



ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

**THE IMPACT OF FOREIGN CAPITAL INFLOWS ON
ECONOMIC GROWTH, SAVINGS, AND INVESTMENT IN
ETHIOPIA**

BY

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**THE IMPACT OF FOREIGN CAPITAL INFLOWS ON
ECONOMIC GROWTH, SAVINGS, AND INVESTMENT IN
ETHIOPIA: A *VECTOR AUTOREGRESSIVE APPROACH***

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ABBREVIATIONS

ADF-Augmented Dickey Fuller test

AIC- Akaike information criteria

ARCH- Auto Regressive Conditional Heteroscedasticity

EG- Engle – Granger

FCI- Foreign Capital Inflow

GDP- Gross domestic product

GNP- Gross national product

HQ- Hannan-Quinn statistics

LDCs- Less developed countries

MoFED- Ministry of finance and economic development

NBE- National Bank of Ethiopia

ODA- Official development assistance

OLS- Ordinary least square

SB- Schwartz-Bayesian criteria

USD- United states dollar

UNDP- United nations development program

VAR -Vector Auto Regressive

VECM -Vector Error Correction Model

WB- World bank

ABSTRACT

This study analyzes the effect of Foreign Capital Inflow (FCI) on the economic growth, saving and investment in Ethiopia for the period 1974/75 to 2008/09. Empirical analysis has been performed by using Johansen Maximum likelihood method. The main result shows that foreign aid has a significant and positive effect on economic growth in the long run as well as in the short run. It has also positive and statistically significant effect on investment in the long run. However, aid has insignificant and negative effect on saving in the long run while it has significantly negative influence in the short run. The net FDI has negative impact on economic growth in both long and short run where as Foreign direct investment has positive and statistically significant effect on saving both in the long and short run. The result further reveals that net FDI has insignificant but positive effect on investment. In the context of policy recommendations, it is clear that aid contributes positively to economic growth both in the long run and short run. So, Ethiopia should focus on aid for the sake of economic growth. In addition, attention should be given in improving the political environment so as to raise the aggregate investment.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The various form of inflow of foreign capital (loans,FDI,grant and portfolio) was welcome in developing countries to bridge the gap between domestic saving and domestic investment and therefore, to accelerate growth[Chenery and Strout(1996)]. Some others have been challenged the traditional view that foreign aid impedes domestic savings growth and mobilization and hence economic growth. Much attention have been paid in past three decades in examining the relationship between foreign capital inflows and domestic saving. The main purpose of these studies have been determined whether in less developed countries foreign capital inflows and domestic saving are complementary or substitute. However,there is acontroversy at theoretical and empirical levels, over the effects of foreign capital on both national saving and economic growth.

In Ethiopia capital inflow has been started around 1950s, during the imperial era, 60-70 percent public sector investment programmes commend themselves to aid givers.(Imperial Ethiopian Government,1968) ,i.e, major part of the public sector investment program was covered by the capital inflow in the form of aid. During the period(1952-1974) Ethiopia obtained 1021.60 million Birr grant and 626 million Birr foreign loan, totally 1647.60 milion capital inflow in the form of aid.

During post 1974, Derg formulated a Ten Year Perspective Economic plan (1985-1994) with an unrealistic expectation of receiving foreign aid to finance more than half of planned investment

(World Bank 1987). During the period (1975-1991) the country obtained Birr 5526.87 million grant and Birr 5658.30 million foreign loan.

In post 1991 period there exists significant increase in grants and loans, mainly due to the economic policy of EPRDF, significant amount of loans and grants is obtained for stabilization, rehabilitation, reform and sector development programs, and a number of donors have joined the support program.

In addition to grants and loans foreign resources in the form of Foreign Direct Investment (FDI) was welcoming to raise the aggregate investment and hence growth. Imperial regime believed as it would complement its attempt at development. So, it is understandable that when government launched its industrialization program in 1945, there was the simultaneous issue of the first investment policy to attract foreign investors in to the country. However, the first step did not come in the form of legislation, but as a statement of intent. The first legal document was the statement of policy for the encouragement of foreign capital investment in Ethiopia (Imperial Ethiopian Government, 1950) which provided a five- year tax holiday, duty free importation of machinery, and remittance of profit.

