relationship among the variables.

Table 7: Error Correction Representation for the Selected Autoregressive Distributed Lag Model: ARDL (1, 1, 2, 2, 1, 0, 0, 2)) selected based on Akakie Information Criterion.

Dependent variable is ΔLnGDPPCG				
Regressor	**Coefficient**	**S.E.**	**T-Ratio**	**Prob.**
Δ (LnEHC)	0.377006	0.256838	1.467875	0.1570
Δ (LnODA)	-0.202984	0.084992	-2.388277	0.0264**
Δ (LnODA(-1))	0.428578	0.158085	2.711066	0.0131**
Δ (LnIMP)	0.031828	0.234570	0.135686	0.8934
Δ (LnIMP(-1))	-0.366832	0.162065	-2.263486	0.0343**
Δ (LnLF)	-0.656492	0.241372	-2.719827	0.0128**
Δ (LnHHC)	0.034194	0.125068	0.273400	0.7872
Δ (LnGCF)	0.454696	0.140145	3.244568	0.0039***
Δ (LnAI)	0.146186	0.047511	3.076882	0.0057***
Δ (LnAI(-1))	0.088040	0.051159	1.720891	0.1000
Policy change	0.948514	0.390484	2.429076	0. 2420
TREND	-0.080507	0.037591	-2.141644	0.0441**
ECM(-1)	-0.293979	0.180227	-7.179732	0.0000***
ECM = LNRGDPPCG- (0.5603*LNEHC -0.6043*LNODA+ 0.6707*LNIMP -0.6842*LNLF+ 0.0264*LNHHC+ 0.6698*LNGCF+ 0.0078*LNAI +0.7330*D01 -7.5479 -0.0622*TREND)				

R-squared	0.829629	Mean dependent var.	-1.162477
Adjusted R-squared	0.683596	S.D. dependent var.	0.345166
S.E. of regression	0.194155	Akaike info criterion	-0.134673
Sum squared resid.	0.791622	Schwarz criterion	0.667544
Log likelihood	21.69347	Hannan-Quinn criterion	0.155383
F-statistic	5.681120(0.000128)	Durbin-Watson stat	1.759476

Source: My own calculation using Eviewversion10 statistical packages.

Note: The ***and ** sign indicate the significance of the coefficients at 1% and 5% significant level respectively.

The estimated short-run model reveals that health and education have no significant effect on the real GDP per capita growth in the short run. This may be for the reason that the data sample is small. The other possible reason may be the reason that investments in human capital may not bear fruit that may significantly affect economic growth in the short run.

The result in the table 7 also shows gross capital formation is the main contributor to real GDP per capita growth in the short run, followed by average inflation. It depicts 0.45% in the real GDP per capita growth when gross capital formation increases by 1%, and it is statistically significant at 1% level of significance. Contrary to its long run insignificant effect, average inflation significantly contributes to real GDP per capita growth in the short run and statistically significant at 1% level of significance. A 1% increases in the average inflation (one period lagged value) causes the real GDP per capita growth to increase by 0.14% while its lagged value has insignificant positive effect.

On the other hand, labor force and official development assistance have negative significant effect on the real GDP per capita growth. A 1% increase in the labor force and official development assistance causes the real GDP per capital growth to decrease by 0.65% and 0.20% respectively. Import of goods and services also has positive insignificant effect like its long run effect even though its lagged value has negative significant effect.

4.2.5. Model Diagnostic Tests

To check the verifiably of the estimated long run and short run model, some diagnostic test is undertaken. The results reported in Table 8 indicate that there is no error autocorrelation and heteroscedasticity in the estimated model. The errors are also normally distributed. In addition, the Ramsey functional form test confirms that the model is specified well. Hence, the relationship between the variables is verifiable or valid.

Table 8: Model Diagnostics Tests

Test Statistics	LM Version	F Version
Serial Correlation Test	CHSQ(2) = 1.168659(0.5575)**	F(2,19)= 0.285910(0.7545)**
Normality Test	CHSQ(2) = 1.458933(0.482648)**	Not applicable
Hetroskedasticity test	CHSQ(1) = 22.31808(0.2182)**	F(1,38)= 1.472564(0.1964)**
Functional Form test	CHSQ(2) = 0.572623(0.286311)**	F(2,8) = 0.645345(0.4425)**

