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SCHOOL OF GRADUATE STUDIES

**ECONOMIC GROWTH, CAPITAL
ACCUMULATION AND MACRO STABILITY IN
EHTIOPIA**

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**Economic Growth, Capital Accumulation and
Macro Stability in Ethiopia**

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Acronym

ADLI	Agricultural Development Led Industrialization
AIC	Arkaike Information Criteria
CPI	Consumer Price Index
ECOM	Error Correction Model
EPRDF	Ethiopian People Revolutionary Democratic Front
GDP	Gross Domestic Product
GDS	Gross domestic saving
GKF	Gross capital formation
HIC	Higher income countries
HQ	Hannan-Quinn statistics
LDCs	Least Developed Countries
MICs	Middle Income Countries
MoFED	Ministry of Finance and Economic Development
SBC	Shwartz Bayesian Criteria
SSA	Sub Saharan Africa

Abstract

This study tries to investigate the impact of capital accumulation and macro stability on economic growth of Ethiopia taking a series of data range from 1971 to 2006. Result of co-integration test using Johanson likelihood approach indicates that all explanatory variables which are entered in the model form long-run equilibrium. The study is also conducted test for weak exogeneity and test for zero restrictions on co-integrating vectors to determine causality relationship and level of significance among equilibrium established variables. The result indicated that real GDP positively and strongly associated with physical capital, but negatively and significantly with budget deficit and political instabilities. The study could not find strong evidence which supports the existence of macro instability in the long-run other than short-run impact. The existence of war as indicator of political instability, adversely affects real GDP both in the long-run and short-run. In Ethiopia context, physical capital is found to be more important than human capital probably due to lesser human capital are accumulated in the stock.

CHAPTER ONE

1. INTRODUCTION

1.1. Statement of the Problem

Globally, there is high economic inequality between developed and less developed countries (LDCs). To put the extent of the difference figuratively, the average income of the top 20 richest countries is 37 times higher than the income of those 20 bottom poorest countries. What is worth mentioning is that in the past four decades, richest countries registered sustainable economic growth as opposed to the poor ones, which causes to enlarge income inequalities between the two world (World Bank,2003).

Ethiopia is one of the poorest nations, which has registered unsatisfactory economic performance for centuries. Looking at the long-run trend of per-capital income, in the last three and half decades, the economy and the sector grew by 3.1% and 2.1% respectively, while the population grew by 2.6%. This implies that the living standard of the people do not change over these large periods. (See table 3.2). According to the estimation of the World Bank (2006), the per capita income of the country was estimated at

\$160, which puts it in the least rank. Similarly, Ministry of Finance and Economic Development (1999/2000) reported that about 44% of populations of the country live below the poverty line.

A number of factors explain for the dismal economies of the country. But, it is worth mentioning on the major factors which explains the economic growth. The role of capital accumulation on economic growth of the nation is not ambiguous, but the magnitude of their contribution is vague. Due to various reasons adequate human and physical capital could not be accumulated. CSA (2004) reported that net enrollment ratio at primary and secondary school were 37.8% and 14.5% respectively. Concerning physical capital, the proportion of people who have access to safe water, electricity and proper sanitation were 35.8%, 12.8%, and 30.6% respectively. Regarding road infrastructure, since the availability of road is very limit, over 50% of the population of the country were traveled more than 10 kilometers to access all weather roads.

Beyond the conventional factors, macro and political stabilities are preconditions for sustainable and fast economic growth to occur. Failure to secure them means that country's endeavor in accumulating capital and enhancing production is threatened. Baro (1991) and Ghura (1995) disclosed that macro stability helps business and individuals to undertake

more realistic plan. Under high variability of price of commodities, business falls under difficulty to calculate profits and costs, which hamper for smooth resource allocation.

In Ethiopia, problem of macro instability seems to be existed for long period of time. This problem can be understood that the country has experienced different economic systems and policies in different regimes. The last three governments which have been administered the country has pursued their own economic system and economic policies. First, during the Imperial regime, the country was ruled by king and practiced market economic system. Following, the country fall under the military rule and implemented socialist economic system. Lastly, in the current government- EPRDF officially declared a capitalist economy as an appropriate economic system for the country, while providing room for its intervention in key areas (Ethiopian Economic Association, 1999/2000).

Such inconsistence of economic systems and policies would lead to suspense that there is problem of macro instability in the country. To this end two queries are raised: does macro instability is a long-run phenomenon in the country? And if so how much series is the problem? It is the estimated results which answer these questions.

Like macro, political instability has negative impact on economic growth. Haan and Siermann (1996) point out that by increasing risk for investment, political instability creates unfavorable environment for investment, and hence push both capital and labor to be out flowed instead of the other round to take place. Again, Ghura (1995) argue that political instability by threatening property right restrains investors from undertaking large investment. He added that, when there are conflict and war, financial and human resource are diverted from productive to non-productive activities, such as ordering peace and stability and military expenditures.

Political instability is major problem in the country which persists not for less than a century and has not yet got resolution. For a long period of time, the country has been suffering from internal and external instabilities, which has been incurring considerable financial, manpower and physical costs (World Bank, 2001 and Alemayehu, 2004). During the whole period of Derg, the country was bitterly bitten by civil war, where significant share of government's expenditure, which accounted about 40% of the recurrent budget and 7.5% of the GDP, went to military purpose (See Table 3.4). The current government has also faced serious external instability due to land dispute with Eritrea, and internal instability occasionally. Although, there is no doubt on the adverse impact

of political instability on economic growth of the nation, the seriousness of the problem has to be investigated from the research output.

1.2. Objective of the Study

1.2.1. General Objective

The general objective of this study is to investigate the impact of capital accumulation and macro stability on economic growth of the nation.

1.2.2. Specific Objectives

1. To evaluate economic growth performance of the country at different periods and compare them against other region.
2. To examine the role of physical and human capital accumulation on economic growth of the country.
3. To determine whether problem of macro instability exists or not in the country; if it exists how much is significant in affecting production.
4. To investigate the adverse effect of political instability on economic growth, as political stability determine the level of output to be produced in a given period via influencing economic agents in a system.

1.3. Hypothesis of the Study

1. The macro economy of the country is highly instable, which hampers smooth production process and hence slow down the speed of a country in moving towards steady state level of production. The instability of the country can be deduced from inconsistent economic policies which have been practicing under different regimes.
2. The political situation of the country is highly instable which hampers real GDP growth. The political instability of the country can be sensed from lack of political freedom and human rights; civil and neighboring war; strikes and civil disobedience; and absence of good governance and democratic way of government transfer.
3. Human capital exerted positive impact on economic growth of the country.
4. Physical capital significantly and positively contributes to real GDP growth.

1.4. Scope of the study

Since economic growth is multi-dimensional phenomenon, where economic, political, social, cultural, natural, demographic, institutional and other factors play their own role, it is so difficult to capture all of them and include in the model. Thus, the study incorporates important

variables from conventional- human capital and physical capital, from non-conventional- inflation, budget deficit and dummy for war covering 36 years from 1971 to 2006.

1.5. Significance of the study

This study is important at least it tries to explain economic performance of the country in general and growth performance in particular. The empirical results, which are estimated, have policy implications which suggest the government how to allocate its efforts and resources to bring maximum result. Moreover, the findings could be used by policy makers as research input, when they evaluate the existing policies and design new ones. In general, this study has policy implication, which suggests how fast growth can be attained.

1.6. Limitation of the Study

Lack of appropriate data is one major problem in this study. A number of explanatory variables are not measured directly, as they lack appropriate measurement device. Thus, the variables are measured by other variables thinking they approximate the variable of interest. Speaking specifically, the share of active labor force enrolled in secondary school has been taken as proxy for the stock of human capital. However, this is too narrow to measure human capital as it is defined broadly by nutrition, education, experience and health status. There is also problem with measurement of stock of physical capital, where ready made data are not available. In fact, accumulation of physical capital can be generated by aggregating annual data of gross capital formation in to initial investment and subtracting the amount of wear out stock. However, initial investment and depreciation rate are calculated based on assumption which could yield wrong result. Another problem is with measurement of stability- macro and politics. Macro stability is proxed by inflation and budget deficit, where high inflation rate and budget deficit are an indication of macro instability. Political instability is also takes different forms- good governance and democracy, human rights and political freedom, civil and neighboring war. In this study, political stability is measured narrowly using civil and neighboring war only.

Getting actual data on the proxy variables is another area of limitation. Variables on real GDP, gross capital formation, budget deficit, CPI could not have ready made data. Three series for the first three variables and two series for the latter variable at different base years are available. These different series for the same variable are transformed in to one uniform series. The transformed series are the approximation of actual, which lowers the accuracy of the collected data.

1.7. Organization of the paper

The rest of the paper is organized as follows. Chapter two reviews works done on the impact of capital accumulation and macro and political stability on economic growth. Chapter three explains economic performance of the country in general and growth performance in particular. Chapter four deals with model specification, methodology identification and estimation results. The study is winded up by concluding major findings and forwarding policy implications.