In 1953, the government legislated the marine industry proclamation to encourage registration of ships under Ethiopian law, with complete tax exemption save for a token registration fee and annual tax (Imperial Ethiopian Government (IEG, 1953).

In 1954, the government, with the objective of enhancing the expansion of agricultural and industrial investment, exempted imports of any and all machinery and implements from all duties

and taxes (IEG,1954). In 1963,the government launched its second five year development plan (IEG,1962) with a total investment bill of Birr 2.7 billion, with the objective of shifting the structure of the economy from agriculture to industry, which was expected to result in annual GNP growth rate of 4.6 percent and a per capitagrowth rate of 2.8 percent.

The second five-year plan was launched with the back ground of frustrated expectations of foreign capital inflow during the first five-year plan(1958-62). To insure adequate inflow of foreign esources,the government proposed to intensify the drive to mobilize foreign resources by expanding the range of existing benefits,previleges and exemptions. (Second Five Year Development Plan-SFDP, 1962)

Generally, in all three regimes, Ethiopia has been receiving capital inflows in order to fill resource-gaps so as to achieve desired economic objectives.

1.2 Statement of the Problem

The ultimate goal of any country is to achieve sustainable economic development. But economies of Least Developed Countries (LDCs) are characterized by balance of payment deficits, which arise from the general structure of the econmy as well as international economic relations. This is because LDCs are dependent on the primary production for their foreign exchange requirements. More over, when saving is considerd, the rate of saving in LDCs is not sufficient enough to finance the necessary level of investment. So it has been very difficult to get in to what is known as sustainable economic growth and development.

Ethiopia, being one of the less developed countries in the world is characterized by low level of saving and investment activities, that negatively affect economic growth in the country. Therefore, to fill the saving and investment gap that helps to achieve sustainable growth and development the country is in need of foreign capital from developed countries.

Though capital inflow has its own importance in some aspects, it is in question that whether capital inflow assists generally LDCs and particularly that of Ethiopia in accelerating economic growth by positively affecting saving and investment in the country.

Some of the questions need explanation on the impact of capital inflows on economic growth, savings and investment in Ethiopia are:-

- Does Ethiopia use the capital inflows to avoid the bottlenecks of economic growth?
- Do capital inflows positively affect economic growth, savings and investment in Ethiopia?

Such and similar questions are not as easy as to pose them to provide answers. Generally, this paper tries to explain whether capital inflow has a positive and significant impact on economic growth, savings and investment in Ethiopia i.e, whether it has significantly helped the country in financing the saving-investment gap, raising the aggregate investment and accelerating economic growth.

1.3 Objectives of the Study

The general objective of this study is to examine the impact of capital inflows on savings, investment and economic growth.

To achieve the above broad objective the study has the following specific objectives:-

- *To examine uses of capital inflows to the extent that they tend to finance saving investment gaps*
- *To look whether inflows are associated with higher investment, and with faster economic growth*
- *Empirically investigate the relationship among savings, investment and economic growth in Ethiopia.*

1.4 Data and Methodology

For the purpose of analyzing the impact of foreign capital inflow on economic growth, savings and investment in Ethiopia, secondary data source, from 1974/75 to 2008/9, is used. The major data sources for the problem under investigation are publications of National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED) and Central statistics Authority (CSA) of Ethiopia. Besides, IMF CD-ROM and WB CD-ROM, were used. In order to achieve the objectives mentioned above, three equations (namely saving, investment and growth equations) are specified and estimated by using VAR Model.

1.5 Hypothesis:

As growth theories suggested, an increase in capital inflows would lead to a faster economic progress because it is used to fill the resource gap. For instance, if capital inflow is used to fill the saving gap, i.e., the saving rate increases, and there would be higher capital accumulation (investment) in the country. This higher rate of investment would then leads to a faster economic growth. Moreover, capital inflow would also increase the aggregate investment in the country which leads to economic growth. That is, positive and significant impact is expected.

