SCHOOL OF GRADUATE STUDIES

THE EFFECT OF HUMAN CAPITAL DEVELOPMENT ON ECONOMIC GROWTH: AN EMPIRICAL ANALYSIS IN ETHIOPIA.

A THESIS SUMITTED to St. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES in PARIAL FULEILLMENT of the REQUIREMENTS for THE DEGREE of MASTERS of ART in DEVELOPMENT ECONOMICS

BY

BILISUMA TESEM

JUNE 2022

ADDIS ABABA, ETHIOPIA

SAINTMARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES

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DECLARATION

I Bilisuma, hereby declare that this thesis work entitled the effect of human capital Development on Economic Growth: An Empirical Analysis in Ethiopia submitted by me for the award of the degree of Masters of Art in development Economics Ethiopia is my original work and all sources and materials used for this thesis been duly acknowledged. I have submitted this thesis to Saint Mary's University as of Ma 2022 and I agree to admit any responsibility for the scientific and ethical mischief pertaining to this research work as per terms and conditions of Saint Mary University.

Declared by: Bilisuma Tesema

Signature: _____

Date: _____,

Place and Date of Submission

ENDORSEMENT

This thesis has submitted to St. Mary's University, School of Graduate Studies, Institute of Agriculture and Development Studies for examination with my approval as a university advisor.

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Wondimagegne Chekol (PhD) Date

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As members of board of examining of the final MA thesis open defense, we certify that we have read and evaluated the thesis prepared by Bilisuma Tesema under the title **"The effect of human capital Development on Economic Growth: An Empirical Analysis in Ethiopia".** We approved that this thesis meets the accepted standards with respect to originality and quality we recommend that to accepted as fulfilling the thesis requirement for the Degree of Masters of Art in Development Economics

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External Examiner	**Signature**	**Date**

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ACRONYMS & ABBREVATIONS

ADF: Augmented Dickey Fuller

AIC: Akaike Information Criterion

AR: Autoregressive

ARDL: Autoregressive Distributed Lagged Model

DF: Dickey Fuller

ECT: Error Correction Term

EPRDF: Ethiopian People's Revolutionary Democratic Front

PP: Prosperity Party

FDRE: Federal Democratic Republic of Ethiopia

GCF: Gross Capital Formation

GDP: Gross Domestic Product

HSDP: Health Sector Development Program

MOE: Ministry of Education

MOF: Ministry of Finance

MOH: Ministry of Health

NBE: National Bank of Ethiopia

ODA: Official Development Assistance

OECD: Organization for Economic Cooperation and Development

TGE: Transitional Government of Ethiopia

TVET: Technical and Vocational Education Training

UNDP: United Nations Development Program

VECM: Vector Error Correction Model

WDI: World Development Indicator

WHO: World Health Organization

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ABSTRACT

The general objective of the study was to assess the effect of human capital development on economic growth in Ethiopia. The ARDL Approach to Co-integration and Error Correction Model has applied in order to investigate the long run and short run effect of Human capital accumulation on Economic growth. The stationary test under taken. The result of the stationary test shows that real GDPPC growth, import of pharmaceuticals and medical equipment, labor force and Educational enrolment are stationary at level while education human capital, official development assistance, health human capital and gross capital formation are stationary at their first difference. The finding of the Bounds test shows that there is a stable long run relationship between real GDP per capita growth, education expenditure, health expenditure, labor force, gross capital formation, pharmaceuticals and medical equipment, Educational enrolment and official development assistance. The estimated long run model revels that human capital in the form of education (proxed by the ratio of public expenditure on education to real GDP) is the main contributor to real GDP per capita growth followed by health human capital (proxed by the ratio of public expenditure on health to real GDP). 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. However, 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 improved significantly when the ratio of public expenditure both on health and on education to GDP increases. Hence, the government should 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

Being a country with a large reserve of human and natural resources Ethiopia should not have been with high level of poverty, unimproved infrastructure services, unqualified education and health status. 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 114.96 million and population growth rate of 2.5% in 2020 (world bank, 2020). The United Nations estimate of the population shows that the population has further grown to about 102.4 million in 2016 with growth rate of 2.53% and 114.96 million with growth rate of 4.3% in 2022 (world meters, 2022).

Human capital defined as all the attributes of workforce that potentially increase their productivity in all or some productive tasks (Acemoglu, 2009). It encompasses the notion that there are investments in people (e.g. education, training, health) and that these investments increase an individual‘s productivity (Goldin, 2014). In the recent time, growth literature has given more emphasis to the consequence of human capital in economic growth and development. Generally, development theorists' especially neoclassical and endogenous growth theories argue that human capital has substantial effect on economic growth and development. As an example, Lucas (1998), Romer (1990), Romer, Mankiw and Weil (1992) argues that human capital is very important in increasing the productivity of labor by increasing the efficiency of the workers and physical capital. Similarly, Erosa, Koreshkova and Restuccia (2009) argues that human capital development is essential in explaining variety in the output per worker through amplifying TFP differences across countries.

The modern theory of economic growth argues that human capital; especially education and health have the principal role on achieving economic growth and development (Gyimah Brempong and Wilson, 2005). However, empirical findings are mixed. Some empirical findings have found negative while the others have found the positive relationship between human capital and economic growth. It may be either because the proxies that have used do

not capture key elements of human capital, or because the data on the proxies are incorrect. This means that major reason for the mixed evidence may be that human capital has been poorly measured (Le et al, 2005).

As the objective of teaching is student learning, assessing the impact of teachers' support on learning has considered a major indicator of teaching quality in higher education institutions. This impact has made evident in students' increased knowledge and skills because of their experiences. Though it seems to have been the case, whatever students learn could not always attributed to teachers' support. Instead, students' assessment of teachers' behavior is considered as evidence of the quality of the teaching (Zenawi, Z., Beishuizen, J., & Van Os, W. (2011)).

Current approaches for assessing the quality of teaching and learning focus solely depends on compliance and accountability, and use quantitative measures that serve as indicators of institutional effectiveness and efficiency. However, whether such approaches can linked to instructional activities or students learning in universities not clearly known (Tadesse et al, 2015). The most common themes of quality teaching and learning suggested by the different participants included the need for more teachers that are experienced, adequate textbooks and reference materials and better laboratory equipment and facilities (Ibid).

In primary school, gross enrolment rate is 98.2 per cent for boys and 92.4 per cent 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 increment in enrolment in primary education. It 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 is only roughly about half the rate of the general enrollment rate (Ibid).

Secondary school enrolment 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 school. 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, 237,877 students were studying in technical and vocational institutions (TVET) in2012/13. In the same year, 79,786 students 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 sevenfold between 2005/6 and 2013/14(UNDP, 2015).

In Ethiopia, different education and health policies designed to create skilled and competent citizens. In the country, Long-term trends indicate that encouraging progress in educational attainment has 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 15.1 percent per annum. Expansion of education has taken place at all levels with particular efforts towards universal primary education (UNDP, 2015).

As one part of its socioeconomic measures, FDRE government has also developed national health policy and comprehensive Health Sector Development 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 US$ 20.77 in 2010/11. However, 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

Recently Ethiopia's educational system is in deep crisis. Most of the literature highlighted the implication of the deterioration of the quality of education on the development of the country associated with the problems. Current education policy, organization, administration, provision, staff quality, system of enrollment, language policy, financing, learning cycle, system of educational evaluation, system of quality assurance, academic freedom, intellectual migration (brain drain) and political control of the education system.

Even though Ethiopia is committing much resource and efforts to the education and health sectors look forward to productivity improvement of the citizens and thereby economic growth. These resources are costs to the public not only for the reason that they are economic resources but also because they have alternative uses. Therefore, investigating the effect of human capital on economic growth is very important to policy makers and to the whole society.

The modern theory of economic growth argues that human capital; especially education and health have the principal role on achieving economic growth and development (Gyimah Brempong and Wilson, 2005). However, empirical findings are mixed. Some empirical findings have found negative while the others have found the positive relationship between human capital and economic growth. It may be either because the proxies that have used do not capture key elements of human capital, or because the data on the proxies are incorrect. This means that major reason for the mixed evidence may be that human capital has been poorly measured (Le et al, 2005).

A number of researchers have tried to examine the effect of human capital development on economic growth in Ethiopia. For example, Seid (2000) (cited in Gidey, 2015) found an insignificant effect of human capital on the level of output. Kifle (2006) has also found the same result. However, the measurement approach in their research has ignored health aspect of human capital, which could have affected the finding.

Contrary to the above researchers, Ketema (2006) has found a significant positive effect of human capital expenditure on economic growth in Ethiopia. Similarly, Gebru (2015) by using expenditure on health and education as proxies of human capital found that the variable has positive significant impact on economic growth. Nevertheless, the researchers have not

shown the impact of education and health separately. In view of the fact that both education and health are important elements of human capital, using both indicators is pretty better measure of human capital than using the either alone. In line with this gap, the researcher has used both education (the ratio of public education expenditure to real GDP) and health (the ratio of public health expenditure to real GDP) to empirically analyze the impact of human capital development on economic growth in Ethiopia.

1.3. Research Questions

- Is there a long run relation between human capital and Real GDP in Ethiopia?
- Does human capital development have significant effect on real GDP per capita growth in the long run in Ethiopia?
- Does human capital development have significant effect on economic growth in the short run in Ethiopia?
- Does education affect economic growth more than health in the long run?

1.4. Objective of the Study

General objective of the study is to assess the effect of human capital development on economic growth in Ethiopia. In line with this general objective, the research has addressed the following specific objectives:

- To investigate the co-integration between human capital development and economic growth in Ethiopia.
- To analyze the effect of human capital development on economic growth in the short run in Ethiopia.
- To analyze the effect of human capital development on economic growth in the long run 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 expected to be significant in respect of the following aspects: first, it provides information on the relationship between human capital development and economic growth for the researchers and any concerned body in the area of the study. It also serves as a

reference for further studies on the areas of human capital. At the same time, it also tries to generate empirical evidences for policy implications with regard to the effect of human capital development on economic growth.