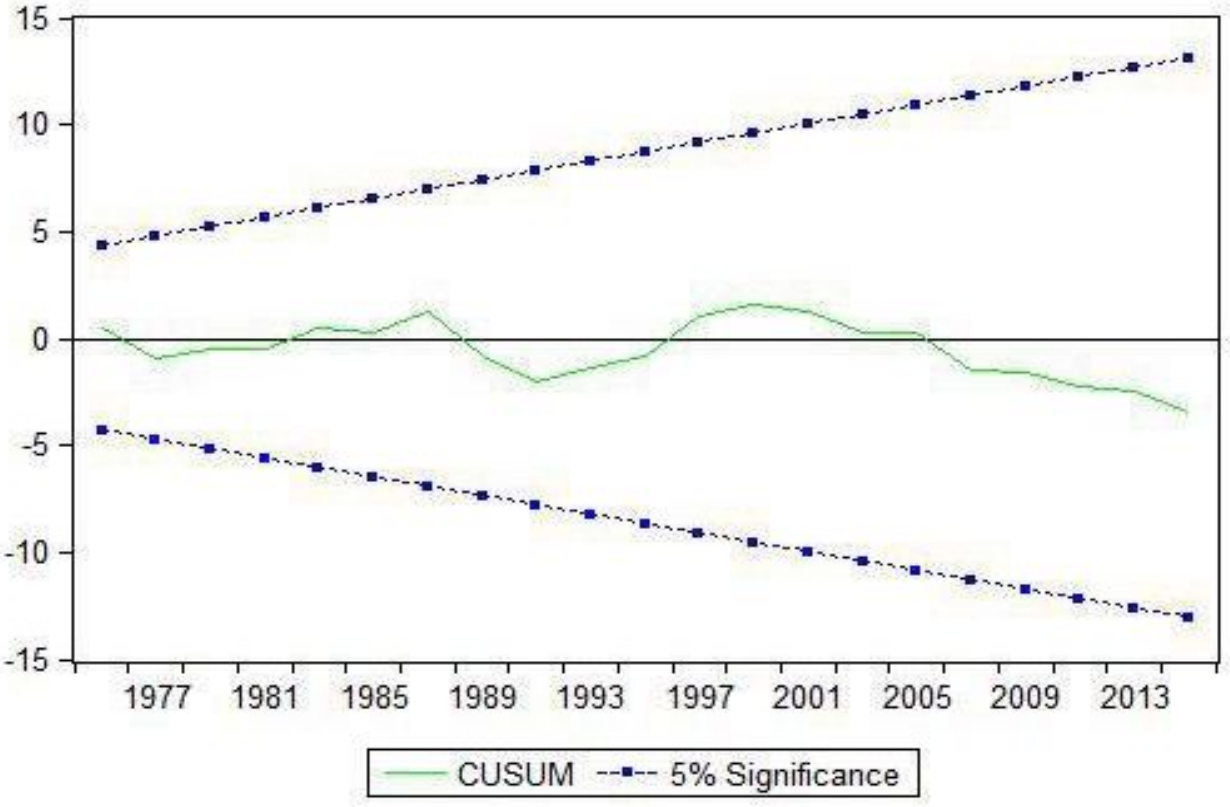
Source: My own calculation using Eviewversionversion10 statistical package

Note: The sign ** indicates the significance of the coefficients at 5% level of significance. The test for serial correlation is the LM test for autocorrelation, the test for functional form is Ramsey 's RESET test, the test for normality is based on a test of

skewness and kurtosis of residuals, the test for heteroscedasticity is based on the regression of squared residuals on original regressors.

In addition to the above diagnostic tests, the stability of long run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. These tests are recommended by Pescara and Shin (1999, 2001). For the reason that statistics these tests can be graphed, we can identify not only their significance but also the point at which instability (structural break) occurred. If the plot of CUSUM and CUSUMSQ statistic moves between the critical bounds (at 5% significance level), then the estimated coefficients are said to be stable.