1.6 Significance of the Study

Most of the studies carried out so far in this area have dealt with the impact of foreign capital inflow on economic growth or saving separately both in the developed and less developed countries over the years. Therefore, the study aims to assess the impact of foreign capital inflow on economic growth, savings and investment in Ethiopia. Moreover, the issue of capital inflow is still on debate and this paper may give a clue for further investigations on this area.

1.7 Scope and Limitation of the Study

The study would explore the possible ways through which foreign capital affects economic growth, savings and investment. To achieve this objective, the period range from 1974/75 to 2008/09 is chosen. This period is chosen based on availability of data.

Although this study attempts to shed on the impact of foreign capital inflow on growth, savings and investment in Ethiopia, yet it suffers from certain limitations. The first problem arises from the problem of inconsistent in data by different institutions. Even data arises from the annual reports of the National bank of Ethiopia shows different figures for the same year. The other problem is that, due to the lack of data the foreign portfolio investment variable is excluded and FDI was used instead as a proxy for foreign private investment.

1.8 Organization of the Paper

The paper is structured as follows. The following section (section two) summarizes in brief the macroeconomic performance and foreign capital in Ethiopia. Theoretical and empirical literature reviews are presented in section three. Section four discusses the model and methodology whereas section five presents estimation results. Finally section six concludes and provides policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1 Capital and Developing countries

Reflections on the problems of developing countries led to the identification of insufficient capital stock as the cause of their low income. Among economists who made such prognosis, the most notable are Singer and Nurkse. According to Singer (1949) the less developed countries suffer from “a dominant vicious circle of low production no surplus for economic development – no tools and equipment—low standard of production”. An underdeveloped country is “poor because it is poor”. According to Nurkse (1953), the problem of these countries was that there is small capacity to save resulting from low level of real income. The low level of real income is a reflection low productivity, which in turn is due largely to the lack of capital. The lack of capital is a result of small capacity to save.”(Nurkse 1953).It is evident that to break out of this vicious circle the country must increase its savings. “The country’s incremental ...is the crucial determinant of growth...the general problem is to maximize the marginal saving ratio, that is, the proportion of any increment in income that is saved .(Nurkse ,1953 :142) . Evsey Domar, one of the pioneers of growth economics, enunciated that “in under developed countries it is clearly capital rather than labor that is the factor limiting growth (see Domar, 1957).Given the need for larger capital stock and inadequacy of domestic saving to finance investment that would make this possible, it was concluded that domestic saving should be supplemented by foreign resources.

This shifted the issue from whether external resources are useful to developing countries to how much was sufficient to help them realize their growth potential. This issue gained popularity in the late 1950s and 1960s, and developed in two directions — the supply side and the demand side. (Befekadu,1992)

The supply side of the volume of foreign resources required by the developing countries was initiated and propagated by the UN and its specialized agencies such as UNCTAD as well as private bodies such as the Pearson Commission. UN (1951) as cited by Befekadu (1992). These organizations and commissions, both for reasons of equity (bridging the huge and growing gap between the rich and the poor countries) and economics (a richer country is a better trading partner), aimed for a maximum feasible volume of foreign resources. The target ranged from 0.7 per cent of the national income of Pearson Commission to the 1 per cent of national income of the UN and its specialized agencies (Ibid). While this approach advocated an increase in the volume of resource flows, it nevertheless suffered from a number of problems (Befekadu, 1992). First, the recommended level included all resources without distinction between the different types of flows such as aid, direct and portfolio investment and credit from all sources. Neither did it deal with the terms and conditions under which these resources were to be provided, including the thorny issue of whether they were to be tied or untied. Second, the proposals did not have anything to say on the distributional mechanism, i.e., how, if the targeted amount is made available, the amount is to be distributed among the needy countries, and who should have the responsibility of doing so. An approach that paralleled the supply side and became more popular on the strength of its pragmatism is the demand-determined foreign resource requirement (Rodan (1961) & Hoffman (1960) as cited in Befekadu (1992). Based on purely economic criteria, this approach identifies the resource needs of developing countries on an individual basis, given each country's absorptive capacity and the constraints that limit the productive utilization of its resources (Ibid). This method of determining foreign resource requirements has been justified on a number of grounds, without materially affecting the final outcome UN (1951), (Rodan (1961) & Hoffman (1960) as cited in Befekadu (1992). One of the earliest justifications was that since the developing countries did not have the necessary volume of savings, foreign resource inflow could supplement domestic resources to increase investment and thus make possible rate of growth that would be higher than that attainable in its absence. (Ibid)