Additionally, it deals with assessment of education human capital on economic growth in Ethiopia and expected to beneficial for different stakeholders, Such as for the researcher, government, policymakers, and other economic agents. The study will expected to improve the practical knowledge and skill of the researcher of this study by making familiar with factual evidence and general information of the relationship between education human capital and economic growth. It may also have some contribution to the formation appropriate policy option regarding the subject area of education human capital and economic growth in Ethiopia and serve as benchmark to conduct further research in this area.

1.6. Scope and limitation of the Study

1.6.1. The scope of the Study

The study has made use of annual data covering from 1980/81 to 2020/21.This particular study did not include comparative analysis with other countries. For the sake of empirically analyze the long run and short run effect of human capital development on economic growth (real GDP per capita growth), the ratio of public education expenditure to real GDP were 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).

1.6.2. Limitations of the study

Undertaking research on the assessment of the effect of human capital proxed by education expenditure on economic growth at international level is a complex task since it will require huge finance, time, and sufficient knowledge. These constraints may force the study to undertake a research at national level (in Ethiopia) and examine the relationship between education human capital and economic growth in Ethiopia. According to time frame, the study will delimited with only 40 years data from (1981 – 2021).

This particular research did not include the effect of private expenditures on education and health. For the reason that the government, government expenditure on education, provides most of the basic education and health service and health can explain the human capital created in education and health sector in Ethiopia.

This research only concern human capital proxies such as public expenditure on primary, secondary, and tertiary education, health that is one limitation, because human capital includes other dimensions like literacy rate. Availability of data and accuracy will usually a challenge for researchers in most developing countries like Ethiopia.

1.7. Organization of the Paper.

This study organized in to five chapters. The first chapter states the general introduction of the study. The remaining part of this thesis has four chapters. Chapter 2 contains both theoretical and empirical literatures on the areas of human capital. The methodology part of the study organized in chapter three and Chapter 4 contains result and discussion of the study while chapter five deals with conclusion and recommendation of the study.

CHAPTER TWO: 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). In addition, 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 postindustrial 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). This chapter will establish theoretical and empirical foundation for the study.

2.1. Theoretical Literature Review

2.1.1. Neoclassical growth theories

Schultz (1961) and Becker (1962) are among the first human capital theorists (Marimuthu et al., 2009). They have argued that education augments individual's skill and therefore his or her human capital. A higher skill level in the workforce increases the production capacity. On the other hand, Spence (1973) supposed education as a market signal for the potential productivity of workers. It also serves as a selection tool to pick potential workers that can trained for specific jobs more quickly and at a lower cost than their counterparts. Nevertheless, their argument was not practically incorporated into economic growth theories until the standard neoclassical growth model revised by Mankiw, Romer, and Weil in 1992. These researchers have used a Cobb Douglas production function to reconsider the Solow growth model. Generally, neoclassical growth theory argues that long-term economic growth determined solely by the development of factor inputs such as physical capital and labor. Studies reveal a significant contribution from technical progress, which defined as an exogenous factor. Solow (1956) and Cass (1965) are among those who first demonstrated this. They propose the convergence theory of which treats technology as the sole long run determinant of growth.

Lucas (1988) considers human capital as a separate input in the production function formed principally by workers through education or on-the-job training. In the Lucas (1988) model,

the rate at which human capital being developed was seen as the critical determinant of productivity growth. On the other hand, Romer (1990) treats human capital as a factor affecting innovation that have a positive impact on the long-run rate of productivity growth, instead of treating human capital as a direct input to the production of goods. That means, for Romer endogenous growth caused by developing technology while for Lucas it is the non-decreasing marginal returns of human capital creates endogenous growth. Generally, they conclude that having a large population is not sufficient to generate growth, rather stock of human capital and research and development are sources of economic growth. According to these models, the law of diminishing returns to scale may not be true since the returns on physical and human capital goods do not necessarily diminish through time. If the owner of the capital employs a skilled and healthy worker, the productivity of the capital and the technology will improve.

The main investments in education may include time and money spent in formal schooling, on the job-training and off-the-job training. These investments involve direct tuition fees, foregone earnings during schooling time, and reduced wages during training that incurred in order to gain a return on this investment in the future. (Becker 1993, cited in Gidey, 2015) argues that investments in human capital may include not only schooling but also expenditures on medical care, on job training 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 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).

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 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.

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

Income-based approach is another alternative, which values human capital stock using the earnings of the individual obtained from a labor market. Mulligan & Sala-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 recently employed to measure human capital in China, the United States, the United Kingdom, Australia, New Zealand, Sweden and Norway (Christian, 2011). Nevertheless, 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 where the 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). Moreover, the stock of health capital can 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 measure by resources devoted to the health system either by government or by the individuals (Ibid).

2.1.2. Growth Theories

There are different types of theories of economic growth such as Harrod-Domar, which is classical economic theory, Solow-Sowan it is neoclassical economic theories, and the new economic theory or endogenous growth theories, can influenced by economic factor. It starts from the observation that technological progress of Endogenous growth theory explains long-run growth as emanating from economic activities that create new

technological knowledge. It is long-run economic growth a rate determined by forces that are internal to the economic system, particularly those forces governing the opportunities and incentives to create technological knowledge. In the long run the rate of economic growth, as measured by the growth rate of output per person, depends on the growth rate of total factor productivity (TFP), which is determined in turn by the rate of technological progress. The neoclassical growth theory of Solow (1956) and Swan (1956) assumes the rate of technological progress to determine by a scientific process that is separate from, and independent of, economic forces. Neoclassical theory thus, implies that economists can take the long -run growth rate as given exogenously from outside the economic system.

Endogenous growth theory challenges this neoclassical view by proposing channels through which the rate of technological progress, and the long- run rate of economic growth takes place through innovation, in the form of new product, processes and markets, many of which are the result of economic activities. For example, because firms learn from experience how to produce more efficiently, a higher pace of economic activity can raise the pace of progress innovation by giving firms more production experience. In addition, because many innovations result from Research and Development expenditures undertaken by profit-seeking firms, economic policies with respect to trade, competition, education, taxes and intellectual property can influence the rate of innovation by affecting the private costs and benefits of doing Research and development (Howitt and Aghion, 1998).

2.2. Empirical Literature Review

Different scholars have tried to analyze 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) analyzed the importance of education and human capital development in the growth process, Barro (1991) 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.

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 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 could attributed to health. They have also found that 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. This implies that increased stocks of health human capital leads to higher steady state income.

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 sub dividing 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 significant.

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 accepted as an indicator of human capital and economic growth in Ethiopia. The study 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 confirmed through Johnson co-integration analysis whereas the long run and short-run dynamics observed by vector error corrector model (VECM) specification. For causality purpose Vector Error Correction Model (VECM), based causality tests employed. The finding has indicated that in the long run investment in education and health would affect further economic growth.

Bojoro and 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 stock in the study is proxed by primary, secondary and tertiary Educational enrolment. Human capital investment is proxed 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 enrolment have a positive statistically significant effect on economic growth in both long run and short run. However, tertiary school enrolment has an insignificant effect on economic growth both in the long run and short run.

2.3.1. Health and Education sector in Ethiopia

2.3.1.1.Education sector in Ethiopia

Education is a means through which man transmits his experiences, new findings, and values developed over the years, in his struggle for survival and development. It enables individuals and society to make all-rounded participation in the development process by acquiring knowledge, ability, skills and attitudes. Education enables man to identify harmful traditions and replace them by useful ones. It helps man to improve, change, as well as develop and conserve his environment for the purpose of an all rounded development by diffusing science and technology into the society. Education also plays a role in the promotion of respect for human rights and democratic values, creating the condition for equality, mutual

understanding and cooperation among people. Education does not operate in isolation, rather it has to be integrate with research, practice and development to contribute towards an all-rounded development of the society.

In Ethiopia, education dates back to the Sixth Century when the Sabean alphabet introduced along with Christianity. Beginning in the early years of the Christian era, the churches of Ethiopia developed school system, which over the centuries served not only as focal points for learning but also prepared the nations religious and governmental leaders (Gebru, 2015).

In 1974, the imperial regime dismantled and replaced by the socialist system hence; the educational system of the country 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 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 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 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 labor, market were highly discouraged (Ketema 2006).

The Ethiopian Government is committed to bringing all children to school following the philosophy of inclusive education. Inclusive education implies educational arrangements in regular schools, in and out of classrooms settings, that children and youth with special educational needs can taught integrated with others with particular support provided

according to their needs. In an internationally recognized policy for inclusion, students with special educational needs denotes persons with disabilities, learning difficulties and behavioral problems, and specially gifted and talented children.

Inclusiveness also targets children deprived of education, which includes victims of cultural influences, children who forced to live on the streets because of social, economic and political chaos, and working children. In the Ethiopian context, also children and youth in emerging regions and pastoral areas should targeted to uplift the education coverage. The Ethiopian Constitution accepts the international declarations and conventions, and states education as a human right. In line with the international declarations, conventions and policies, it establishes the universal right to education, emphasizes the need to allocate resources and assist disadvantaged groups. In practice, the Ethiopian inclusive education particularly refers to education for children and youth with disabilities, omitting learners with temporary learning difficulties and specially gifted and skilled children. The Master Plan enlarges the current concept of inclusive education meaning merely special needs education for disabled learners towards the principle of providing education to all who may face with any kind of special need or learning difficulty, be it of temporary or more permanent nature. Important is to comprehend that inclusiveness does not mean full integration. There may be remarkable practical difficulties in trying to teach everybody together. Therefore, some children with disabilities better accommodated in either special classes, units or special schools. Acknowledging the importance of inclusiveness in its widest sense, the Master Plan, however, cannot cover the provision of education for pastoralist children, street children, orphans and child workers. The Master Plan builds on the Constitution of Ethiopia, the principles directed by the Education and Training Policy (1994), Special Needs Education Program Strategy from 2006 and Special needs/Inclusive Education Strategy published in 2012. Most importantly, the Master Plan is based on the ESDP V 2008-2012 EC (2015/16 – 2019/20 G.C.), and the accompanying Multi-Year Action Plan (MYAP) guiding the implementation of the sector plan (MOE, 2016).