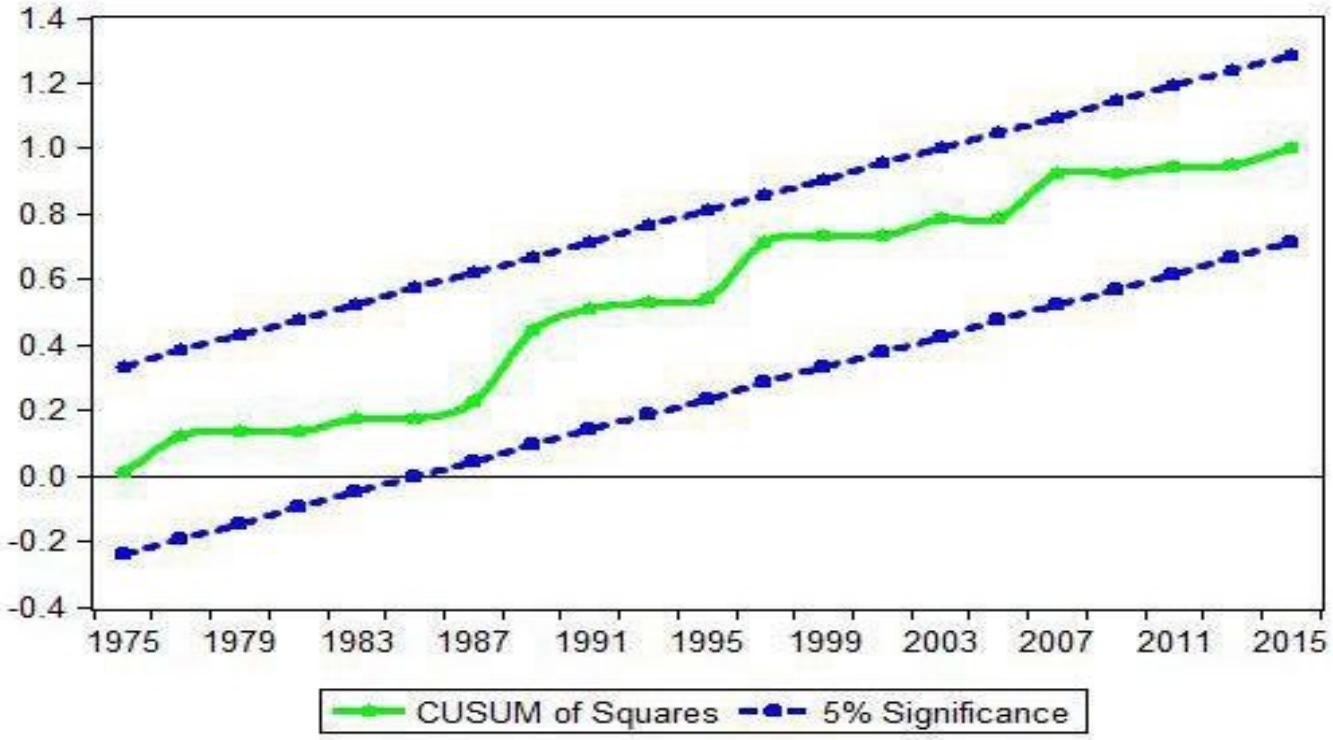
Figure 9: Plot of cumulative sum of recursive residuals



Source: My own Calculations.

Note: The straight lines represent critical bounds at 5% significance level

Figure 10: Plot of cumulative sum of recursive residuals square



Source: Own Calculations.

Note: The straight lines represent critical bounds at 5% significance level

4.2.6. The Pair wise Granger Causality Results

A granger causality test is made to identify the direction of causality between the dependent variable, education and health. The result is reported in Table 9 below. The result revealed that, at a lag length of one, there is significant causality between real GDP per capita, education human capital (proxied by the ratio of public education expenditure to real GDP) and health human capital (proxied by the ratio of public health expenditure to real GDP)

Table 9: Pair wise granger causality test

NULL HYPHOTHESIS	Lag length 1		Lag length 2	
	F-Stat	Prob.	F-Stat	Prob.
EHC does not Granger Cause RGDPPCG	4.16580	0.0482**	1.59259	0.2178
RGDPPCG does not Granger Cause EHC	1.41145	0.2422	1.93111	0.1601
HHC does not Granger Cause RGDPPCG	2.97217	0.0928*	2.00673	0.1496
RGDPPCG does not Granger Cause HHC	0.94977	0.3359	0.35211	0.7057

Source: My own calculation using Eviews10 statistical package

Note: The signs ** and * indicate the significance of the coefficients at 5% and 10% level of significance respectively.

There is a unidirectional causal relationship from both education and health to real GDP per capita growth. This shows that economic growth is the result of both education and health human capital accumulation but not vice versa. On the other hand, the granger causality test shows no significant relationship between real GDP per capita growth and human capital accumulation at lag 2.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Summary and Conclusion

The very core of the study was to analyze the effect of human capital accumulation on economic growth in Ethiopia (1975/76 – 2016/17). To put in another word, the study was aimed at analyzing the effect of public education and health expenditure on real GDP per capita growth both in the long run and in the short run. The study was also intended to investigate the co-integration relationship between human capital accumulation and economic growth. At the same time, the study is aimed at analyzing the causal relationship between human capital accumulation and economic growth. Accordingly, ARDL model of co-integration is applied to meet the objective of the research.