2.1.2. Importance of the Foreign Capital Flows

The purpose of the flow of capital to underdeveloped countries is to accelerate their economic development up to a point where a satisfactory growth rate can be achieved on a self sustaining basis. Capital flows in the form of private investment, foreign investment; foreign aid and private bank lending are the principle ways by which resources can come from rich to poor countries. The transmission of technology, ideas and knowledge are other special types of resource transfer.

When discuss about the constraints of economic growth, one should refer to the saving gap and foreign exchange gap of the country. A net capital inflow contributes to the filling of both the gaps. The capital flow of countries increases due to the amount of resources available for capital formation above what can be provided by domestic savings. It also raises the recipient economy's capacity to import goods: capital flow provides foreign exchange and eases the problem of making international payments.

Countries in early stages of development assumed to have a primary need for technical assistance and institution building and only limited need for capital assistance chiefly for infrastructure projects. As the need for capital assistance increases, the need for technical assistance shifts from general to more specific skills. The gradual increase in domestic savings and a growing capacity to attract private and other conventional foreign capital on non-concession ally term will progressively reduce the need for foreign aid.

The assumption that the need for foreign capital is temporary and limited is underlined by several recipients in Latin America elsewhere and expected attain rapid development in ten to fifteen years but it is recognized that in Asia and Africa, the need for capital flows will remain for a much longer time. Theoretical and empirical research on the role of foreign capital in the growth process has generally yielded conflicting results. Conventionally, the two-gap approach justifies the role of foreign capital for relaxing the two major constraints to growth (Chenery and Bruno, 1962; McKinnon, 1964). In the neo-classical framework, however, capital neither explains differences in the levels and rates of growth across

countries nor can large capital flows make any significant difference to the growth rate that a country could achieve (Krugman, 1993). In the subsequent resurrection of the two-gap approach, the emphasis has generally laid on the preconditions that could make foreign capital more productive in developing countries. The important preconditions comprised presence of surplus labor and excess productive demand for foreign exchange. With the growing influence of the new growth theories in the second half of the 1980s that recognized the effects of positive externalities associated with capital accumulation on growth, the role of foreign capital in the growth process assumed renewed importance. In the endogenous growth framework, the sources of growth attributed to capital flows comprise the spillovers associated with foreign capital in the form of technology, skills, and introduction of new products as well as the positive externalities in terms of higher efficiency of domestic financial markets, improved resource allocation and efficient financial intermediation by domestic financial institutions (de Mello and Thea, 1995; Bailliu, 2000). Since the spillovers and externalities associated with different forms of foreign capital could vary, a pecking order approach to the composition of capital flows is often pursued which helps in prioritizing the capital flows based on the growth enhancing role of each form of capital (Reisen, 2001; Razin, Sadka and Yuen, 1998).

2.1.3 Capital Inflows and the Resource Transfer

For developing economies, the primary benefits of capital inflows are the opportunities to accelerate economic growth and/or to increase current consumption (Bosworth and M. Collins, 1999). The inflows can raise growth rates by supplementing domestic saving and thereby raising the rate of capital accumulation (Ibid). They may also accelerate growth through the transfer of technology and management skills. Alternatively, capital inflows may be used to raise current consumption, potentially reducing saving (Ibid). Indeed, there is a long-standing interest in the

extent to which the resource inflows associated with current account deficits are invested or consumed (Ibid).

Capital inflows need not be associated with a resource transfer. Indeed, significant shares of the flows to developing countries have been offset by reserve accumulation or capital outflows. (Bosworth and M. Collins, 1999).

2.1.4 Growth Theories and the Foreign Capital Component

This section provides various theories of economic growth and how the capital component can be integrated in to these theories. The theoretical view about economic growth can be classified under three broad headlines, namely: (1) the Keynesian (Harod-Domar growth model), (2) the neo-classical (Solow) growth model, and (3) the endogenous growth theory.