CHAPTER TWO

2. Literature Review

2.1. Theoretical issues

2.1.1. The Neoclassical Theory of Economic Growth

Following classical growth theory, the neoclassical school of growth comes up with the idea of convergence, when in the long-run the economy of poor countries will converge to the economy of the rich ones. That is to say, poor countries with lower initial per capita income grow faster and finally converge to economies of rich ones. Since LDCs have lesser capital, its marginal productivity is higher, which attract capital to flow towards them. Convergence to take place, in neoclassical context, countries should have similar production function. Again, countries' capacity in adapting exogenous technology should be the same. If countries are varies in these two conditions, there is no tendency convergence to take place (See for example Pack, 1994 and Barro, 1991).

Having disclosed general essence of neo-classical, it is interesting to review the works of Solow (1956) and Mankiw et al. (1992), who are predominant scholars in their school.

Like classical, Solow (1956) developed growth model by modeling output as a function of capital and labor. He assumes that production take place using constant return to scale, where $\alpha+\beta=1$. However, each capital and labor is governed by diminishing marginal productivity. More over, Solow assumes that labor supply and technology are exogenously determined. Putting in mathematical form, supply of labor is given by $L(t)= L_0e^{nt}$, and technology is denoted by $A(t)= e^{gt}$ where labor and technology grow exogenously at a rate of n and g per time respectively. Solow by considering equilibrium of demand for labor and supply of labor, finally arrived at capital accumulation equation of $dk/dt= sF(k, L_0e^{nt})$.

Extending the model by including technology which are determined exogenously, capital accumulation equation is given by $dK/dt= se^{gt}k^\alpha(L_0e^{nt})^\beta=sK^\alpha L_0^\beta e^{(n\beta+g)t}$, where $A(t)= e^{gt}$, is technology; α and β are the share of capital and labor in the nation's income (Solow, 1956).

Solow model put essential prediction, which deserves credit to mention some of them. i) The level of income of poor countries converges to rich ones irrespective of the initial difference in income. ii) The steady state level of income is merely a function of saving and populating growth. That is to say, the higher saving rate and the lower population growth, the

higher will be the steady state level of income; and the reverse also true.

iii) The steady state growth of per capita income has nothing to do with saving and population growth rates, rather it depends absolutely on technological growth. Nevertheless these predictions could not be taken as grant with out justifying empirically (See for example, Solow, 1956 and Mankiw et al., 1995).

Mankiw et al. (1992) augmented Solow model by adding human capital in to the model. The model has also developed based on the assumption of decreasing return to scale of production function, where $\alpha + \beta < 1$. This assumption contradicts Solow's constant return to scale. They have also assumed that one unit of resource is freely transform in to either one unit of physical capital or one unit of human capital. More over, they have assigned the same depreciation rate for all types of physical capital.

According to Solow model, the steady state level of per capita income is stated as $\ln[Y(t)/L(t)] = \ln A(0) + gt + \alpha/(1 - \alpha)\ln(s) - \alpha/1 - \alpha \ln(n + g + \delta)$.

Where $Y(t)/L(t)$ is output per labor, $A(0)$ refers for technology, resource endowment, climate, institution and the like; g is advancement in knowledge, $n+g+\delta$ are growth of population (n) adjusted by technical progress (g) and depreciation rate (δ) (Mankiw et al.,1992).

Under augmented Solow model, the steady state level of per capital income is given by the equation,

$$\ln[Y(t)/L(t)] = \ln A(0) + gt - (\alpha + \beta)/(1 - \alpha - \beta) \ln(n + g + \delta) + \alpha/(1 - \alpha - \beta) \ln(s_k) + \beta/(1 - \alpha - \beta) \ln(s_h)$$

Analytical comparison of the two models show that excluding human capital, the marginal effect of physical capital on per capita income is given by the coefficient of $\alpha/(1-\alpha)$ which in fact lower than including human capital which is given by $\alpha/(1-\alpha-\beta)$. Incorporating human capital in to the model, it makes the effect of physical capital on income stronger. To illustrate, it is not the existence of physical capital, but its efficient utilization of the resource that matters for growth. When higher levels of human capital are accumulated; machinery, equipment, building and the like capitals functions effectively and efficiently. Thus, the existence of human capital strengthened the effect of physical capital on per capita income than with out including (Ibid).

2.1.2. Endogenous Economic Growth Theory

One prediction of neo-classical is convergence. The convergence hypothesis can not be accepted unless otherwise they are supported empirically. Following the broad data set developed by Heston and Summers, the convergence hypothesis began to be tested. The regression works took two different outcomes- one is strong evidence for convergence within a country, but lack of evidence across country. These two versions of outcome alert the mind of researcher to question on the validity of neo-classical assumption of exogenous technological change and availability of uniform technological opportunities. The critics of neo-classical growth theory on the assumption of exogenous technology lead to the emergence of new idea- endogenous growth theory, where technology is determined endogenously within the system. They argue that technology is not given for all countries in the glob, but is determined endogenously within the system (See, for example Romer,1986 and 1994 and Baro,1991).

The level of technology is determined within the system by the level of capital and labor. Taking in to account technology as a function of labor and capital, the production function for firm j can be written as $Y_j = A(K, L)K_j^{1-\alpha}L_j^\alpha$. Once again A is the level of technology which is determined

endogenously by spill over effect of knowledge. It is assumed that when there is investment in physical capital, there is technological progress due to spill over effect of knowledge where knowledge about technology transfers from firm to firm within system. In contrast, increase in the stock of labor in the economy discourages firms to innovate capital intensive technology and hence the level of technology diminished due to negative spill over effect. The equation tells that output of firm j is a function of K and L which are under its control and the level of technology which are determined locally. The level of technology in turn is the function of country wide stock of capital and labor (Romer,1994).

King and Rebelo (1990) developed a growth model where technologies are determined endogenously within the system, which is the outcome of national policies. They argued that public policies significantly determine growth of an economy indirectly through influencing the action of investors towards investment. Well developed policies encourage private investors to accumulate physical and human capital accumulation which in turn facilitate production activities.

The basic essence of endogenous growth model which explains this thought is given by the production function, $Y = AK$, where A denotes for factors that affect technology and K is both human and physical capital,

which are high in quality and variety. Unlike of classical, capital is characterized by constant return to scale. Two factors explain for these features. One is positive externality effect of capital where private physical and human capital investment yield a total return in excess of the return of the owner of the factor. Thus, the share of capital on national income is higher than what the classical assumed. In addition, the model considers knowledge as a type of capital. A knowledge is permanently expands due to new scientific discoveries where they are developed on the basis of the existing body of knowledge. Hence, research and development are vital instruments for producing the desired qualities and varieties of capital, which saves capital from exhibiting diminishing return to scale (Pack, 1994 and Mankiw et al., 1995).

Given $Y = AK$, by differentiating capital, capital accumulation equation is given by $dK/dt = sY - \delta K$. Next, by combining production function and capital accumulation together, growth of income is given by the equation $dY/dt/Y = dK/dt/K = sA - \delta$. This equation gives two major insights about growth. First, as long as saving is higher than depreciation of capital, the rate of capital accumulation and output increases steadily. Thus, saving causes permanent increase in income. This idea contrasted to neo-classical growth model that saving causes growth of an income temporary until it

reaches the steady state level. When the nation reaches steady state level, saving will do nothing to influence growth (Mankiw, et al.1995)

The endogenous model also contrasts to neo-classical model in terms of convergence. When ever there is difference in saving, difference in income prevails and hence there is no room for convergence to take place. Second, a difference in income is not related to differences in return of capital. This does not mean that lower income nations have higher return of capital. It is higher risk and uncertainties in poor countries which cause capital to move towards capital abundant nation instead of following the natural route (Romer, 1994 and Lucas, 1988).

How ever, this theory is not free from limitation. The major limitation of the theory which is stated by Pack (1994) is that the theory lacks empirical evidence which support for their convergence hypothesis.

2.2. Empirical works on Economic Growth

Following cross country data set developed by Heston and Summers, a number of growth regressions has been produced. The core area of their study is to diagnosis economic growth problems of poor countries and to recommend solution by which their problems will be solved.

The role of capital accumulation on economic growth of the nation is not ambiguous. Stiglitz (1996), Nelson and Pack (1999), Berthelemy and Soderling (1999), and Schmidt-Hebbel, et al. (1996) disclosed that capital accumulation played vital role for economic success of East Asian. Another study which was conducted by Kim and Lau (1994) compared the source of growth between two groups- four Tiger of East Asia and five developed countries- Germany, France, Japan, the United Kingdom and the United State. They found that in the former countries- capital accumulation is major source of growth, which contributed between 48 and 72 percent of their economic growth, while in the latter countries- technical progress is the crucial input which account between 46 and 71 per cent of growth.