2.3.1.2. Health Sector in Ethiopia

The Ethiopian health sector successfully concluded 20 years of the National Health Sector Development Program (HSDP) divided into four series of five-year HSDPs I to IV commencing in 1997. The Health Sector Transformation Plan (HSTP) is the next five-year national health sector strategic plan, which covers EFY 2008-2012 (July 2015 – June 2020). It has been prepared by conducting in-depth situational assessment and performance evaluation of HSDPs; considering the global situation and the country's global commitment and most importantly, the goals of the national long-term vision and Growth and Transformation Plan (GTP).

The development of the Health Sector Transformation Plan guided by a roadmap prepared jointly with all relevant stakeholders under the leadership of the Ministry of Health and Regional Health Bureaus. The roadmap clearly stipulated the major steps of the development process, planning approach and methodology and communication strategy. It also clearly indicated the roles and responsibilities of all actors giving due emphasis for the involvement of all relevant stakeholders, including the private sector to ensure commitment by all for the implementation of the strategic plan by having a shared vision. (HSDP, 2015/16-2019/20).

The current 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. In addition, the development of self-reliance in these endeavors and, 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 sectoral for a comprehensive betterment of life. So, health development shall not see only in humanitarian terms but also as an essential component of the package of social and economic development as well as being an instrument of social justice and equity.

2.3.1.3.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 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 increased through investment in the prevention and treatment of illness (Gardner 2001). Due to this some scholars includes stock of health in their model and argued that health determines the total working hour an individual want to spend to generate income (Basov, 2012).

2.3.1.4.Conceptual Framework.

The conceptual framework shown in Figure 1 indicates that, GDP per capita Growth is dependent on Labor force growth, Gross Capital Formation, Education human capital, Health human capital, Official development assistance, Educational enrolment and Import of pharmaceuticals and medical equipment. From the theoretical and empirical literature reviews, the researcher developed the following conceptual framework of the study**.**

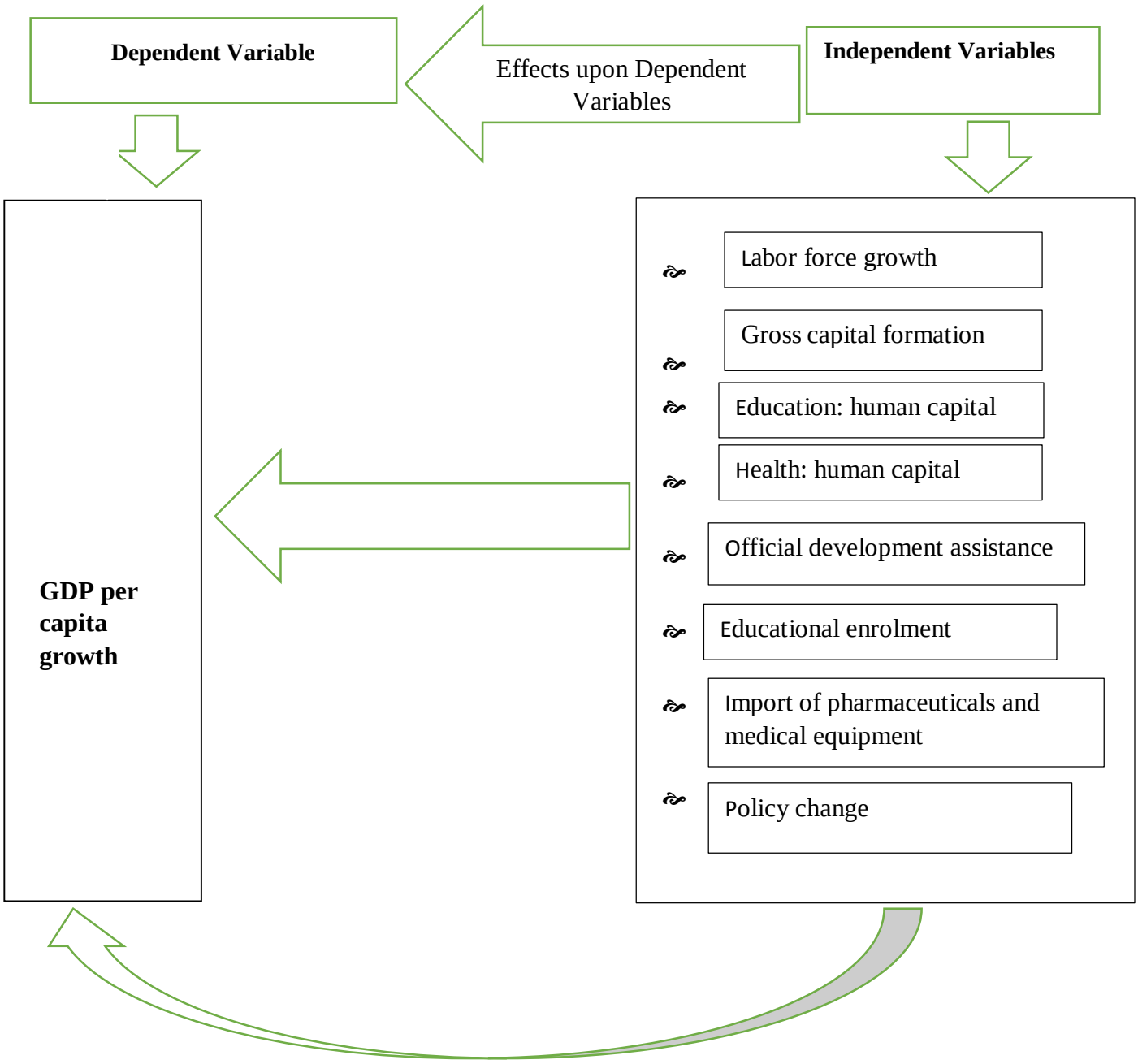


Figure 1.1. The conceptual framework of the study

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, Romer and Weil (1992) and Weil (2009) has accommodated human capital as an independent factor of production in their empirical analysis in defense of the neoclassical Solow model. Benhabib and Spiegel (1994) has used Cobb-Douglass production function where GDP per capital used as dependent variable while labor force, physical capital and human capital used as independent variable. Oluwatobi and Ogunrinola (2011) have also used Educational 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.

Similola (2015) has also applied the Cobb- Douglass production function to investigate the relationship between investment in education, health and economic growth in Nigeria by using Johansen co integration and ordinary least square technique of analysis. Righteous (2017) in his study ―the impact of human capital development on economic growth in Zambia‖ has also used human capital augmented Cobb- Douglass production function in which Johansen ‘s cointegration test and the Error Correction Model was employed to investigate both short run and long run impact of human capital development. The broad-spectrum form of the human capital augmented Cobb-Douglas production function that was developed by Mankiw, Romer and Weil (1992) shown below:

$$\mathbf{Y(t) = K(t)^{\alpha} H(t)^{\beta} A(t)L(t))^{1-\alpha-\beta} U} \quad \text{..... (1)}$$

By transforming the equation in to the log linear form, we can get the following equation.

$$\mathbf{1n\ Y(t) = \alpha\ ln\ K(t) + \beta ln\ H(t) + (1-\alpha-\beta)\ AL(t)) + Ut \ldots\ldots\ldots\ldots\ldots\ (2)}$$

Where;

Y = Output level

K = Level of Physical capital

H = Level of human capital

A = Level of Labor Augmenting Technology

L= Level of Labor force

α = elasticity of physical capital w.r.t output

β = elasticity of human capital w.r.t output

$\alpha + \beta < 1$

The model can transformed to the testable form as follows. According to Mankiw, Romer and Weil (1992) the labor force and the labor augmenting technology grows at the rate of **n** and **g** respectively and effective labor ($\mathbf{AL_t}$) grows at the rate of **n+g**.

$$\mathbf{L_t = L0 \cdot e^{nt}} \text{ ---------- (3i)}$$

$$\mathbf{A_t = A0 \cdot e^{gt}} \text{ ---------- (3ii)}$$

By assuming that the constant share of output denoted by S_k and S_h which are devoted to the investment of physical and human capital respectively, the investment devotion can be written as:

$$\mathbf{Ikt = S_k Y_t} \text{ ---------- (4i)}$$

$$\mathbf{Iht = S_h Y_t} \text{ ---------- (4ii)}$$

Where; IKt and **IHt** are the investment in physical and human capital respectively.