2.1.4.1 The Harod-Domar Model

Early theoretical formulations that relate external finance with economic growth were based on the Harod-Domar model. This model uses saving as a ladder to growth (Hansen and Tarp, 2000). The model is based on the assumptions that potential output is proportional to the stock of capital and factor inputs are employed in fixed proportion with no possibility of substitution. The model further assumes that; the economy is closed, there are only two factors of production (labour and capital), labour is homogeneous and grows at a constant rate, and there is no technical progress. Therefore, in the Harod-Domar framework, change in potential output will be:

$$\Delta Y = \frac{1}{V} \Delta K \dots\dots\dots (2.1)$$

Where; Y = potential output, K= physical capital and V= constant capital output ratio.

According to the model, change in capital stock equals to gross investment. Hence, considering constant rate of capital depreciation (δ) the growth rate of potential output will be:

$$\frac{\Delta Y}{Y} = \frac{1}{V} \frac{I}{Y} \dots \dots \dots (2.2)$$

The model shows that output and capital formations are linearly related. That is, when there is more capital stock (which is financed by saving including its foreign capital components), the higher would be the growth of an economy. From the outset, the Harod-Domar model was used to calculate the amount of finance required to bridge the gap between the available savings and the required amount that must be channeled to investment to bring about the targeted growth rate (Easterly, 1998). This implies, in the Harod-Domar model, constraints on savings is the binding limit to growth. That is, when domestic savings alone are inadequate to bring about the investment level necessary to attain the targeted growth rate then growth is said to be constrained by the savings gap (i.e., short fall of actual savings from the desired level)(Ibid). Therefore, the role of foreign capital in this regard is to augment domestic savings so as to achieve the targeted rate of growth.

Studies beginning from the 1960's extended this analysis to include the gap between import and export (referred to as trade gap) as the other source that limits growth (Chenery and Strout, 1966). This approach is based on the assumption that all investment goods are not produced locally (i.e. some level of capital import is necessary in order to achieve the desired investment level) (Ibid). When foreign exchange earned through export are insufficient, actual import will be lower than the level required to achieve a targeted growth rate (Weiskopf, 1973). Thus, the

role of foreign capital inflow here is to increase the level of import in which the export earnings is not sufficient to import the required level so as to achieve the targeted growth rate.

The incorporation of this gap led to the Two-Gap model where both savings and foreign exchange act as the constraints that impede growth (Chenery and Strout, 1966). In this model, both gaps represent separate or independent limit to growth where inflow of foreign fund is used to fill the gaps (Ibid). Moreover, according to the model, it is one of the two constraints that would be binding at a given point in time. That is, it is the larger of the two gaps that constrains growth. Therefore, the impact of foreign transfer relies basically on identifying the binding constraint (Weisskopf 1973). The desired rate of growth cannot be attained if foreign finance is not sufficient to finance the larger gap (Ibid). In addition, if the foreign exchange constraint is binding, the growth impact of aid will not be facilitated via its impact on the level of savings. Rather, aid affects growth through relieving the limits on import. This means, in contrast to the Harod-Domar model where the effect of aid on growth is through saving, growth can be directly influenced by foreign inflow if the trade gap is binding (Hansen and Tarp, 2000).

In the late 1980's, the role of fiscal limitation in affecting growth gained attention in the gap analysis. In this framework, the gap between government revenue and expenditure is considered as the other source of growth hindrance (Taylor, 1994). Actually, fiscal gap is one component of saving gap. However, in theory, the inclusion of this gap plays an important role at a time when a country suffers from external shock and/or when underutilization of capital persists. For instance, expenditure on education, infrastructure, health and so forth is required to expand economic capacity. But, government revenue must be sufficient to meet the expenditure. Otherwise, growth

will be limited by fiscal gap (Hjertholm, Laursen and White, 2000). Therefore, fiscal limitation has the potential to be the binding constraint in affecting growth than the other two gaps.