Berthelemy and Soderling (1999) through their findings predicted that capital accumulation will be an engine for future economic prospect of

nations. The good economic growth record of a number of Africa countries during 1960's and 1970's is largely explained by capital accumulation. During these periods, capital accumulation accounted for 67 per cent of economic growth of the continent. In contrast, in the recent period, 1990's capital accounted not more than 11% of the growth. Similarly, Lim (1994) pointed out that capital accumulation, labor and technical progress contributed about 65%, 23% and 14% of the output growth of developing world respectively. In addition, in other region- Eastern Asia countries, such as Korea, Taiwan, Malaysia, Singapore, and Thailand capital accumulation contributed about 60 to 80 percent during their take off stage.

Mankiw et al. (1992), using cross country data for 98 non-oil producing countries tested the validity of Solow's prediction and augmented the model by adding human capital. They got a result that both capitals determine real GDP per active labor force positively and significantly. Baro (1991), taking 98 sample countries from the period 1960 to 1985 tried to investigate the impact of initial human capital and per capita income at 1960 on growth of preceding year. He reported that the proceeding growth of per capita income of a nation is positively correlated with initial human capital, but negatively with initial level of per capital income. The estimated result mean that, for poor countries, the higher initial human

capital, the lower will be the fertility rate and hence more physical capital are accumulated, which assists them to catch up the economies of the richer ones. Analogically, Ghura (1995) using pooled time series and cross section data of 33 SSA from 1970 to 1990 disclosed that both physical capital and human capital are positively associated with growth in per capital real GDP. While physical capital significantly determines growth, human capital has got insignificant coefficient at the conventional level. However, it becomes significant when policy variables are included in the model. Again, Flen (1997) taking a sample of 96 countries from 1960 to 1980 and employing three stage estimation techniques estimated that the marginal effect of physical capital and human capital on income is positive and significantly different from zero. Another study Iradian (2007), by taking shorter period of time (2001 to 2006), and applying panel regression approach for transition economies reported that physical capital contributes about 0.26 to per capita income growth.

A number of studies tried to distinguish the marginal impact of private and public capital on per capita GDP growth. Most of them proved that private capital is more productive than public. To look at few works, Ashauer (2000) for the case of 46 low and middle-income countries from 1970 to 1990, Calamitsis et al. (1999) for the case of low and middle-income countries from 1970 to 1990 and Dessus and Herrera (2000) for the case of

28 developing countries from 1981 to 1991 regressed real GDP on private capital and public capital among other variables. In the former two studies private capital got significance coefficient, but public capital in the case of the latter one. Country wise study, Beddies (1999) for the case of Gambia found that private capital and human capital are important contributors to the growth of the nation, nevertheless public capital's contribution is negative. Similarly, Akitoby and Cinyabuguma (2004) for the case of Democratic Republic of Congo disclosed that private capital positively and significant determine growth.

In Ethiopia, Alemayehu and Befekadu (2002) taking 38 observations from 1960 to 1997 and applying Collins and Bosworth bench mark regression explained that human capital and physical capital contributed about 1.42 and 0.07 for the growth of real GDP per worker. Another paper Netsanet (1997) taking sample periods of 28 years from 1967/68 to 1994/95 and using ECM model got significant effect of human capital on real GDP. Similarly, Seid (2000) taking sample periods from 1960/61 to 1998/99 and using Johansen co-integration approach found that human capital significantly determine real GDP.

Having reviewed the contribution of conventional variables on economic growth, it has paramount importance to look at other related works on

macro and political instabilities variables. The importance of macro stability on the growth of the nation is highly advocated by a number of working paper. For example, World Bank (1991) disclosed that macro stability is a precondition for sustainable growth and recommend countries to spend their time and resource on creating stable economy. Ghura (1995) using pooled time series and cross section data for 33 Sub-Saharan Countries spanning from 1970-90 and employing an instrumental variable technique got negative and significant impact of macro instability, measured by inflation standard deviation, on per capital real GDP growth. Nevertheless, since multi-collinearity problem exist between inflation (INF) and inflation standard deviation (INFSD), the coefficient of macro instability being insignificant when both variables appear in the model at a time. Calamitis et al. (1999) has extended Augmented Solow growth model by including additional determinants apart from conventional ones such as macro and political stabilities among others. Using panel data for a sample of 32 countries from Sub-Saharan Africa, spanning from 1981 to 1997, they demonstrated that both macro stability- higher ratio of deficit to GDP and high inflation standard deviation determine growth negatively, but the latter is insignificant. Iradian (2007) the lower inflation rate and budget deficit of transition economies contributed significantly for growth of per capita income. Country wise study, in the case of Democratic

Republic of the Congo, Akitoby and Cinyabuguma (2004) pointed out that budget deficit negatively associated with economic growth.

Like macro, political instabilities has negative impact on economic growth of a nation. Ghura (1995) and Calamitis et al. (1999) disclosed that, political instability are negatively associated with per capita income of Sub-Saharan Africa. Landau (1986) reported that political instability explained by total successful and attempted coups are negatively associated with growth. In addition, countries which fail to be democratic and the occurrence of war during study period are negatively affect growth. Similarly, Baro (1991) found that political instability, proxied by figures on revolution, coups, and political assassinations, are negative affect economic growth of a nation. He interpreted the result that political instability directly affects property right and indirectly investment and growth. Collier and Gunning (1999) ranked Africa as the most risky continent in the world. Feng (1997) disclosed that, political instability representing by undemocratic way of government change has negatively effect on economic growth.

CHAPTER THREE

3. Macroeconomic Performance in Ethiopia (Descriptive Analysis)

3.1. Overview of Current Policies and Strategies of the Nation

Major economic objective of the current government, EPRDF is to attain sustainable and fast economic growth along with ensuring macro economic stability. The main reason for paying due attention for macro stability is to protect the poor from the burden of higher price and to encourage private savings and long term investment. Again, the government's commitment in achieving its objective of long-run economic growth goes even to the extent of compromising short-run efficient allocation of resources. This implies that the government is committed to attain sustainable long-run growth event at the cost of inefficient allocation of resources in the short term. To this end, policy favors state involvement in the form of producing and providing goods and services when private sector fail to do so, protecting domestic industries from external competition and supporting infant industries using subsidies and

reserving land for private and public investment operation. The government is also highly involved in provision of social and physical capital such as electricity, potable water, health services, schools, roads, telecommunications and the like which has vital role in the process of development. Another policy intervention is to balance regional inequality in income and social and economic facilities (See Ethiopia, 1998 and Ethiopian Economic Association, 1999/2000).

To Design appropriate development strategy, it needs good understanding the context of the nation. One has to note that, the country has abundant land and large segment of population who are engaging in agricultural activities, nevertheless they are performing backwardly. Taking in to account this situation, Agricultural Development Led Industrialization (ADLI) strategy is developed aiming at increasing employment of these two resources (land and labor) and increasing their productivity through capital accumulation. Moreover, technically, labor intensive technology and land augmenting inputs such as fertilizers, improved seeds and the like are essential to raise production and productivity. This implies that, agricultural sector has been paid at most attention in bringing economic growth via improving the productivity of its abundant resources-land and labor (See, EPRDF, 1991, Rahel, 2003, Ethiopian Economic Association, 1999/2000).

ADLI is designed with prime objective of linking both agriculture and industry sectors through back ward and forward linkages. An improvement in the productivity of agricultural sector generates additional earnings to farm holders. An improvement in productivity of agricultural sector and an increment in earning of rural society foster the level of linkage of agricultural sector to non-agricultural sectors through back and forward linkages. Through income effect, rural people purchase agricultural inputs for their farm investment and industrial products for their house hold consumption. Such demand creates market for non-agricultural products and hence the income of urban dwellers will increase. In turn, an improvement in income of urban dwellers will encourage them to purchase higher quantities of agricultural products such as input for industrial products and food products for personal consumption. Such linkages would boom the product of the economy in general and the product of the agricultural sector in particular (MoFED, 2006 and Ethiopian Economic Association, 1999/2000).

3.2. The Structure of Ethiopian Economy

It is well known that agricultural sector is the back bone of Ethiopian's economy, although its performance is disappointing and its techniques of production is backward. Table 3.1 demonstrates the share of value added- agriculture, industry, distributive services and other services in Ethiopia's GDP in three regimes- Imperial (1970/71-1973/74), Derg (1974/75-1990/91) and EPRDF (1991/92-2005/06).

Table 3.1: The share of value added to GDP

Sectors	The share of value added to GDP by period			
	1970/71-2005/06	1970/7-1973/74	1974/75-1990/91	1991/92-2005/06
Agriculture	54.19	62.63	56.24	49.61
Industry	12.17	10.97	12.18	12.49
Distributive services	18.53	17.64	18.55	18.76
Other services	15.09	8.75	13.02	19.13

Source: Source: Ministry of Finance and Economic Development and own computation

During the entire period under review (1970/71- 2005/06), the share of agriculture, industry, distributive services and other services were 54%, 12%, 18.5%, and 15% respectively. As can be seen from the above table, during the last 36 periods, the share of other services in the GDP increase significantly where its share during current government rose to more than double compared to periods

from 1974/75 to 1990/91. Similarly, the shares of industry and distributive sectors show an increment, but such increments are marginal. In contrast, the share of agriculture reduced modestly. This means that the decline share of agriculture sector by 13% (from Imperial to EPRDF) largely accrued to other service, where the share increased by 10.4%. Generally speaking, we can understand from the table that the economic structure of the nation has not changed significantly. Hitherto, the economy of the nation is dominated by agricultural sector, although its share is reduced modestly.