By expressing the equation in intensive form, $k = \frac{K}{AL}$ as the stock of physical capital per effective unit of labor, $h = \frac{H}{AL}$ as the stock of human capital per effective unit of labor. and $y = \frac{Y}{AL}$ As the level of output per effective unit of labor, where **n** is the growth rate of labor, g is the rate of technological change and **δ** is the common (time invariant) depreciation rate, we can write the time path of **h** and **k** (differentiation of **h** and **k** with respect to time) as follows:

$$\dot{K}(t) = S_k\, y(_t) - (n + g + \delta)\, \dot{K}(t) \quad \text{---------- (5a)}$$

$$\dot{h}(t) = S_h\, y(_t) - (n + g + \delta)\, \dot{h}(t) \quad \text{----------(5b)}$$

By assuming α+β <1 i.e. diminishing returns to scale in the two outputs (physical and human capital), imply that the economy converges to a steady state defined by:

$$K* = \left[\frac{sk^{(1-\beta)}\, sh^{\beta}}{n+g+\delta}\right]^{1/1-\alpha+\beta} \quad \text{---------- (6i)}$$

In logarithm form

$$\ln k^{*} = \frac{(1-\beta)}{(1-\alpha-\beta)} \ln S_k + \frac{\beta}{(1-\alpha-\beta)} \ln S_k - \frac{1}{1-\alpha-\beta} \ln [n + g + \delta] \quad \text{----------(6ii)}$$

$$h^{*} = \left[\frac{Sk^{(1-\alpha)}\, Sh^{\alpha}}{n+g+\delta}\right]^{1/(1-\alpha-\beta)} \quad \text{----------(7i)}$$

In logarithm form

$$\ln h^{*} = \frac{(1-\alpha)}{(1-\alpha-\beta)} \ln Sk + \frac{\alpha}{(1-\alpha-\beta)} \ln S_h - \frac{1}{(1-\alpha-\beta)} \ln [n + g + \delta] \quad \text{----------(7ii)}$$

Substituting equation (6i and 7i) into the production function (equation 1) and taking logs yields an equation for income per capita at steady state (y*) will be:

$$\ln y^{*} = \ln\left[\frac{Yt}{Lt}\right] = \ln A(0) + g_t + \frac{\alpha}{1-\alpha-\beta} \ln s_k + \frac{\beta}{1-\alpha-\beta} \ln s_h - \frac{(\alpha+\beta)}{(1-\alpha-\beta)} [n + g + \delta]$$

Since $\ln A_t$ is not observable, it will captured by the error term (Mankiw et.al, 1992). At the same time, g_t is not observable and cannot be distinguished empirically (Bassanini and

Scarpetta, 2001). Accordingly, the basic equation to measure empirically can written as follows.

$$\ln y^* = \ln\left[\frac{Yt}{Lt}\right] = C + \frac{\alpha}{1-\alpha-\beta}\ln S_k + \frac{\beta}{1-\alpha-\beta}\ln S_h - \frac{\alpha+\beta}{1-\alpha-\beta}[n + g + \delta] \text{ ----------(8)}$$

Based on the theoretical framework developed by Mankiw et al (1992), the following empirically testable log-linear type of model, with some modification to accommodate other additional variables is used in the estimation (Getachew, 2014; Gidey, 2015 and Peter and Lucas, 2017).

$$LnGDPPCG_t = f(LnLAB_t, lnCF_t, LnEHC_t, LnHHC_t, LnODA_t\, lnEdE_t, lnIMP_t\, D)$$

Where;

$LnGDPPCG_t$ = natural logarithm of real GDP per capital growth at time t.

$LnLAB_t$, = natural logarithm of labor force growth at time t.

$LnGCF_t$, = natural logarithm of Gross capital formation at time t.

$LnEHC_t$, =natural logarithm of education human capital at time t.

$LnHHC_t$, =natural logarithm of health human capital at time t.

$LnODA_t$, = natural logarithm of official development assistance at time t.

$LnEdE_t$, = natural logarithm of growth rate of educational enrolment at time t.

$LnIMP_t$ = natural logarithm of import of pharmaceuticals and medical equipment at time t.

D_1= is a dummy variable that indicates a policy change.

Generally, in the empirical works of human capital, several researchers have only used education human capital as a proxy of human capital whereas both health and education are the most important aspects of human capital (Gundlach, 1996). To stay away from such limitations, different researchers have used both education and health measures as a proxy for human capital. For example, Barro (2003) has measured human capital using educational

attainment and life expectancy. Gebru (2015) at the same time has used both education and health as a proxy to measure human capital. Gidey (2015) has also used both education indicator (enrolment rates) and health indicator (share of total government expenditure on health to GDP).

With regard to this research paper, both education (ratio of public education expenditure to real GDP) and health (ratio of public health expenditure to real GDP) are used. The availability of data in Ethiopia and other international databases related to education and health indicators of Ethiopia are more suitable to use such techniques of measurement than the other alternative measures discussed above.

3.1.1. Data Source and Measurement of the Variables

The study has used annual data from 1980/81-2020/21. The data has collected from World Bank development indicators (WDI), from Ministry of Finance (MOF), and National Bank of Ethiopia (NBE). Even though the given institutions may have limitations on storing and collecting data: in Ethiopia, they are the best of compiled and long-term data. Most of the researches conducted in the country used their data and by them, self they engaged on conducting continues researches. These data sources are the most widely used in Ethiopia. The data from different sources I collected tried to reconciled by collecting the variables found some from World Bank development indicators https://data.worldbank.org/indicator/ (official developments assistance) the rest from national bank of Ethiopia and Ministry of Finance with respect to the following table 1.1 as per their proxy/unit.

Table 1: 1. Summary of data sources by variable

Types of Variable	Unit/Proxy	Sources
Real GDP Per Capital	Real Gross Domestic Product Per Capital	NBE
Physical Capital Stock	Ration of real gross capital formation to the ratio of real GDP	NBE
Labor force	Labor force growth rate	MOF
Education Human Capital	The ratio of public education expenditure (capital and recurrent) to real GDP	NBE
Health Human Capital	The ratio of public health expenditure (both capital and recurrent)to real GDP	NBE
Official Development Assistance	The ratio of official development assistance to real GDP	World Bank
Imports of Pharmaceuticals and medical equipment	Growth rate of imports of pharmaceuticals and medical equipment	NBE, MoH
Dummy variables	0 and 1	_____

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

I. Real GDP Per Capita growth (GDPPCGt)

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 GPD per capita can used as proxy in the growth rate form.

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

It is a proxy for physical capital stock in the economy and it can derived by dividing the gross capital formation adjusted through GDP deflator to real GDP. Barro and Sala-I-Martin (2004) has shown that the sign expected from the coefficient GCF is positive, because the development of the capital is supposed to favor the growth of the real GDP by promoting further production of new goods and services. Other empirical findings like Wilfred and Adeleke (2013), Ali (2015), and Bojoro and Yushi (2015) have also found the positive sign.

III. Labor

Theoretically, labor force is a major element for sustainable rate of economic expansion. It could be the engine of growth for labor-intensive economies like Ethiopia. However, if it not used efficiently and if it is less productive, it may be a burden for the economy because of high rate of unemployment. It incorporated in the model in its growth rate (bloom et al, 2007).

IV. 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 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 development in the form of education and health expected to have a positive effect on economic growth.

V. 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 socioeconomic 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, 2015). Therefore, since Ethiopia is among the main aid recipient countries in Africa: it entered in to the model as one control variable.

VI. Educational Enrolment

Ethiopia's economic development is largely dependent on an educated workforce, yet one of the greatest limitations to educational progress is a disadvantaged economy (Hoot, Szente &Tadesse, 2006). Fortunately, the Ethiopian government understands the value of education and currently dedicates a significant amount of resources towards its development at all levels. Recognizing the need for 21st century workers who are skilled in science, technology, mathematics, and engineering (STEM), Ethiopian universities are steering students towards these STEM-related degrees.

VII. Growth Rate of Imports of pharmaceuticals and Medical equipment

Import of good and services can see as one of the determinants of economic growth (Kogid et al, 2011 and Getachew, 2014). 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 producers from the market and it may lead to high inflation when trade deficit occurred (Kogid et al, 2011).

VIII. Policy Variable

Changes in economic policies can influence the performance of the economy through investment in human capital and therefore, policy change dummy (D) added in to the model. The Derg regime (1975/76- 1991/92) was known by its hard control of production and distribution while the EPRDF/PP (1992 to date) known for its redistributive pattern in the economy (Ndulu et al, 2008). Therefore, dummy for changes in economic policies take zero for the period 1975/76-2020/21 and one otherwise.

3.1.2. Stationarity of the time series data

Stationarity is concerned with the stochastic processes. A time series data said to be stationary if the mean, variance and covariance of the series are time independent. In another way, the process 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 nonstationary.

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 solved by differencing the data set (Verbeek, 2004). If the variable is stationary

without differencing, then it 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 carried out through the Augmented Dicky-Fuller (ADF) test

3.1.2.1. Testing a Unit root

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

Y_t is Random walk: $Yt = \rho Yt\text{-}1 + ut$……. (9)

Y_t is a random walk with drift: $Yt = \beta 1 + \delta Yt\text{-}1 + ut$…… (10)

Yt is a random walk with drift and trend: $Yt = \beta 1 + \beta 2t + \delta Yt\text{-}1 + ut$---------- (11)

Where t is the time or trend variable and ut 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 $\mathbf{Y_{t-1}}$ from both sides of equation (9). Subtracting $\mathbf{Y_{t-1}}$ from both sides of equation (9) gives:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + ut \text{……. (12)}$$

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

$$\Delta Y_t = \delta Y_{t-1} + u_t \text{ …… (13)}$$

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 Δ**Yt** on one period lagged value of **Yt** and find out if the estimated **δ** is statistically equal to zero or not. Then, the null hypothesis Ho: **δ = 0** against the alternative hypothesis Ha: **δ < 0** will be tested.

In equation (13) if δ =0 or ρ =1, the process will become a random walk which is a nonstationary process i.e., there is a unit root problem. However, if δ <0 or (ρ <1), the series $\mathbf{Y_t}$ is stationary (Gujarati and Porter, 2009).