The Harod-Domar model and the extended versions point that the approaches suffer from basic limitations (Easterly, 1998). First, the underlying assumption that growth is proportional to capital stock is unlikely to be true. That is, a linear association of capital and output would imply that as long as the finance (including foreign capital) required for capital formation is available, any growth target would be achieved (Ibid). This assumption is incorrect according to Easterly (1998) even Evsey Domar (co-founder of the Harod-Domar model) had admitted it to be unrealistic and dismissed the original model (Easterly, 1998). Thus, the level of capital formation alone does not guarantee growth as postulated by the Harod-Domar model. Several factors that affect productivity at the same time must be addressed. This includes identifying the relationships between debt, investment, policies and growth. Moreover, the growth impact of foreign aid is not one - for-one as postulated by the Harod Domar type of analysis (Hjertholm, Laursen and White, 2000). Rather, foreign aid may substitute domestic resources, affect the exchange rate and, therefore, may bring undesirable result (Ibid). Hence, the simplistic view of early theories does not adequately address the macro economic impact of aid. In addition to this, gap analysis is developed based on the assumption that the structure of the economy does not change. The theory, therefore, is inapplicable in times of policy changes that reshape a country's economic structure (Sepehri and Lodhi, 1999).

2 .1.4.2 The Neo-classical (solow) growth model

Unlike the Harod-Domar model, the neoclassical growth model allows for factor input substitution and diminishing marginal returns in the production process (Johns, 1998). The basic neo-classical growth model shows that for the growth of an economy capital accumulation is the central issue. The model further shows that aggregate saving (investment) determines the growth of capital stock, which, in turn plays a key role in the growth of an economy (Ibid). Technology is considered as exogenous, whose prime role is to augment labour (Ibid). In this framework, the rate of investment and population growth determines the growth rate of per capita output (Ibid). Nevertheless, growth continues only in the transition to a new steady state. In the long run, the rate of technological change which is exogenous by assumption, determines the growth rate of the economy (Schmidt-Hebbel, Serven and Solimano, 1996). This implies that policy measures do not affect long run growth rate. Thus, the standard neoclassical growth model does not emphasize the contribution of policy for long run rate of growth (Durberry, Gemmell and Greenway, 1998). This model can be briefly explained as follows.

The Solow model studies the growth path of economies by assuming a neoclassical production function which combines two factors to produce output: capital and labour. Both factors are perfectly substitutable (Morrissey, 2001) and exhibit diminishing returns to scale (Ray, 2001):

$$Y(t) = K(t)^\alpha L(t)^{1-\alpha} \dots\dots\dots (2.3)$$

Where; $0 < \alpha < 1$

Output is denoted by Y, K is capital, L equals labour and A is technology. The assumption of diminishing returns implies that each additional investment project produces a smaller return until the point where the next project is not profitable (Concessional Budget Office, 1994). When no profit exists there are no incentives to invest and no capital is accumulated.

The neoclassical model describes how an economy will eventually converge to a steady state where the growth rate of per capita output is constant in the long run. The growth rate of the economy is determined by the growth of the labour force and the savings rate which are taken as exogenous. The per capita savings rate is defined as:

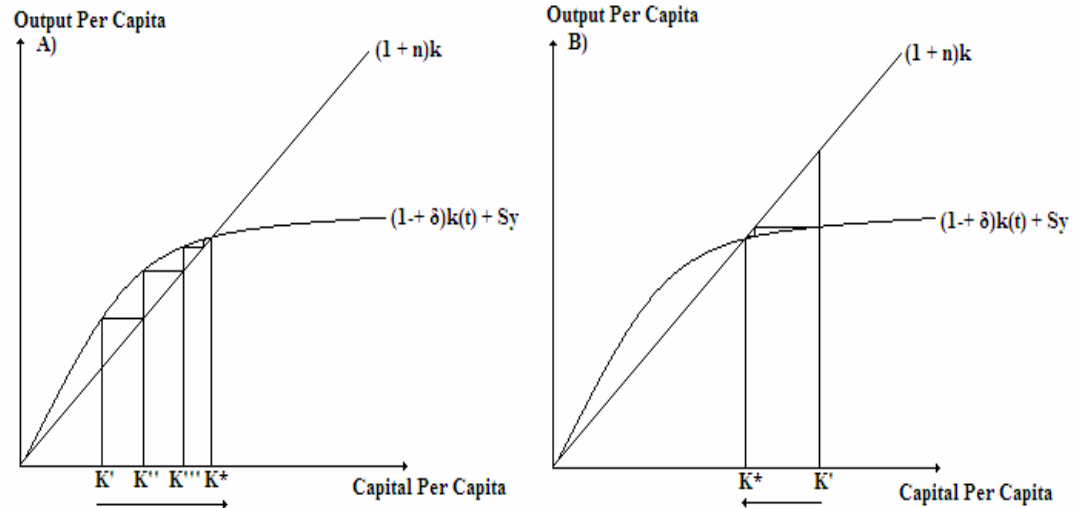
$$S_i = \frac{I_i}{Y_i} \dots\dots\dots (2.4)$$