The main finding of this paper shows that public education expenditure and public health expenditure contributes to real GDP per capita rise in the long run. In other words, the result discloses that economic performance can be enriched significantly when the ratio of public education expenditure to real GDP and the ratio of public health expenditure to real GDP increase. Holding other things constant, a one percent change in public education expenditure brings about 0.560 percent change in real GDP per capita growth. Health expenditure also has significant long run effect on the Ethiopian economy. A one percent change in public health expenditure has resulted in 0.026 percent change in real GDP per capita growth. The finding also shows that real GDP per capita growth was 27% more sensitive to the change in the public education expenditure than change in the public health expenditure. This shows that real GDP per capita growth is more elastic to the change in public education expenditure.

The findings of this research concerning the long run positive impact of the education and health human capital are consistent with the endogenous growth theories (mainly advocated and/or developed by Lucas (1988), Romer (1990), Mankiw, Romer and Weil (1992) which argue that improvement in human capital (skilled and healthy workers) leads to productivity improvement and thereby output growth. With respect to the researches made in Ethiopia, the finding of this research is also similar to Ketema (2006) and Gebru (2012) and Gidey (2013) with its last result.

In the short run, the coefficient of error correction term is -0.293979 suggesting about 29.40 percent annual adjustment towards long run equilibrium. This is another proof for the existence of a stable long run relationship among the variables. At the same time, estimated short-run model reveals that gross capital formation (one period lagged value) and average inflation (one period lagged value) contributes to the real GDP per capital growth. On the other hand, education and health has no significant short run effect on the economy. This could be due the small data sample size employed in this research. The other possible reason may be the reason that investments in human capital may not bear fruit that may significantly affect economic growth in the short run.

A causality test also indicates that, there is a unidirectional causal relationship from both education and health to real GDP at lags one. Contrary to this, there is no any significant causality between real GDP, education human capital and health human capital with lag length of two and this is consistent with the work of Gidey (2015).

5.2.Recommendation (policy implication)

The results of this study have important policy implications. In order to achieve economic growth, more resources would be devoted to educate the citizens of the country and to improve the health of the people. Such measures have a large effect on human productivity, which leads to improved national output per capita. In other words, as more people become educated and healthy, they will increase their productivity in the long run. Hence, the government have a duty to channel its expenditure to create institutional capacity to improve education and health services delivery in the country.

The measures should not only focus on creating new capacity but also strengthening the existing ones by creating the acting ability. The quality of education and health has to also be given a greater emphasis if the country is to get more benefits from the investment in these sectors. In addition, the government want to work by creating better environment for the private sector to invest in education and health. Because, participation of the private sector in the education and health sectors can help by creating another potential investor apart from government itself and hence speeding up human capital accumulation.

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Appendix

Appendix A: Bound Test Result

ARDL Bounds Test

Sample: 42

Included observations: 40

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	5.466386	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.38	3.45
5%	2.69	3.83
2.5%	2.98	4.16
1%	3.31	4.63

Appendix B: estimated model for Wald test (bound test)

Test Equation:

Dependent Variable: D (LNRGDPPCG)

Method: Least Squares

Sample: 42

Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEHC)	0.316030	0.304643	1.037378	0.3114
D(lnODA)	-3.492029	1.051567	-3.320786	0.0032
D (lnODA (-1))	2.550528	1.083820	2.353277	0.0284
D(lnIMP)	0.421130	0.241491	1.743872	0.0958
D (lnIMP (-1))	-0.464417	0.189870	-2.445974	0.0233
D(LNLF)	-1.994137	1.187512	-1.679256	0.1079
D(LNAI)	0.106985	0.056281	1.900919	0.0711
D(lnAI(-1))	0.041517	0.061553	0.674490	0.5074
D01	0.514808	0.414333	1.242498	0.2277
C	-8.531129	5.474316	-1.558392	0.1341
@TREND	-0.037231	0.039355	-0.946013	0.3549
lnEHC(-1)	0.563160	0.418080	1.347017	0.1923
lnODA(-1)	-2.603540	0.891505	-2.920389	0.0082
lnIMP(-1)	1.304721	0.469296	2.780170	0.0112
lnLF(-1)	-4.647737	1.713529	-2.712377	0.0130
lnHHC(-1)	0.024726	0.143932	0.171788	0.8652
lnGCF(-1)	1.207651	1.455893	0.829491	0.4162
lnAI(-1)	0.017413	0.103023	0.169021	0.8674
lnRGDPPCG(-1)	-1.227195	0.215314	-5.699549	0.0000

R-squared	0.845502	Mean dependent var	0.003727
Adjusted R-squared	0.713075	S.D. dependent var	0.438097
S.E. of regression	0.234668	Akakie info criterion	0.244355
Sum squared reside	1.156453	Schwarz criterions	1.046573
Log likelihood	14.11289	Hannan-Quinn criter.	0.534412
F-statistic	6.384660	Durbin-Watson stat	1.965895
Prob (F-statistic)	0.000052		

Appendix C: Graph of Normality Test