3.3. Economic Growth Performance in Ethiopia

Table 3.2 demonstrates long-run economic growth performance of Ethiopia ranging from 1971 to 2006. During the entire period under review real GDP grew by 3.1%. Disaggregating this long-term growth by regimes, during Imperial regime (1970/71 to 1973/74), Derg period (1974/75-1990/91) and EPRDF (1991/92-2005/06) real GDP grew by 2.7, 1.7 and 4.9 % respectively. In terms of per capita income growth, the table disclosed that during the last four periods of Imperial regime nearly zero per capita GDP growth recorded, which was followed by a negative during Derg (-1.24) and positive during EPRDF (2.74%). In general, in three and half

decades, on an average the per capita GDP of the nation grew merely by 0.6%, implying the living standard of the citizen remains unchanged.

Disaggregating growth of GDP by sector, agriculture, industry, distributive services and other services grew on an average by 2.0, 3.5, 3.2 and 5.6 % respectively during the aforementioned period. As can be seen from the result, while good performance was observed in other services, poor performances was recorded in agriculture.

Table 3.2: Long-run economic growth, 1970/71- 2005/06, in Ethiopia (Period average)

S. No	Macro economic Indicators	Growth of national income by period			
		1970/71-2005/06	1970/71-1973/74	1974/75-1990/91	1991/92-2005/06
1.	National income				
1.1.	GDP	3.1	2.7	1.7	4.9
1.2	Agriculture	2.1	1.3	1.1	3.3
1.3	Industry	3.5	2.3	1.1	6.5
1.4	Distributive services	3.3	4.9	0.6	5.9
1.5	Other services	5.6	7.0	4.7	6.4
1.6	Population	2.6	2.6	2.9	2.1
1.7.	Per capita GDP	0.6	0.07	-1.2	2.7

Source: Ministry of Finance and Economic Development and own computation

One has to note that there is no smooth trend in growth of the sector, where at one period satisfactory growth registered; in other period disappointing performance appears. For example, 13.4, 23.4, 11.2 and 12 % of negative growth rate registered during 1983/84, 1984/85, 1997/98 and 2002/03 respectively. In contrast, significant and positive growth rate observed during 1982/83(12.7%), 1985/86 (14.8%), 1986/87 (17.2%), 1995/96 (13.7%), 2000/01 (10%), 2003/04 (16%), 2004/05 (12.5%), 2005/06 (10.6%). Because of high share of agriculture in the GDP of the country, its instability also transferred to GDP, which makes its growth highly volatile. Similarly, Alemayehu and Befekadu (2002) explained that the growth performance was not only poor and the living conditions become worse but also the growth performance also cyclically fluctuates depending on the performance of agricultural sector, which is in turn determined by weather condition and political instability such as war and undemocratic way of government changes.

Compare economic growth performance of Ethiopia against the performance of other countries, during the same period, the per capita income of HIC, MIC, and SSA grew by 2.2, 2.6 and 0.14 % in the last three and half decades, explaining Ethiopian economy performing lesser than other regions of the world. (See Appendix B1)

Looking into the current government, its economic performance is getting better both in terms of GDP and per capita GDP, when they grew on an average by 4.9 and 2.7 per cent respectively. This performance enables the country to register higher per capita income growth performance than Higher income countries (1.8), LDCs (1.7) and SSA (0.7), but lower than MICs (3.18). World Bank (2005) pointed out that good performance in the last 15 years are largely explained by the existence of peace and stability in relative terms and economic reform from command to market driven economy are among the major factors.

3.4. Saving and Investment in Ethiopia

One major source for financing gross capital formation is gross domestic saving. A number of studies found that there is strong correlation between saving and investment or capital accumulation.¹

Table 3.3: Investment and saving in Ethiopia

S. No	Macro economic Indicators	Period			
		1970/71-2005/06	1970/71-1973/74	1974/75-1990/91	1991/92-2005/06
1.	Investment and Saving				
1.1	Government expenditure (% of GDP)	13.7	8.9	15.4	13.1
1.2	Private expenditure (% of GDP)	78.5	77.1	77.5	80.0
2.1	Gross domestic saving (% of GDP)	7.7	13.9	7.08	6.8
2.2	Gross capital formation (% of GDP)	15.5	14.5	13.3	18.24
2.3.	Resource gap (% of GDP)	-7.8	-0.6	-6.17	-11.4

Source: Source: Ministry of Finance and Economic Development and own computation

Table 3.3 reports that during the entire period under review a country registered gross capital formation of 15.5 % of GDP. In terms of regimes, higher gross capital formation registered during EPRDF (18% of GDP) as opposed to Derg (13% of GDP). The lower GKF during Derg was the result

¹ (See for example Berthelemy and Soderling, 1999 and Hebbel, et al., 1996).

of political instability, where considerable share of recurrent expenditure (40%) and GDP (7.48%) were allotted for military expenses. (See Table 3:4). Compared to other countries, during the entire period the level of GKF as a percentage of GDP is lower than the levels which are registered in HIC, MIC and SSA by 7.2, 10.5 and 4% respectively. (See Appendix B2)

The table also displays that during the entire period under review, on an average gross domestic saving amounted 7.7 % of the GDP. Reading through regimes, on an average about 14%, 7.08%, and 6.8 % of the GDP were saved respectively in three regimes. The report shows that GDS was not only low, but also diminishing. More over, the nation attains the least domestic saving in the world. For comparison, HIC, MIC, SSA registered 22.64%, 26.23% and 19.461% respectively. (See Appendix B2). The reason for low GDS in Ethiopia is due to subsistence economy of the nation, where gross consumption expenditure consists of higher share of the GDP (92.3%) and high level of expenditure during various cultural celebrations. The lower gross domestic saving of the nation would have its own implication in an endeavor of capital formation and accumulation.

From table 3.3, we understand that GKF exceeds GDS by 7.8% during the entire period under review. The gap enlarge through time from 0.5% during the Imperial (1970/71-1973/74) to 11.4% during EPRDF. To put in

other words, GDS cover 96.5%, 51.85% and 37.7% respectively during the three consecutive regimes. The remaining parts are covered different from domestic sources such as aid, loan and remittances. The table it self answers the reason for enlargement of resource gap, partly due to high capital formation which have been taking place in the country, which demand significant resource and partly due to diminishing GDS as a percentage of GDP.

3.5. Public finance in Ethiopia

Table 3.4 depicts public sector performance of the country in terms of revenue, expenditure and deficit. During the period under review, the government expenditure (23.24% of the GDP) exceeds its earnings in the form of revenue and grant (18% of GDP). This causes the country to put in to deficit with an amount of 5.2% of the GDP. The revenue earned was lower during the Imperial regime (10.7%) and higher during Derge (19.7%) and EPRDF regime (18%). Looking at specific government expenditures, the recurrent expenditure consisted of 16% of the GDP, while capital expenditure amounted only 7.1% of the GDP, implying recurrent expenditure absorbed about 70% of the government expenditure. It is only, the remaining 30% used for capital expenditure.

Table 3.4: Government revenue, expenditure and deficit

S. No	Macroeconomic indicators	Period			
		1970/71- 2005/06	1970/71- 1973/74	1974/75- 1990/91	1991/92- 2005/06
1.	Public finance				
1.1	Government revenue and grant (% of GDP)	18.0	10.7	19.7	18.1
1.2	Government expenditure (% of GDP)	23.2	11.9	25.4	23.8
1.3	Recurrent expenditure (% of GDP)	16.1	9.3	18.3	15.5
1.4	Capital expenditure (% of GDP)	7.1	2.6	7.1	8.3
1.5	Defense expenditure (% of GDP)	5.3	1.6	7.5	3.8
1.6	Defense expenditure (% of recurrent expenditure)	30.7	17.6	40.3	23.4
1.7	Fiscal deficit (% of GDP)	-5.2	-1.1	-5.8	-5.7

Source: Ministry of Finance and Economic Development and author's computation

It is important to pay some attention to defense expenditure, as it measures the extent of unrest and political instability which prevails in the country. During the entire period, defense expenditure accounted about 5.3 % of the GDP, where highest share registered during Derg regime (7.5%) and followed during EPRDF (3.8%). Similarly, during the period under review, defense expenditure accounted about 30.7% of the recurrent expenditure. Splitting by period, it accounted 17.6%, 40.3% and 23.4% of the recurrent expenditure respectively during the three regimes. What we realize here is that high defense expenditure incurred during Derg regime was due to political instability explained by civil war and war with Somalia, and during EPRDF owing to boarder conflict with Eritrea.