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

Hypothesis Testing-

Null hypothesis: Ho: δ = 0

Alternative hypothesis: Ha: δ < 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 $\boldsymbol{\tau}$ (tau) statistic, Dicky-Fuller assumes that the error terms $\mathbf{(u_t)}$ are not correlated (Enders, 1996 cited in Gidey, 2015). Nevertheless, the error term in the Dickey-Fuller test usually has autocorrelation, which needs to remove 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 is. 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, 2002). In the ADF test, the lags of the first difference dependent variable added in the regression equation until the autocorrelation problem will be resolved. The regression equation presented in the following form:

$$\Delta Yt = \delta\ Yt_{-1} + \beta \sum_{i=1}^{p} \Delta Yt - 1 + u_t \quad \text{..... (14)}$$

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.

$\Delta Yt = \beta 1 + (\beta 2t + \delta)Yt - 1 + \beta \sum_{i=1}^{p} \Delta Yt\text{-}1 + u_t$ ..... **(15)**

Where β2 the coefficient on a time trend series**;** δ is the coefficient of $\boldsymbol{Y_{t-1}}$**;** ***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 $\mathbf{u_t}$ 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: δ = 1

Ha: δ # 1

The ADF test procedure for unit roots is similar to statistical tests for hypothesis and it can tested on three possible models as specified in equations (9), (10) and (11). However, the critical values of the tau test to test the hypothesis that δ = 0, is different for each of the three specifications (Gujrati, 2004). Hence, due to the above advantages over DF test, the researcher used the ADF test of stationarity. In addition, Akaike Information Criterion (AIC) an estimator of prediction error determines the lag-length of the ARDL model.

3.1.3. Co-integration Analysis and Vector Error Correction Model

The concept of co-integration has developed by and further elaborated by Engle and Granger (1987). It is concerned with integrating short run dynamics with long run equilibrium (Maddala, 1992). If a group of time, series individually integrated of the same order and if at least one linear combination of these variables is stationary, then the variables said to be cointegrated. 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 undertake through the Engle-Granger procedure, the Johansen's co-integration procedure, Autoregressive Distributed Lag (ARDL) method of co-integration 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 expected to integrate of the same order. In case the variables found to integrate of the same order, the next step is to estimate the co-integrating parameter through OLS and test for co-integration (Maddala and Kim, 1998). Augmented Dicky Fuller (ADF) test can used to test the existence of cointegration. This done by calculating the residuals from the estimated equation and testing its stationarity. In addition, 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 (Verbeek, 2004). 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 applied in case we have more than one cointegrating 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 carried over to the second step making the result unreliable (Enders, 1996 cited in Gidey, 2015).

Johansen maximum Likelihood (1988) co-integration method technique solves the above shortcomings of Engle-Granger procedure (Maddala 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 (Verbeek, 2004). However, the application of the Johansen technique will fail when the underlying regressors have different order of integration, especially when some of the 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 applied with the regressors 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 Shahabadi, 2011). Therefore, due to the above-mentioned advantages, the researcher has employed ARDL method of co-integration to investigate the effect of human capital development 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. However, the second step takes place only if co-integration relationship 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 specified in order to test the long-run co-integration relationships between variables.

$$\Delta LnGDPPCG_t = \beta_0 + \lambda 1 lnGDPPCG_{t-i} + \lambda 2 lnLAB_{t-i} + \lambda 3 lnGCF_{t-i} + \lambda 4 lnEHC_{t-I} + \lambda 5 lnHHC_{t-i} + \lambda 6 lnODA_{t-i} + \lambda 7 lnIMP_{t-i} + \beta 1 \sum_{i=0}^{n} (\Delta lnGDPPCG)_{t-j} + \beta 2 \sum_{i=0}^{n} (\Delta lnLAB)_{t-j} + \beta 3 \sum_{i=0}^{n} (\Delta lnGCF)t\text{-}j + \beta 4 \sum_{i=0}^{n} (\Delta lnEHC)_{t-j} + \beta 5 \sum_{i=0}^{n} (\Delta lnHHC)_{t-j} + \beta 6 \sum_{i=0}^{n} (\Delta lnODA)_{t-j} + \beta 7 \sum_{i=0}^{n} (\Delta lnIMP)t\text{-}j + \beta 8 \sum_{i=0}^{n} (\Delta lnSCE) \beta 9_t + \beta 9 D + et \ldots\ldots\ldots\ldots\ldots (26)$$

Where;

LnGDPPCG*t* = Natural logarithm of real GDP per capita growth at time *t*.

LnLAB*t* = Natural logarithm of labor force growth rate at time *t*.

LnGCF*t* = Natural logarithm of gross capital formation at time *t*.

LnEHC*t* = Natural logarithm of education human capital at time *t.*

LnHHC*t* = Natural logarithm of health human capital at time *t*.

LnODA*t* = Natural logarithm of official development assistance at time *t.*

LnIMP*t* = Natural logarithm of import of pharmaceuticals and medical equipment at time t

LnEdE= Natural logarithm of Educational enrolment at time t

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 β7 and β8 are coefficients that measure short run relationships.

'Et 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 Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). The hypotheses 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 used to test the above hypothesis. The critical values of the F-statistics for this test are available in Pesaran, 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 rejected. If it is below the appropriate lower bound, the null hypothesis cannot rejected, and if it lies within the lower and upper bounds, the result would be inconclusive. In this paper, the computed F-statistics 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 estimated:

$LnGDPPCG_{t-i} = \beta 1\sum_{i=1}^{n}(lnGDPPCG)_{t-i} + \beta_2\sum_{i=0}^{n}(lnLAB)_{t-i} + \beta_3\sum_{i=0}^{n}(lnGCF)_{t-i} + \beta_4\sum_{i=0}^{n}(lnEHC)_{t-i} + \beta_5\sum_{i=0}^{n}(lnHHC)_{t-i} + \beta_6\sum_{i=0}^{n}(lnODA)_{t-i} + \beta_7\sum_{i=0}^{n}(lnIMP)_{t-i} + \beta_8 \sum_{i=0}^{n}(lnEdE)_{t-i} + \beta 9_t + \beta_{10}D$ ----------(27)

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 estimated as follows:

$\Delta LnGDPPCG_{t-i} = \beta_0 + \beta_1\sum_{i=1}^{a}(\Delta lnGDPPCG)_{t-i} + \beta_2\sum_{i=0}^{b}(\Delta lnLAB)_{t-i} + \beta_3\sum_{i=0}^{c}(\Delta lnGCF)_{t-i} + \beta_4 \sum_{i=0}^{d}(\Delta lnEHC) + \beta_5\sum_{i=0}^{e}(\Delta lnHHC)_{t-i} + \beta_6\sum_{i=0}^{f}(\Delta lnODA)_{t-i} + \beta_7\sum_{i=0}^{f}(\Delta lnIMP)_{t-i} + \beta_7 t + \beta 8 \sum_{i=0}^{f}(\Delta lnEdE)_{t-i} + \beta_7 t + \beta_8 D + \delta ECT_{t-1} + \epsilon_t$----------(28)

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

$ECTt_{-1}$ = 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.

ϵt = 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 hetroskedasticity test and test for stability of the model are undertaken to check the robustness of the model. CUSUM and CUSUMSQ test of stability also undertaken to check the stability of the coefficients. In order to estimate the models specified in equation (26), (27) and (28) above and to perform the pre estimation and post estimation diagnostic tests, *stata15 and Eviews 10* statistical packages are used.

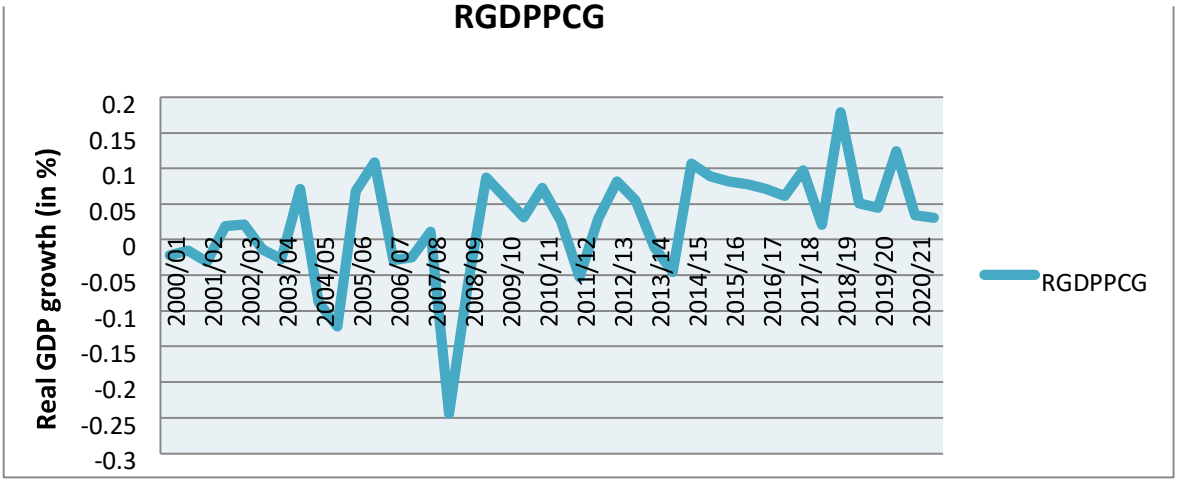
CHAPTER FOUR: RESULT AND DISCUSSION

4.1. Descriptive Analysis

4.1.1. The Trend of Real GDP per capita Growth (1980/81-2020/21)

Economic growth in Ethiopia as it measured by GDP per capita growth rate. As shown in Figure 2.1, real GDP per capita had about 2.2% negative rate of growth in 2007/08. This means that real GDP per capita growth of the country has declined by 2.2 percent from the previous year. However, the economy has started to recover and real GDP has grown by 2% in 2008/09, which has further grown to about 7.1 percent in 2018/19. The growth has further fluctuated and real GDP per capita has scored a 12 percent negative growth in 2007/08 to 2008/09. The trend also shows that the real GDP per capita growth declined by 6.4 percent in 2011/12 and 2013/14 and it has shown greater progress in 2014/15 by showing a 5.9 percent growth. It also has deteriorated by scoring a 2.3 percent decline in the real GDP per capita growth in 2017/18. General trend shows vicissitudes in the real GDP per capita growth in the time under consideration and average growth is 2.4 percent.