This equation represents the connection between savings and investment which are the driving force behind growth in the Solow Model. Household's savings are lent to investors via banks. These investors can then use the funds to expand production, or replace machinery, with causes capital to accumulate. The capital movement equation (Ray, 2001) takes the following shape:

$$(1 + n) k(t + 1) = (1 + \delta)k(t) + sy(t) \dots\dots\dots (2.5)$$

Where, $0 < \delta < 1$

Figure 3.1: Dynamics of the Solow Model



Source: Ray, D (1998) "Development Economic."

$(1 + \delta)$ represents the level of capital depreciation, $k(t)$ denotes the level of capital at time t and $sy(t)$ indicates the fraction of income which is saved, and combining all the components on the right hand side of the equation explains how much capital is available in the next time period i.e. $k(t+1)$. Capital tomorrow depends on the existing capital today minus depreciation plus the fraction of income which is invested. It is assumed that the population grows at a constant rate n , which has a negative effect on capital in the next period. As the population grows, capital is dispersed over a larger number of people causing capital per capita to fall. The evolution of growth in the Solow model can be seen in figure 2.1 below:

At point k' in panel A, the stock of capital is greater than the growth of population $[(1 + \delta)k(t) + sy(t) > (1 + n)k(t + 1)]$ which results in higher capital per capita and a movement from k' to k'' . This increase in capita per capita caused a decrease in the capital-output ratio due to diminishing returns to capital. This means capital will continue to increase at a decreasing rate until point k^*

which is known as the steady state. At this point capital accumulation equals population growth (Boone, 1996).

Panel B shows a situation where growth in the population outstrips accumulation in capital causing the economy to converge back to the steady state (K' to K^*). In the long run diminishing returns imply that the economy will always converge back to a point with a constant growth rate. The neoclassical model implies that external finance stimulates growth via higher investment levels (Ibid).

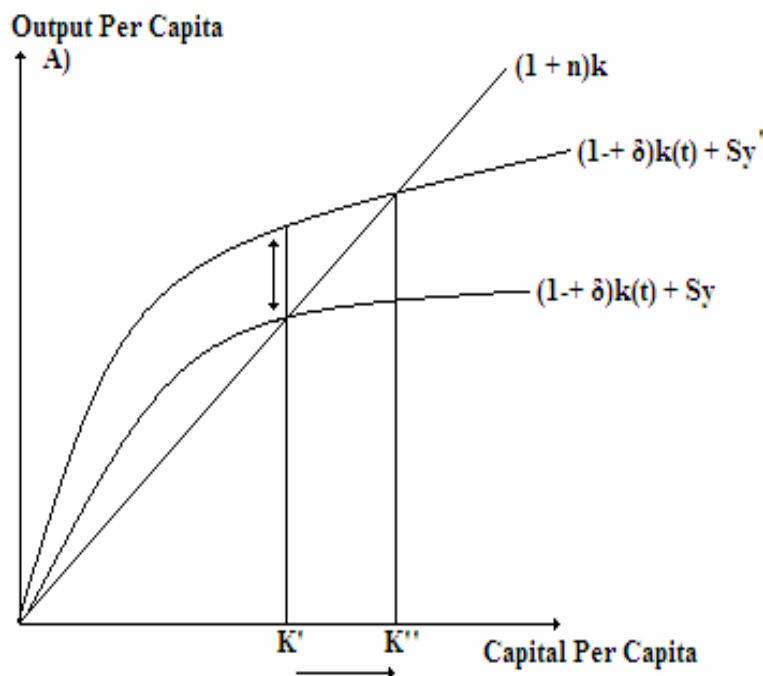
The average propensity to save is low in developing countries. This is because the developing world suffers from the savings gap and/or the foreign exchange gap. The savings gap stems from a vicious circle in which poor countries initially start with low growth levels which correspond to low income levels. The average propensity to save is low because any income is immediately consumed through basic commodities. Lack of saving prevents capital accumulation which further restricts growth.