Chapter Four

4. Model Specification and Estimation Results

4.1. Model Specification

4.1.1. The model

In modeling growth, there is no hard and fast rule that govern how growth process of poor countries should pattern to produce fast and sustainable economic growth. This growth model is a neo-classical version of growth, which is a function of capital accumulation. The task of modeling growth will be manageable when it goes from simple to complex. Hence, to develop appropriate model, which capture the context of the country, I rely on neo-classical growth model. Hence, the model begins with simple production function, where output is the function of capital and labor.

$$Y_t = f (K_t, H_t, L_t) \quad \text{-----} \quad (4.1)$$

Where $Y(t)$, $K(t)$ and $L(t)$ are level of production, stock of capital and number of labor at period t .

The accumulation of capital and active labor force alone do not matter for the growth of the nation. It is the productivity of the input which matters

lot. The productivity of the input in turn is depended on the degree of technology adopted and the extent of existing stock of capital utilized. Based on this concept, a general frame of per capita income as a function of physical capital, human capital, hours of labor utilized and the productivity is given by

$$Y(t) = K(t)^\alpha A(t)L(t)^{1-\alpha} \text{-----} \quad (4.2)$$

Where $A(t)L(t)$ is the number of effective units of labor, α and $1-\alpha$ are share of physical capital, human capital and labor in national income respectively.

Mankiw et al. (1992) by augmenting Solow growth model with human capital, they specified a model of real GDP per active labor force which is given by

$$\ln(Y/L) = \eta_0 + \eta_1 \log(I/GDP) + \eta_2 \log(SCHOOL) + \eta_3 \log(n+g+\delta) + e \text{-----} \quad (4.3)$$

where Y/L is output per labor, I/GDP is the ratio of gross capital formation to GDP, School is a measure of human capital, proxy by the share of active labor force enrolled in secondary school, $n+g+\delta$ is a measure of population growth adjusted by technical growth and depreciation rate, fixed at $n + 0.05$, and e is the error term.

Based on Augmented Solow growth model and taking in to account the context of the country, growth model with explanatory variables-capital

accumulation, macro stability and political stability is developed. From the Augmented Solow growth model capital accumulation variables, I/GDP and SCHOOL are taken. In addition, new variables macro stability the outcome of policy and political stability the outcome of governance are incorporated. Macro stability variables are given by inflation rate and the ratio of budget deficit to real GDP. In terms of politics, stability is defined by taking a dummy of one when the country is engaged in war either internally or externally and zero other wise. Hence, the model is specified as follows,

$$\text{Log (RGDP)} = \eta_0 + \eta_1 \log (\text{PK}) + \eta_2 \log (\text{HK}) + \eta_3 \log (\text{INF}) + \eta_4 \log (\text{BUDDEF}) + \eta_5 \text{dwar} + e \text{-----}$$

(4.4)

Where RGDP is real GDP, PK is physical capital proxied by the ratio of gross capital formation to real GDP, HK is human capital, proxied by secondary school enrollment ratio, INF is inflation rate, which measures level of macro stability, BUDDEF is the ratio of budget deficit to real GDP, which reflects macro stability, dwar is dummy variable for war, which take one when the country is engaged in war either internally or externally and zero other wise. All variables other than dummy for war are written in natural logarithm.

4.1.2. The data

The data series in this analysis covers 36 periods ranging from 1971 to 2006. The data set for this regression analysis are real GDP, GKF, budget deficit, CPI, active labor force, secondary school enrollment, and dummy variable for war. The problem with these series is that data could not be available in ready made form. In the data base of Ministry of Finance and Economic Development (MoFED), one could find three different national income accounts- the old goes from 1960/61 to 1992/93, the middle from 1980/81 to 1998/99 and the latter from 1995/1996 to 20005/06. The latter series is measured at the current price of 1999/2000. This series is advanced, which incorporated additional variables and approaches, which are not considered under the previous two series. Hence, based on latest series, and running back as far as 1970/71 using growth of the two old series GDP, Gross Capital Formation and budget deficit at current price of 1999/2000 are formed. Mathematically, data are transformed using $X_{t-1} = X_t/Y_t * Y_{t-1}$, where X_{t-1} and X_t are transformed real GDP, Gross capital formation and budget deficit at periods t-1 and t respectively. Y_t and Y_{t-1} are old versions of series at periods t-1 and t respectively. Analogically, the researcher has encountered with two different series of consumer price index. One, the old version holding base year at December 1980 goes from 1971 to 2004, while the new version range from 1999 to 2007, which is

constructed at base year of December 2007. To transform the two series in to one taking base year of 2000, so as to make compatible with the base year of national income accounting, first the base year of the two series are debased in to December 2000. The two CPI data are transformed in to one series taking in to accounting new series and return back further following the growth of old series. Inflation is derived from data of consumer price index by taking growth formulae, $(P2-P1/P1)*100$. When inflation rate are transformed in to natural logarithmic form, problem encountered with the negative rate. The reason is negatives signs are not defined in logarithm. Hence, by assigning positive number- one/hundred percent to all series the data are changed in to natural logarithm. The existence of war either internally or externally take dummy, where 1 is assigned for the existence of war and 0 other wise. When we count the existence of war, only serious circumstances are considered.

4.2. Econometric Methodology

Time series econometrics estimates relationship among the variables. The relationship among variables may be short-run or long-run. Short-run relationship among variables occur when the relationship stay only for a temporary period of time. For example, a given interest of variable may be affected by unusual factors, such as shocks which prevail only for short period of time. However, variables form long-run relationships or equilibrium when a group of variables, in the case of multivariate model, move in the same direction despite there are short-run shocks which disturb the relationship only temporarily (Banerjee et al.,1993).

4.2.1. Integration

Stationary time series are series which drift around zero and vary at a constant range.² However, in reality, most macro economic time series are non-stationary in nature, for which they do not have constant mean and variance.³ The problem with non-stationary series in the model is that

² under weak stationary or second order stationary

$$E[x(t_i)] = E(x(t_i+h)) = \mu < \infty,$$

$$E[x(t_i)^2] = E(x(t_i+h)^2) = \sigma^2 < \infty,$$

$$E[x(t_i)x(t_j)] = E(x(t_i+h)x(t_j+h)) = \gamma < \infty$$

³ Generating data using first order autoregressive process, $y_t = \rho y_{t-1} + u_t$ and writing in lag operator form

using $(1-\rho L)y_t = u_t$, and taking a characteristic equation $1-\rho L=0$, the variable is said to be non stationary when the unit roots are less than one ($\rho=1$).

they produce spurious relationship⁴. Hence, to arrive at appropriate long-run equilibrium, which shows exact relationship between the variables, the variables under the model should be stationary. That is to say, even if the variables are not stationary, they have to be differenced d times to get stationary series. If the data generated process is stationary, then the order of integration is 0, which is symbolized by $I(0)$. If stationary series is resulted having differenced once, they are said to be integrated of order 1, which are symbolizing by $I(1)$. (Haris, 1995)

Apart from fear of encountering with spurious relationship, test of integration is essential which simplify the task of co-integration. To come up with co-integration, all series should have the same order of integration, preferably one, $I(1)$. Although there is no restriction to mix different order of integration, say $I(0)$, $I(1)$ and $I(2)$ in multi-variate model, it is not recommended due to complexity in handling them. When integrated order zero are included in $I(1)$ variables, then the number of co-integrating vectors increase. This is because, apart from co-integrating vector/s which is/are generated by the system, each series of $I(0)$ create co-integration by it self. Hence, all together causes to increase the number of co-integrated vector. Again, including $I(2)$ in the system of $I(1)$, the degree of complexity in estimating co-integration increases. To make co-

⁴ where the relationship between the variables shows significant coefficient, but it is not actual relationship, rather than it is the result of contemporaneous correction.

integration exercise more easy, unit root test must assure that all variables which are entered in the system are integrated order one, $I(1)$ ⁵. (Ibid).

4.2.2. Co-integration based on Johansen Maximum Likelihood Approach

Given an equation $Y_t = \beta X_t + U_t$, X_t and Y_t form co-integration, given by $CI(d,b)$, when each variable are non-stationary having d order of integration defined by $I(d)$ and there exists β which causes the error term of the model u_t to have lower order of integration, $I(d-b)$, where b is greater than zero. Generally speaking, the components of the vector $x_t = (x_{1t}, x_{2t}, \dots, x_{nt})$ are said to co-integration when all x_t are integrated of order d individually, and they are an integrated of order $(d-b)$ jointly. Thus, when two or more non-station series are linked to form co-integration, their trends move together (See for example, Harris,1995 and Maddala, 2001).