Figure 2.1. The Trend of Real GDP per capita Growth



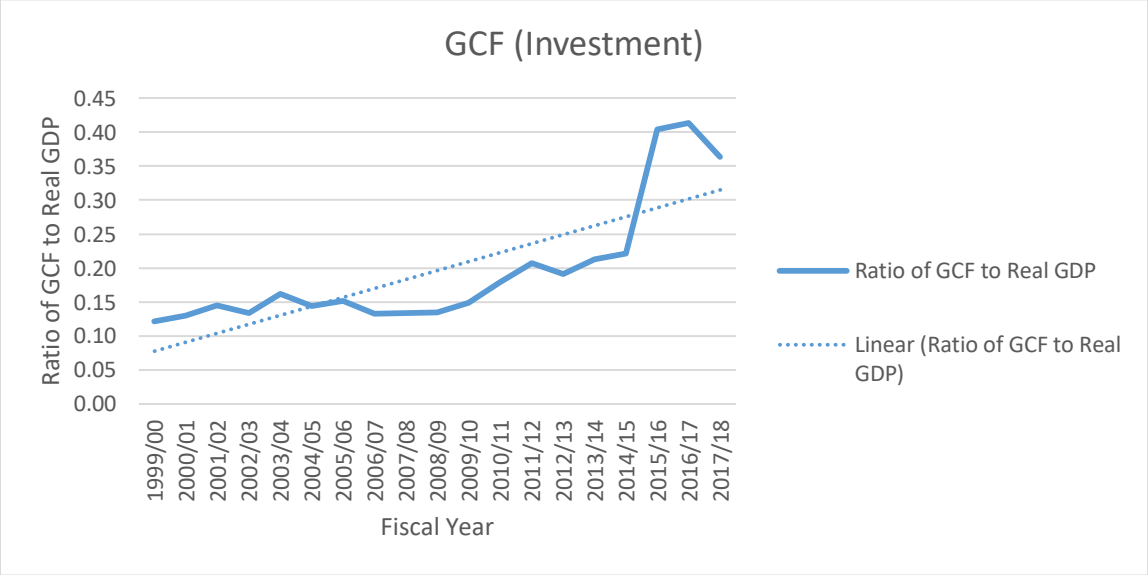
Source: Own computation Based on NBE Data (2022)

Changes in nominal GDP, GDP measured in current or nominal prices, can caused by changes in prices or output, inflation rate, political instability, transitions in government systems Changes in real GDP, GDP measured in constant prices made these fluctuations.

4.1.2. The Trend of Real Gross Capital Formation (1980/81-2020/21)

As shown in Figure 3.1, the ratio of real gross capital formation to GDP has an increasing overall trend with vicissitudes in the meantime. It had about a 15 percent share to real GDP in the year 2002/03 to 2003/04, 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 2014/15-2016/2017 the share of GCF has reached the minimum of 12.8 percent in the transitional period from 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 2016/17. However, it is observable that it has shown a sort of swinging (up and down) patterns. The average for the EPDRF regime is about 27.4 percent while the overall ratio of the period under consideration is 22.9 percent.

Figure 3.1. The Trend of Real Gross Capital Formation



Source: **Own Computation Based on data from NBE 2022**

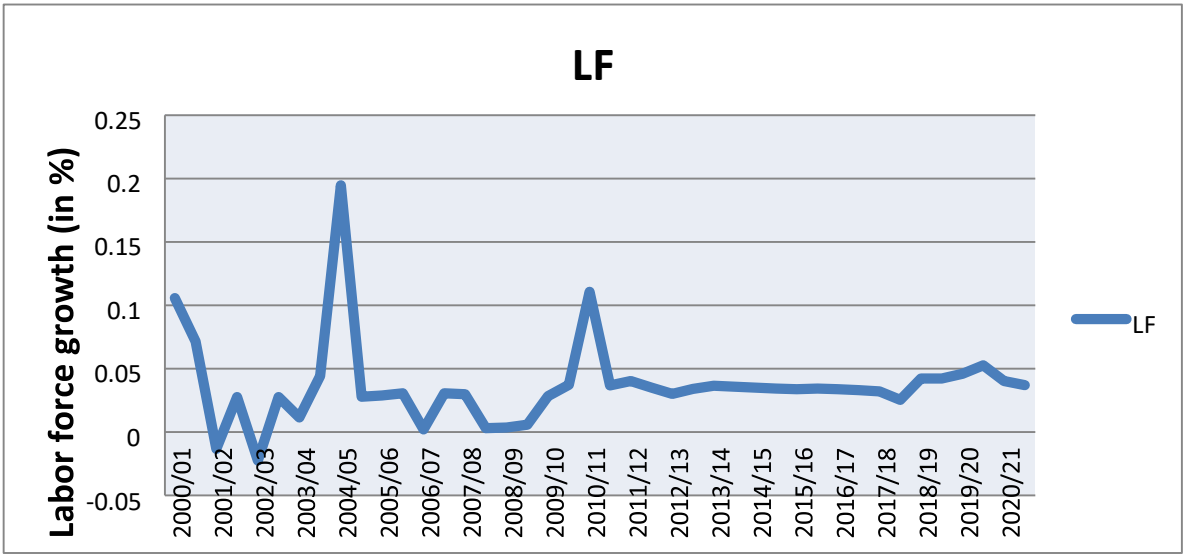
As it observed from the above trend of gross capital formation, it reveals there exist fertile condition to increase through time. Beginning from 1999 to 2010 the trend was almost in

same flow of capital formation due to infrastructures available to expand industries, which can lead to gross capital formation through, continues investment. Later to 2010 – 2016 there was tremendous changes in gross capital formation due to changes in policy appreciating foreign direct investment that can attract investors to industry parks.

4.1.3. The Trend of Labor Force Growth (1980/81-2020/21)

Labor force seen as the one aspect that can affect economic growth. As shown in Figure 3, labor force growth in 1985/86 was about 10.5 percent. This growth has started to decline and reached a negative of 1.3 percent in labor force growth in 1991/92 and has further declined to a negative of 2.2 percent growth in labor force in 1998/99. The growth of labor force reached its maximum in 19983/84 with a growth rate of 19.4 percent. The growth of labor show vicissitudes in the period under consideration and the average over the period is 3.67 percent.

Figure 4.1. The Trend of Labor Force Growth Rate



Source: Own computation depending on the data from MOF (2022).

As per can observe the cause for fluctuations and increments in labor force indicates there are some improvements in stability after different war, internal conflicts that eroded number of populations. Following such cases 2003/04 was the most fertile zone that leads to highly increment in labor force. After years consecutive to 2010/11 there was no high increment as

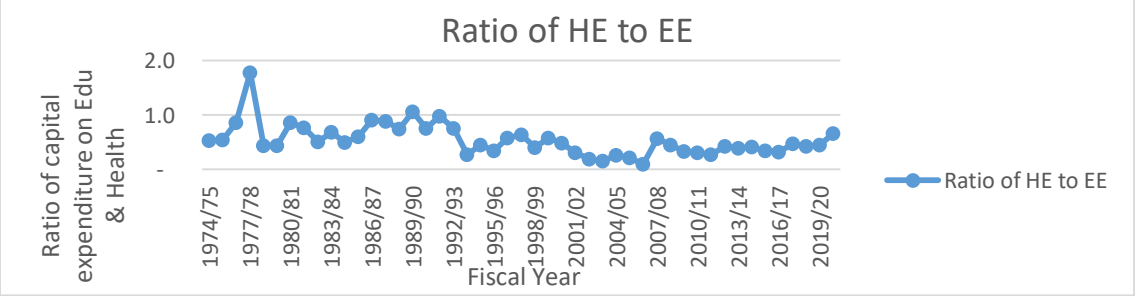
seen on the graph that reveals constant trends during the period. Later to 2019 due to continues conflicts inland there exists some downfall in labor force growth. Number of youth work force invested in war and huge death reflects negatively in growth of Labor force.

4.1.4. The Trend of Education and Health Expenditure (1980/81-2020/21)

As shown in Figure 4, the share of total expenditure on education to GDP slightly increase from average of 0.164 percent in years 1985/86-1990/91 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 depicted in Figure 4, between the year 1991/92 and 1997and98, 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.

Figure 5.1. The Trend of Education and Health Expenditure



Source: Own computation based on the data from NBE (2022)

As the population grows and more individuals enjoy better access to care because of developments such as the Affordable Care Act, increased Medicare enrollment, and expanded Medical aid and other government programs in some states, expenditures will rise.

The health expenditure reveals stable expenses over years due to once constructed health centers, Hospitals and general physicians employed once and serve for long period. At the same time, medical aid from advanced countries covers more of the expenses.