The rationality for identification of co-integration is essential to understand weather the variables in the model establishes long-run equilibrium relationship. Defining equilibrium in the context of econometrics, it mean that a co-movement among economic variables, where in the long-run they converge, although in the short run they

⁵ Unit root test is an instrument which helps to test the null of unit root/ stationary against the alternative of non-stationary.

diverge due to unexpected circumstances from outside such as shocks. One has to note that disequilibrium will be created due to short-run shocks. Hence, temporally short-run magnitude of the variable will be deviated from the long-run. Errors can be corrected when the movement of either or both variables responses to the magnitude of disequilibrium. (Banerjee et al.,1993)

The widely known approaches of dealing with co-integration are Engle and Granger (1987) Error Correction Model and Johanson (1995) Johansen log likelihood approach. Since the estimation of long-run relationship in this paper is based on Johanson approach, it needs to describe the general frame of the approach. The Johansen co-integration approach begins by setting number of lags for the variables under consideration. Including too many lag is not advisable, since it increase the number of parameters to be estimated. Hence, it will be appropriate to begin from large lag length, then reduced to appropriate lag length which are supported by AIC, SBC and HQ statistics. Having decided the number of lag which is entered into the system, the Unrestricted Vector Auto regression (VAR) can be modeled using

$$X_t = \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + \Phi D_t + \varepsilon_t \quad (4.5)$$

where Π_i is an $(n \times n)$ matrix, X_t is stochastic variable with $(n \times 1)$ vector, D_t is deterministic variables such as constant, trend, dummies which are fixed

and non-stochastic; $\varepsilon_t \sim \text{IN}(0, \Omega)$, $t = 1, 2, \dots, 36$; the parameters, $(\Pi, \Phi$ and $\Omega)$, are unrestricted.

Here, the VAR model is presented in reduced form, where X_t is regressed on its own lag as well as on all variables in the model. Hence, applying OLS yields efficient estimation. However, the estimated residuals ε_t should not have problem of serial correlation and conditional heteroscedasticity, and should hardly deviate from Gaussian White noise. (Johanson, 1995).

Next to VAR model, error-correction model (ECOM) comes. Equation 4.5 can be transformed into vector error correction model (VECM) using

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \psi D_t + u_t \quad (4.6)$$

Where $\Gamma_i = -(I - A_1 - \dots - A_i)$, ($i = 1, \dots, k-1$) are $P \times P$ coefficient matrix, and $\Pi = -(I - A_1 - \dots - A_k)$ are $P \times P$ matrix.

The estimator Γ_i contains short run information about an adjustment to change in X_t , while Π contains long-run information. $\Pi = \alpha\beta'$ is the product of error correction coefficient (α) and matrix of co-integrating vectors (β), where α represents the speed of adjustment on disequilibrium and β is a matrix of long-run coefficient. D_t , representing by dummy variable, it handles short run shocks. The existence of co-integration

relationship in the model is determined by the rank of Π . While determining the rank of Π , three possible outcomes are generated- full rank, where the rank is equal to the number of variables in the system; zero rank, where no rank is identified; and $r \leq (n-1)$, where the number of rank identified are less than the number of variables in the system. The first two ranks are nullified as they do not indicate co-integration relationship in the model. The latter, however, is relevant result which assures the existence of co-integration in the system. (Ibid)

4.3. Estimated Results

Using Augmented Dickey-Fuller (ADF) test⁶, test of the unit-root is conducted for all variables at their level and first difference. The test is conducted at lag one and two by including only intercept and both intercept and trend. The result of the test indicates that the null hypothesis of unit root in all variables at level are rejected, but they are supported at their first difference. Hence, we conclude that all variables which are entered in to the model are integrated order one, $I(1)$. (See Table 4.1)

⁶ Augmented Dickey-Fuller (ADF) test, tests the existence of unit root of the variables at level and first difference with trend and with out trend using

$\Delta y_t = \omega + \omega_1 t + \omega_2 y_{t-1} + \sum \phi \Delta y_{t-1}$, where $i = 1$ to k (with intercept and trend) and
 $\Delta y_t = \omega + \omega_2 y_{t-1} + \sum \phi \Delta y_{t-1}$, where $i = 1$ to k (with intercept, but with out trend)

Table 4.1.: Test for unit roots

Variable	With intercept and trend		With intercept	
	ADF Statistic with Lag length		ADF Statistic with Lag length	
	1	2	1	2
log (RGDP)		-0.06	1.24	2.32
log (PK)	-2.92	-3.75*	-1.65	-2.09
log (HK)	-2.08	-1.84	-1.26	-1.32
log (INF)	-3.44	-2.22	-3.29*	-2.16
log (BUDDEF)	-2.84	-2.99	-2.69	-3.01*
$\Delta\log(\text{RGDP})$	-6.65**	-3.63*	-5.77**	-2.74
$\Delta\log(\text{PK})$	-3.88*	-3.96*	-3.92**	-4.05**
$\Delta\log(\text{HK})$	-4.26**	-2.59	-4.32**	-2.76**
$\Delta\log(\text{INF})$	-6.28**	-3.19	-6.42**	-3.27*
$\Delta\log(\text{BUDDEF})$	-4.9**	-3.98*	-4.83**	-3.77**
Critical values at 1%	-4.25	-4.26	-3.63	-3.63
Critical values at 5%	-3.54	-3.55	-2.94	-2.94

Note the asterisks * and ** denote significance at 1% and 5% levels respectively

The first step in VAR model is to determine the length of VAR. Lag selected based likelihood ratio test of moving from large size to small. Since relatively large lag, say eight, are not be supported for VAR model due to lack of sufficient observation, the task of determining lag length begin from four. Both four and three lags couldn't be significant, however, two become significant, as moving form four to two and from three to two

are supported by AIC, SBC and HQ statistics. Hence, VAR model at two lags are selected.

Table 4.2: Tests for a number of co-integrated vector (PC Give output)

H0:rank<=	Trace test	eigenvalues	probability value
0	89.048	0.89	0.007**
1	47.500	0.71	0.202
2	27.719	0.45	0.249
3	11.149	0.39	0.383
4	3.6606	0.20	0.056

Note that the asterisks ** denote rejection at 1% level.

Test of co-integration vector is conducted using trace statistic (λ trace)⁷.

Table 4.2 reports that the null of no co-integration vector is rejected by λ trace statistics at 1% significance level. In contrast, since one co-integration vector is not rejected by the statistic, it can be easily concluded that only one co-integration vector exists.

⁷ The existence of co-integration are tested using trace statistic and maximal eigen value (λ -max statistic).

Trace statistic is calculate using

$$\lambda trace = -2 \log(Q) = -T \sum_{i=r+1}^n \log(1 - \lambda_i)$$

This trace statistic tests the null hypothesis of there are $p \leq 0$ co-integration vector against the alternative $p > 0$.

Table 4.3: Results of Johansen's Co-integration analysis (PC FIML output)

Panel (a): Standardized β' value

β'	Log(R GDP)	Log(PK)	Log(HK)	Log(INF)	Log(BUD DEF)	Dwar
β_1'	1.0	-0.460	-0.044	-1.46	0.063	0.06
β_2'	-0.21	1.0	-0.61	1.40	0.35	0.071
β_3'	0.83	9.2	1.0	16.2	-1.3	1.57
β_4'	0.81	-0.24	0.34	1.0	0.17	0.49
β_5'	3.39	-32.1	-27	-12.84	1.00	5.97

Panel (b): Standardized α - coefficients

Variables	α_1	α_2	α_3	α_4	α_5
Log(RGDP)	-0.52	0.06	0.0034	-0.064	0.00048
Log(PK)	-0.65	-0.34	-0.048	-0.034	0.0045
Log(HK)	0.23	0.37	0.017	-0.046	0.003
Log(INF)	0.91	0.08	0.005	-0.043	-0.001
Log(BUDDEF)	0.21	-1.65	0.158	-0.25	0.00006

Diagnostic tests

Diagnostic tests:

Vector AR 1-2 $F(50, 30) = 1.4991 [0.1189]$

Vector normality $\chi^2(10) = 10.691 [0.3821]$

Vector hetero test: $\chi^2(315) = 312.00 [0.5372]$

Note: Number of lags used in the analysis are two, variables entered unrestricted are constant and Trend and variable entered restricted is Dwar.

The report of different diagnostic test show that the problems of serially correlation, normality and heteroscedasticity are not detected.

Since only one co-integration vector is determined, the first row of α and first column of β are relevant for the study. Hence all the tests and analysis are conducted on these two vectors. Given $\Pi = \alpha \cdot \beta$, the selected vector can be stated as follows:

$$\begin{bmatrix} -0.52 \\ -0.65 \\ 0.23 \\ 0.91 \\ 0.21 \end{bmatrix} * \begin{bmatrix} 1 & 0.46 & -0.044 & -1.459 & 0.062 & 0.059 \end{bmatrix}$$

The result of loading coefficient (α), in table 4.3, Panel (a), shows that error correction term (ECT) inserts strong long run feed back effect on Real GDP (logRGDP) and Physical capital accumulation (logPK). This can be seen their speed of adjustment towards long-run equilibrium is as high as 52 and 65 per cent respectively. The vector of co-integration indicates that the long run elasticity of real GDP (logRGDP) with respect to physical capital (logPK), human capital (logHK), and macro stability, measured by log(INF) rate is positive; but negative with respect to another measure of macro stability log (BUDEDF) and political instability (Dwar). All determinants have got the hypothesized coefficient, but log(INF).

Noting only at the signs of the coefficient, it is too hasty to conclude on the direction of long-run relationships. To arrive at the conclusion two tests are needed- test for weak exogeneity of variables, so as to know causality

among variables and test for zero restrictions on α coefficient, so as to measure level of significance on the long-run parameters.

Table 4.3: Test for Zero Restrictions on α coefficients (Test for weak exogeneity)

α -Coefficients	Log(RGD P)	Log(PK)	Log(HK)	Log(INF)	Log(BUD DEF)
LR test of restrictions: Chi ² (1)	13.61	1.76	0.43	2.16	0.017
Probability value	0.0002**	0.1847	0.5113	0.1142	0.8952

The asterisks** and * denote rejection at 1% and 5% significance level.

Test for weak exogeneity is conducted by putting zero restriction on each α coefficients. Results of chi² with one degree of freedom and their probability value are summarized in table 4.3. The table depicts that weak exogeneity is rejected only for real log(RGDP) at 1% significance level, but not for the rest of the variables, indicating they are weak exogenous with respect to the endogenous variable log(RGDP). Thus, long-run relationship is established by entering log(RGDP) in to endogenous column, while limiting log(PK), log(HK), log(INF), log(BUDGETDEF) and Dwar as exogenous variables.

Thus, the long-run coefficient (elasticity) is stated as follows:

$$\text{Log(RGDP)} = 0.460\text{log(PK)} + 0.044\text{log(HK)} + 1.459 \text{ log(INF)} - 0.062\text{log(BUDDEF)} - 0.059\text{DWAR} \text{-----} (4.7)$$

Table 4.4: Test for Zero Restrictions on the Long-run Parameters

β -Coefficients	Log(RGDP)	Log(PK)	Log(HK)	Log(INF)	Log(BUD DEF)	Dwar
LR test of restrictions: Chi ² (1)	21.26	9.37	0.50	16.81	3.52	4.57
p-value	[0.00]**	[0.0]**	[0.48]	[0.00]**	[0.05]*	[0.03]*

The asterisk ** and *denote significance at 1% and 5% level

Having defined long-run relationship of the model, the next job is to conduct test of significance on the long-run parameters. To test the significance of long-run parameters, zero restriction is imposed on each coefficient of the variables. The results of Chi²(1) and probability value under each restrictions are summarized and presented in table 4.4. The dependent variable log (RGDP) create long-run and significant relationship with respect to log(PK) and log(INF) at 1% level and with log(BUDDEF) and dwar at 5%. But, its relation with log(HK) is insignificant.

The long-run elasticity of $\log(\text{RGDP})$ with respect to $\log(\text{PK})$ is 0.46, implying one per cent increase in stock of physical capital produces 0.46 per cent increment in output. This result coincides with the findings of Alemayehu and Befekadu (2002) for the case of Ethiopia, Mankiw et al. (1992) for the case of 96 non-oil producing countries, Iradian (2007) for the case of transition economies and Flen (1997) for the case of 96 countries from developing and developed world. However, human capital $\log(\text{HK})$ does not determine real GDP significantly. Probably the reason is due to high level of illiteracy, where the net enrollment ratio at primary and secondary school are 37.8% and 14.5% respectively. The illiteracy rate is also significant in rural area where about 50% of the annual production are obtained, implying they are produced by illiterate labor force where they are reluctant to adopt new methods and technologies.

What unexpected result is on the sign and magnitude of measures of macro stability- inflation rate $\log(\text{INF})$, which is 1.46. This magnitude is not only positive, but large. Perhaps the reason is due to an increase in price of commodities continuous in most periods of the observation encourage investors to undertake investment expecting their products will be priced higher tomorrow than today. This result is diverged from the findings of Ghura (1995) for the case of SSA (-0.142 to -0.16) and Iradian (2007), for the case of transition economies (-1.57). In contrast, another

indicator of macro stability-Log (BUDDEF) has got expected sign (0.063) and significance at 5%. Similar result is confirmed by Calamitsis, et al (1999) for the case of 32 countries from SSA, Iradian (2007) for the case of transition economies, and Akitoby and Cinyabuguma (2004) for the case of Democratic Republic of the Congo. The long-run impact of budget deficit on GDP of the country is obvious, where the revenue of the government is too low to cover the planned expenditures. Hence, to fill the resource gap the government relay on external sources which are available at higher interest rate. Although, the credit meets the ultimate purpose, it has long-run consequences where the amounts of debt are compounded yearly and at the end of the day they are repaid from its real GDP. Hence, taking in to account both measurement of macro stability $\log(\text{INF})$ and $\log(\text{BUDDEF})$, there is no strong evidence which assures the existence of macro instability in the long-run.

The long-run elasticity of real out put with respect to political instability of the country is negative (-0.059) and significant at 5% level. This result converges with the estimation of Calamitsis et al. (1999) for the case of 32 SSA (-0.161), Flen (1997) for the case of 96 developed and developing countries (-0.026), Baro (1991) for the case of 98 developed and developing countries (-0.03). Qualitatively, Alemayehu and Befekadu (2002) and Alemayehu (2004) stated that the politics of the country is highly instable,

which is explained by undemocratic transfer of power, civil war, infringement of human rights, war with neighboring countries, where all together hampers economic growth in the country.

The VECM that have been analyzed before considers only the long-run relationship. To exhibit full picture, the model should accommodate short-run dynamics too. Using estimation of long-run coefficients, error correction term (ECT) is obtained using,

$$ECT = \log(RGDP) - 0.46\log(PK) - 0.044\log(HK) - 1.46\log(INF) + 0.062\log(BUDDEF) + 0.059DWAR \text{ ----- (4.7)}$$

In modeling short-run dynamics, all exogenous variables which are considered in the long-run are entered in to the right hand side of the model by differencing and lagging one year. When they are differenced they become stationary, and hence they are I(0). In addition, ECT, which is derived from long-run coefficients, enters in to the model by lagging one year. The rationality for lagging a year is to show how the time path matter to correct errors. According to Hendry and Juselius (2002), economic agents taking all available information at period t-1, they rationally undertake action at period t, which helps to minimize errors. Having specified short-run dynamics, estimation results are obtained through unconstrained ordinary least square.

Why OLS techniques has been employed in short-run.

Table 4.5: Result for Vector Error Correction Model

Explanatory variables	Coefficient	Std. Error	t-ratio
Constant	15.04	3.51	4.28
DlogRGDP_1	0.12	0.21	0.58
DlogPK_1	-0.20	0.058	-3.55
DlogSHOOL_1	0.18	0.11	1.65
DlogINF_1	-0.57	0.18	-3.06
DlogBUDDEF_1	0.029	0.02	1.45
Dwar	-0.04	0.02	-2.05
ECT_1	-0.60	0.14	-4.27
Diagnostic tests AR 1-2 test: $F(2,19) = 4.3589 [0.0277]^*$ ARCH 1-1 test: $F(1,19) = 0.10034 [0.7549]$ Normality test: $\text{Chi}^2(2) = 4.5647 [0.1020]$ RESET test: $F(1,20) = 0.0038622 [0.9511]$ $R^2 = 0.50$			

The diagnostic tests- auto regressive conditional heteroscedasticity, normality, and Ramsey's RESET are not detect statistical problems. But, Auto Regressive (AR) test finds serial correlation problem at 5% significance level.

The estimated result depicts that one year lagged change in physical capital negatively and significantly determine for change in real GDP. Presumably this result occurs due to inventory adjustment, where agents

adjust their future investment taking in to account their past inventory. When more inventories were accumulated in the past, they adjust their inventory by reducing future investment. Hence reduction investment negatively affects real GDP.

One year lagged change in log (INF) yields negative impact (-0.58) on change in real GDP, indicating the existence of macro instability in short term and hence negatively determine change log(RGDP). This can be understood from the experience of last three regimes, when new party come to power, it criticizes the existing policies and strategies and form new ones with out drawing lesson from past. To specify, the Derge regime by discarding the existing market economic policy had introduced command drive economic policy. Following government transfer from Imperial to Derge, macro instability created for few years. Again during the eve of Derge and eary period of EPRDF serious economic instability had manifested. This is an indication of negative impact of macro instability on the economy during short-run. Analogically, Dwar negatively determine change in real GDP with a magnitude of -0.048 indicating political instability curtails the production of the economy.

One year lagged error correction term (ECT-1) has significant impact on change in real GDP at 1% level. Having a coefficient of -0.60, ECT-1

approximate the long run speed of adjustment for the alpha vector as depicted in table 4.3. The coefficient indicates that there is high correction for divergence of RGDP from equilibrium, implying economic agents taking past experience they correct about 60 per cent of errors in one year and the remaining 40% in the next year.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATION

The current government, EPRDF, is pursuing dual economic objectives of attaining fast and sustainable economic growth and creating stable macro economic system. The former is aimed to serve as a means for improving standard of living and the latter is to protect the poor against higher price and to encourage private to save and to undertake long term investment. These dual objectives are sought to be realized in the frame of market oriented economic system while giving room for government intervention where deemed necessarily. In line with this general policy, the government is pursuing ADLI strategy, where it is expected to promote production of the economy in general and production of agricultural sector in particular via improving the productivity of abundant resources-land and labor and by linking agriculture to non-agricultural sectors backwardly and forwardly.