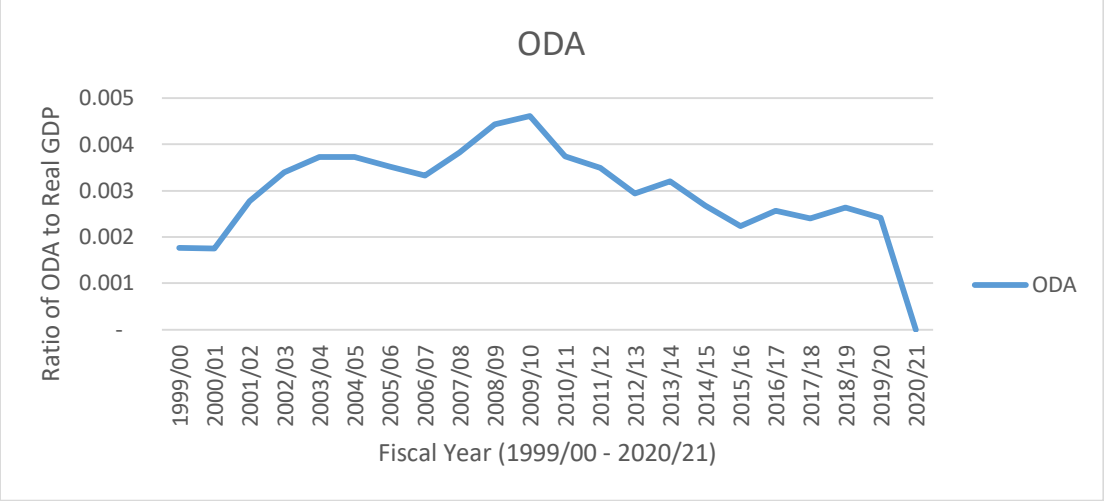
On other side expenditures against education expansions shows stable cases over long period. Similar to expenditure on health, expenditures assigned for expansions of education highly covered by humanitarian Aids, advanced countries, once built schools and concentrated to urban areas.

4.1.5. The Trend of Official Development Assistance (1999/00-2020/21)

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 1999/00 to 2020/21. As shown in Figure 6.1, the share of ODA to real GDP was about 0.13 percent in 1984/85 and 1996/97. It has declined to about 0.11 percent in 1988/89. The figure shows that share of ODA to real GDP has shown a sharp increase from 1992/93 to 1995/96. 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.

The next figure 6.1, reveals that the official development assistances' trend highly varying over years. The case connected with this continues variation that of ODA is since Official development assistance (ODA) defined as government aid that promotes and specifically targets the economic development and welfare of developing countries for main source of financing for development aid. The trend reveals as the given country become more advanced than before the ODA decreases and the plotted graph explain by shifted down and vice versa.

Figure 6.1. The Trend of Official Development Assistance

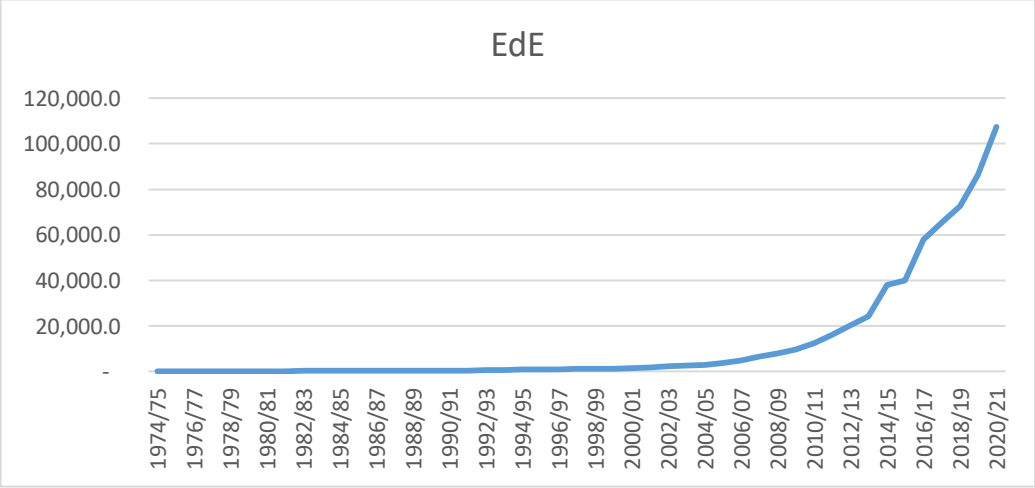


Source: own computation depending on the data from WB (2022)

4.1.6. The Trend of Educational Enrolment Growth (1980/81 - 2020/21)

Based on the data form figure 7.1, the Trend in Ethiopian Educational enrolment in all direction primary, secondary and tertiary level shows tremendous improvements over years. However, some political instability and internal conflicts hinders Educational enrolment in Ethiopia the enrollment in figure shows fruitful and expected result of in primary and secondary schooling in the given period.

Figure 7.1. Trend of Educational Enrollment



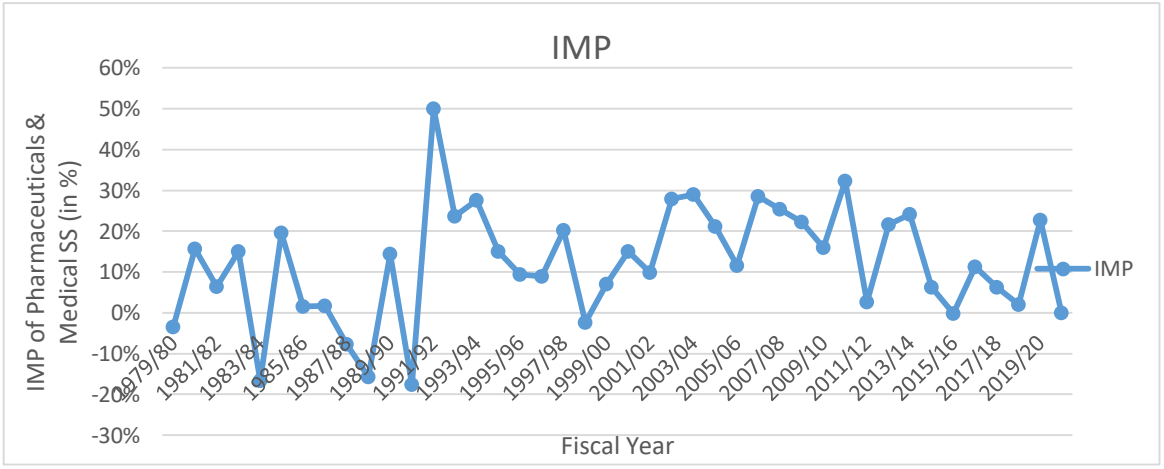
Source: own computation based on the data from Ministry of Education (2022)

The above-plotted graph of educational enrolment shows that there is continues growth in enrolment due to involvement of multiple stakeholders to expand education attainment for different levels. The primarily subsidized schools and students serving to back to areal schools. The enrolment of total schooling growth recorded tremendously as shown on figure 7.1 above.

4.1.7. The Trend of Import of Pharmaceuticals and Medical Equipment's Growth (1981/82-2019/20)

Import of good and services used in the form of growth rate in this study. As it can have observed from figure 7 below, the trend of the import of Pharmaceuticals and Medical equipment has shown a highly fluctuating pattern in period under consideration. It has reached a minimum of negative growth of 15 percent in 1991/92, which means that the import of pharmaceuticals and Medical equipment has shown a 15 decrease from the previous year performance. The maximum growth of import also scored in 1992/93, which was about 99%. This shows the growth of pharmaceuticals and medical equipment is double of its value in the last year.

Figure 8.1. Trend of Import of Pharmaceuticals and Medical Supplies



Source: own computation based on the data from NBE (2022)

Due to their effects on production and prices, import tariffs on pharmaceuticals and medical goods are inimical to affordable access to medicines and medical products. Because of their amplifying effect throughout the supply chain, import tariffs significantly inflate the wholesale and final prices of pharmaceuticals (up to 80% of the ex-factory sales price, according to one recent analysis) and active pharmaceutical ingredients (APIs) (ECIPE,

2017), as well as inputs to vaccines and materials supporting their distribution (OECD, 2021). Import tariffs on a wide range of medical supplies, medical equipment and personal protective products also inflate their domestic prices, thereby worsening affordability and access. In addition to this here are the Political factors affecting the pharmaceutical industry Regulatory Frameworks, Pricing Pressure Growing Healthcare Spend, Aging Population, Growing Obesity Rates, Health Trend, Growing Biotechnology Industry, and Direct Advertising of pharmaceuticals and medical equipment import and export vary over periods.

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 undertaken through Augmented Dickey Fuller unit root test. The test undertaken with two specifications. The first specification tested with constant but no trend while the second specification tested with both constant and trend.

Table 2 1: 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)***
LNEdE	-5.179362(0.0001)***	-5.123967(0.0008)***

Source: Own Calculation Using Eviews 10 package

Note: The rejection of the null hypothesis based on MacKinnon (1996) one-sided p-values. AIC 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 EdE) are stationary in their levels (for both types of specifications) while the null of non-stationarity not rejected for four of variables (EHC, HHC, ODA, and GCF). In addition, 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 cointegration 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 (26) using the appropriate lag-length selection criterion. In the paper Akaike Information Criterion (AIC) used as a guide and a maximum lag order of two chosen for the conditional ARDL model as it shown in the table 3 below.

Table 1 1: summary of data sources by variable

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

Source: own calculation using Eviews 10 statistical package

Note: * shows the selected maximum lag length selected

Then F-test through the Wald-test (bound test) performed to check the joint significance of the coefficients specified in equation (26). The Wald test 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 pharmaceuticals and medical equipment and average educational enrolment. The computed F-statistic value compared with the lower bound and upper bound critical values of the bound test statistics.

Table 1 2: Bound Test Critical Values

Description	At 1% level		At 5% level	
	Lower bound , I(0)	Upper bound I(1)	Lower bound , I(0)	Upper bound I(1)
Critical value bounds	3.31	4.63	2.69	3.83

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

As shown in Table 1.3. 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 1 3: Bound Test Critical Values

Description	Values
Number of observation	40
Optimal lag length of the model	2
Calculated F-statistic	5.46639

Source: own calculation using Eviews 10 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 pharmaceuticals and medical equipment, and average educational enrolment. After confirming the existence of long-run co-integration among the variables, the estimated long-run relationships between the variables estimated and reported in Table 1.4 below.