In the last 36 periods (1971 to 2006) the country's economic structure does not show significant change, as it can not be free from the dependence of agricultural sector. During these periods the economy performed poor as can be observed from its end result, where the per capital real GDP grew

on an average by 0.6% implying the welfare of its people do not changed. Even to the worst, the per capita income of agricultural sector declined by 0.5 %. Besides dismal performance of real GDP, its production is highly volatile, which is largely explained by volatility nature of agriculture. The volatile in agricultural products are caused due to dependence of the sector on the fragility of nature, particularly rainfall.

During the period under review, the country perform lower in per capita real GDP than what other regions- HIC (2.17), MIC (2.6) and SSA (0.14) achieved. Nevertheless, recently (1991/92 to 2006/07), there is a sign of improvement, where it grew by 2.7 per cent on average during which the economy performer better than what HIC (1.8), LDCs (1.78) and SSA (0.7) did.

In the last three and half periods, GKF consisted 15.5% of the GDP, which lagged behind HIC, MIC and SSA by 7.2, 10.5 and 4% respectively. The reason for low GKF in Ethiopia is due to subsistence economy of the nation, where gross consumption expenditure consists of higher share of the GDP (92.3%) and high level of expenditure during various cultural celebrations. Another reason is due to political instability, where defense absorbed significant share of resources, where during Derge and EPRDF regimes, it consisted 7.5 and 3.8% of the GDP implying resources which

could use in capital formation are channeled to unproductive and destructive activities.

The model is specified by relying on capital accumulation based growth model of neo-classical and extend it by incorporating macro and political stability variables. Before estimation, unit root test is conducted to rescue results from spurious problem. The test assures that all variables which are entered in to the model are integrated order one, $I(1)$. Following Johanson log likelihood approach, firstly lag length is determined based on lag selection criteria moving from four to two. Next, test of co-integration is conducted using trace statistic (λ trace), where the statistic rejects the null hypothesis of no co-integration, but strongly support the existence of one co-integration. Through the estimator Π , long-run information are disclosed, where the result of loading coefficient (α) portrays that Real GDP and Physical capital accumulation have got high speed of adjustment -52 and 65 per cent respectively towards the long-run equilibrium.

To understand the causal relationship and significance of the long-run coefficients, tests of weak exogeneity and significance has been conducted. The estimated result demonstrates that the long-run elasticity of real GDP with respect to physical capital is 0.46 and significant at 1% level, which is coincides with the results of Alemayehu and Befekadu (2002) for the case

of Ethiopia; Mankiw et al. (1992) for the case of 96 non-oil producing countries; Iradian (2007) for the case of transition economies and Flen (1997) for the case of 96 countries from developing and developed world.

In this study, strong evidence that assure the existence of macro instability in the long-run is not found. This is because, on the one hand one major measurement of macro economic stability- $\log(\text{INF})$ yields positive impact on real GDP, on the other hand, another measurement of macro instability- $\log(\text{BUDDEF})$ generates negative impact on real GDP. However, there an evidence for the existence of macro instability in the short-run as indicated by negative impact of one year lagged change inflation on one year lagged change real GDP.

Political instability adversely affects production of the economy by a magnitude of 0.059 in the long-run and by a magnitude of 0.58 in the short-run at 5% significance level. Similar result is found in Calamitsis, et al (1999) for the case of 32 SSA , Flen (1997) for the case of 96 developed and developing countries , Baro (1991) for the case of cross section of 98 developed and developing countries.

By drawing lessons from this study, three policy implications are identified which needs government intervention. Although there is weak

evidence which support the existence of macro instability, there is evidence for unsatisfactory performance of fiscal policy explains by negative impact of budget deficit on real GDP. To solve problem of budget deficit, the government needs to generate sufficient revenues which reduces its reliance on external sources. To this end, it is necessary the government to limit its intervention in economic activities where they could be done by private sector. In addition, the government has to promote private enterprises and attract foreign investors, which are best source of government revenue. More over, the government has to improve its efficiency of tax collection.

Having understood the negative consequence of political instability in the economy of the nation, the government should pay significant attention to create stable political system. To this end, the government, the citizen, the civil societies has to create democratic government system, which realize civil and political liberty, avoid internal conflict and war, minimize conflict with external countries, and practice good governance.

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Appendices

Appendix A: Definition, Measurement and Source of Variables under the model

There is no ambiguity with the definition of the variables, which are considered in the model. The problem is with the measurement of the variables. As there is no perfect and direct measurement of variables, it is compulsory to use proxy methods. Hence, of different alternative measurements used by different scholars, the one which are more appropriate to Ethiopia are selected and described in the table as follows,

Variable	Definition	Measurement	Source
RGDP	total product which are produced in the country in a specific period of time in a year	Real gross domestic product at constant price of 1999/2000.	Ministry of Finance and Economic Development (MoFED)
PK	the stock of physical capital which are accumulated through time	Proxied by the ratio of gross fixed capital formation to real GDP at constant price of 1999/2000	Ministry of Finance and Economic Development (MoFED)
HK	is the number of qualified, skilled and healthy productive labor force.	Proxied by the ratio of student who are enrolled in secondary school to working age population.	Ministry of Education and Central Statistical Agency
INF	The rate of inflation, which is the a measure of macrostability	Proxied by growth of consumer price/ index/ inflation rate	National Bank of Ethiopia
DEF	The ratio of real	Proxied by The ratio	Ministry of Finance

Variable	Definition	Measurement	Source
	deficit to real GDP, which a measure of macro stability	of real deficit to real GDP	and Economic Development (MoFED)
dwar	Incidence of war in home or outside home.	One for existence of war either internally and externally and zero other wise	National Bank of Ethiopia

Appendix B

Economic Performance of different regions of the world

Appendix B1: Economic growth performance of different regions of the world

S. No	Economic indicator	Period			
		1971-2005	1971-1974	1975-1991	1992-2006
1.	GDP growth rate				
1.1	HICs	2.9	4.2	3.0	2.5
1.1.1.	Japan	2.9	4.9	3.9	1.16
1.1.2.	Korea, republics	6.9	7.9	8.1	5.3
1.1.3.	Hong Kong	7.2	8.2	7.7	4.41
1.1.4.	Singapore	7.4	10.6	7.4	6.39
1.2.	MICs	4.1	4.2	2.7	2.9
1.3	LDCs	3.3 ⁸		2.0 ⁹	4.5
1.4.	Sub-Saharan Africa	2.8	5.0	2.1	3.1
2.	Per capita GDP growth rate				
2.1.	HICs	2.1 6	3.1	2.2	1.7
2.1.1.	Japan	2.3	3.5	3.2	0.9
2.1.2.	Korea, republics	5.7	5.8	6.7	4.5
2.1.3.	Hong Kong	4.7	5.8	5.9	3
2.1.4.	Singapore	5.1	8.6	5.3	3.9
2.2.	MICs	2.6	4.02	1.86	3.18
2.3	LDCs	0.7 10		- 0.4 11	1.73
2.4.	Sub-Saharan Africa	0.1 3	2.3	-0.8	0.66

Source: Source: World Development Indicator, 2007 and own computation

⁸ range from 1980-2005

⁹ Range from 1980-1991

¹⁰ It ranges from 1981 to 2005

¹¹ It ranged from 1981 to 1991

**Appendix B2: Gross domestic saving and Gross Capital formation of
different regions of the world**

S. No	Economic indicator	Period			
		1971-2005	1971-74	1975-1991	1992 - 2005
1	Gross domestic saving (% of GDP)				
1.1.	HICs	22.6	26.0	22.9	21.2
1.1.1.	Japan	31.5	38.4	32.5	27.9
1.1.2.	Korea, republics	30.6	18.7	30.1	34.6
1.1.3.	Hong Kong	32.0	29.5	33.3	31.2
1.1.4.	Singapore	41.0	25.4	39.6	47.2
1.2.	MICs	26.2	23.6	26.3	26.7
1.3	LDCs	7.8	6.2	6.1	10.3
1.4.	Sub-Saharan Africa	19.4	22.4	20.7	17.0
2	Gross capital formation (% of GDP)				
2.1	HICs	22.7	25.8	23.2	21.0
2.1.1.	Japan	30.0	31.1	31.1	26.4
2.1.2.	Korea, republics	31.3	21.2	31.4	32.6
2.1.3.	Hong Kong	26.9	26.1	27.5	27.1
2.1.4.	Singapore	36.6	41.6	41.0	29.7
2.2.	MICs	26.1	23.9	26.5	26.1
2.3	LDCs	16.6	11.4	15.3	19.6
2.4.	Sub-Saharan Africa	20.	23.8	21.3	18.2

Source: World Bank Development Indicators 2007 and own computation

Declaration

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

Declared by:

Name: _____

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Confirmed by Advisor:

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Signature: _____

Date: _____

Place and date of submission: Addis Ababa University, July, 2008