Table 1 4: Estimated long run coefficients using the Autoregressive Distributed Lag Approach: ARDL (1,1,2,2,1,0,0,2) selected based on Akaike 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	-3.07444	0.0058***
LnIMP	0.670729	0.323291	2.074694	0.789
LnLF	-0.684191	0.205145	-3.33516	0.0031***
LnHHC	0.026425	0.097507	0.271009	0.0505**
LnGCF	0.669824	0.206415	3.24504	0.0039***
LnEdE	0.007825	0.058705	0.133288	0.8952
Policy Change	0.733022	0.274833	2.667154	0.0144***
Constant	-7.547927	3.289894	-2.29428	0.0322**
Trend	-0.062217	0.025996	-2.39333	0.0261**

Source: Own calculation using Eviews 10 statistical package
Note: The *** and ** sign indicates the significance of the coefficients at 1% and 5% significant level respectively

As it shown in Table 1.4. Above, the estimated coefficients of education human capital, imports of pharmaceuticals and medical equipment, average educational enrolment, 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 pharmaceutical and medical equipment and school enrolment are not statistically significant.

Since growth model specified in a log-linear form, the coefficient of the dependent variable can 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 see 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 pharmaceuticals and medical equipment and average educational enrolment have positive effect on economic growth even though the effects are statistically insignificant. The direction of the effect for imports of pharmaceuticals and medical equipment is in line with study conducted by Kogid et al, (2011) and Tareke (2017). In addition, that of average educational enrolment is in line with the notion that moderate positive impact on economic growth (kasidi and Mwakanemela, 2013 and Getachew, 2014). Insignificancy of the result concerning average educational enrolment and imports of pharmaceuticals and medical equipment 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 issues 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 Tasew (2011).

4.2.4. Short Run Dynamic Model

After the acceptance of long-run coefficients of the growth equation, the short-run ECM model 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 1 5: Error Correction Representation for the Selected Autoregressive Distributed Lag Model: ARDL (1,1,2,2,1,0,0,2)) selected based on Akaike Information Criterion.

Dependent variable is ΔLnGDPPCG				
Regressor	**Coefficient**	**S.E.**	**T-Ratio**	**Prob.**
Δ (LnEHC)	0.377006	0.25684	1.467875	0.157
Δ (LnODA)	-0.202984	0.08499	-2.38828	0.0264**
Δ (LnODA(-1))	0.428578	0.15809	2.711066	0.0131**
Δ (LnIMP)	0.031828	0.23457	0.135686	0.8934
Δ (LnIMP(-1))	-0.366832	0.16207	-2.26349	0.0343**
Δ (LnLF)	-0.656492	0.24137	-2.71983	0.0128**
Δ (LnHHC)	0.034194	0.12507	0.2734	0.7872
Δ (LnGCF)	0.454696	0.14015	3.244568	0.0039***
Δ (LnEdE)	0.146186	0.04751	3.076882	0.0057***
Δ (LnEdE(-1))	0.08804	0.05116	1.720891	0.1
Policy change	0.948514	0.39048	2.429076	0. 2420
TREND	-0.080507	0.03759	-2.14164	0.0441**
ECM(-1)	-0.293979	0.18023	-7.17973	0.0000***
ECM = LNRGDPPCG- (0.5603*LNEHC -0.6043*LNODA+ 0.6707*LNIMP -0.6842*LNLF+ 0.0264*LNHHC+ 0.6698*LNGCF+ 0.0078*LNEdE +0.7330*D01 -7.5479 -0.0622*TREND)				

R-squared	0.829629	Mean dependent var.	-1.16248
Adjusted R-squared	0.683596	S.D. dependent var.	0.345166
S.E. of regression	0.194155	Akaike info criterion	-0.13467
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: own calculation using Eviews 9 statistical packages.

Note: The ***and ** sign indicates 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 educational enrolment. It depicts 0.45% in the real GDP per capita growth when gross capital formation increase by 1% and it is statistically significant at 1% level of significance. Contrary to its long run insignificant effect, average educational enrolment 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 educational enrolment (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 pharmaceuticals and medical equipment 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 verifiability 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 hetroskedasticity in the estimated model. The errors are also normally distributed. In addition, the Ramsey functional form test confirms that the model specified well. Hence, the relationship between the variables is verifiable or valid.

Table 1 6: Model Diagnostics Tests

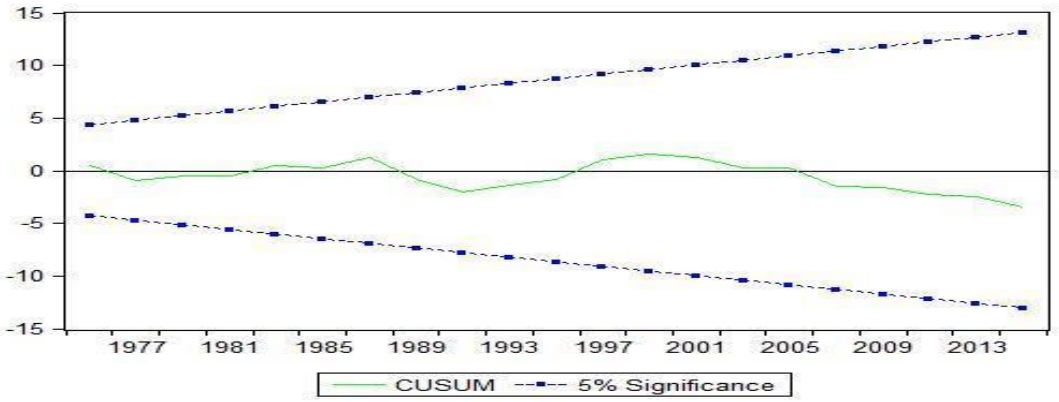
Test Statistics	LM Version	F Version
Serial Correlation Test	CHSQ(2) = 1.168659(0.5575)**	F(2,19)= 0.285910(0.7545)**
Normality Test	CHSQ(2) = 1.458933(0.482648)**	Not applicable
Hetroskedasticity test	CHSQ(1) = 22.31808(0.2182)**	F(1,38)= 1.472564(0.1964)**
Functional Form test	CHSQ(2) = 0.572623(0.286311)**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

Source: own calculation using Eviews 10 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 hetroskedasticity 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 tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. These test recommended by Pesaran 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.

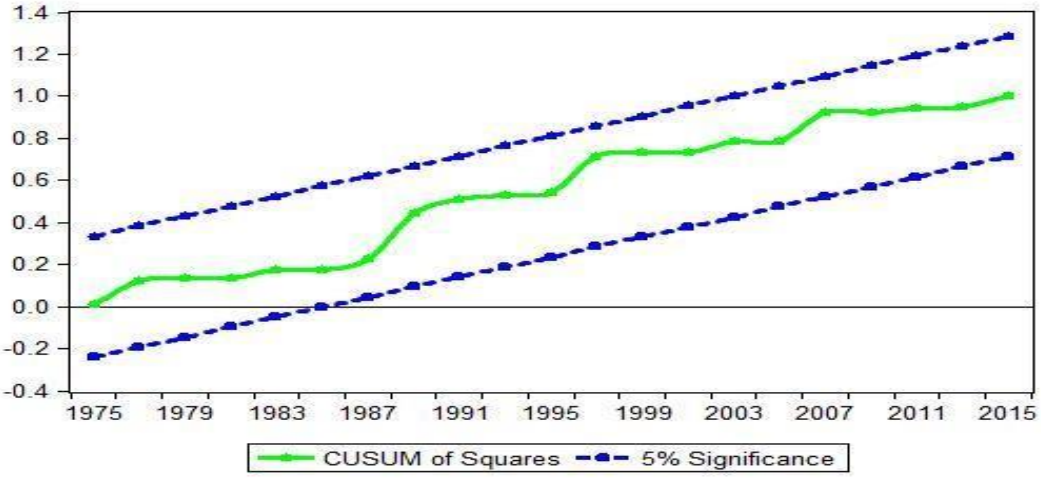
Figure 9.1. Plot of cumulative sum of recursive residuals



Source: Own Calculations.

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

Figure 10.1. 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 made to identify the direction of causality between the dependent variable, education and health. The result reported in Table 1.7. Below. The result revealed that, at lag length of one, there is significant causality between real GDP per capita, education

human capital (proxed by the ratio of public education expenditure to real GDP) and health human capital (proxed by the ratio of public health expenditure to real GDP).

Table 1 7: 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	4.1658	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: own calculation using Eviews 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 development 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 development at lag 2.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The very essence of the study was to analyze the effect of human capital development on economic growth in Ethiopia (1980/81-2020/21). 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 intended to investigate the cointegration relationship between human capital development and economic growth. At the same time, the study aimed at analyzing the causal relationship between human capital development and economic growth. Accordingly, ARDL model of co-integration 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 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 is 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 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).

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 educational enrolment (one period lagged value) contributes to the real GPD per capital growth. On the other hand, Education and health has no significant short run effect on the economy. This could be due 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. Recommendations and Policy Implication

The results of this study have important policy implications. In order to achieve economic growth, more resources should 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 should 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 given a greater emphasis if the country is to get more benefits from the investment in these sectors. In addition, the government should also 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 investors apart from government itself and hence speeding up human capital development.

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APPENDICES

Appendix A: Bound Test Result

ARDL Bounds Test
Date: 05/24/22 Time: 12:23
Sample: 3 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
Date: 05/24/22 Time: 12:23
Sample: 3 42
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
		0.304643		
D(LEHC)	0.316030		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(LNEdE)	0.106985	0.056281	1.900919	0.0711
D(LNEdE(-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
LNEdE(-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	Akaike info criterion	0.244355
Sum squared resid	1.156453	Schwarz criterion	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