However, foreign capital (finance) can be used to bridge this gap by relaxing the budget constraints faced by individuals. Often, developing countries cannot domestically produce all the capital goods needed for growth. They have to import from more advanced nations, however, they lack the foreign exchange needed to buy the foreign goods. Foreign aid can eliminate this 'foreign exchange' gap by providing the necessary currency. Consequently investment can occur and growth can increase.

Figure 2.2 illustrates how greater savings due to foreign capital, increase economic growth (although at a decreasing rate), with higher saving levels shifting the $(1 + \delta)k + Sy$ curve upwards. Remaining at point K' means that capital has accumulated faster than population therefore capital per capita increases, causing a gradual movement to a new steady state, K'' . Increasing the amount of capital per worker will cause productivity levels to increase which will ultimately raise GDP (Ray, 1998).

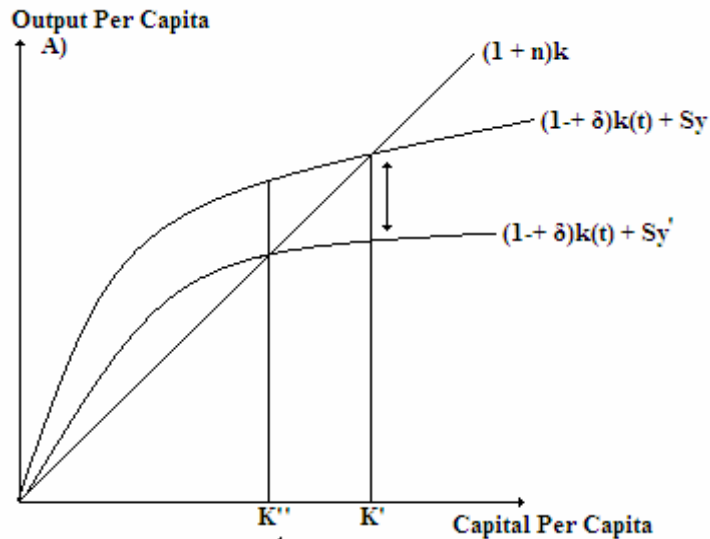
To represent the growth path in the presence of distortionary government policy, consider the introduction of a tax. This tax will cause people to save less which shifts the $(1 + \delta)k + Sy$ curve downwards as less capital is accumulated. Remaining at K' means that the population is growing faster than capital accumulation. Gradually capital per capita falls, and the economy moves to K'' . (Ibid)

Fig 2.2: Solow Growth Model with Foreign capital.



Source: Ray, D (1998). "Economic Development."

Figure 3.3: Solow Model with Policy Distortion (Tax)



Source: Ray, D (1998). "Economic Development."

The Solow Model, however, is hindered by two basic limitations (Mankiw, Romer and Weil, 1992): firstly the inability to explain long term growth. Secondly, the assumption of diminishing marginal returns. The first limitation is that the Solow Model only describes changes in the level of growth in the long run, whilst the rate of growth cannot be changed. Figure 2.4, panel A, shows that an increase in the rate of savings only increases the level of growth and not the rate. This is because the new growth path remains parallel to the original. However, as shown in section B of panel A, as the economy moves onto a new growth path, growth increase temporarily during the transition period, but in the long run the growth rate is constant.

The Solow Model can be augmented with technological progress which means the economy can move onto a new growth path which experiences an increasing growth rate, shown in panel B of figure 2.4. However, this technology is taken as exogenous (Mankiw, Romer and Weil, 1992)

and the model fails to explain the sources of the technology. This reliance on exogenous factors without explanation of the source is perhaps the model's most serious limitation. This means that an economy cannot experience long term growth without technological progress which just falls from heaven with no explanation (Ibid).

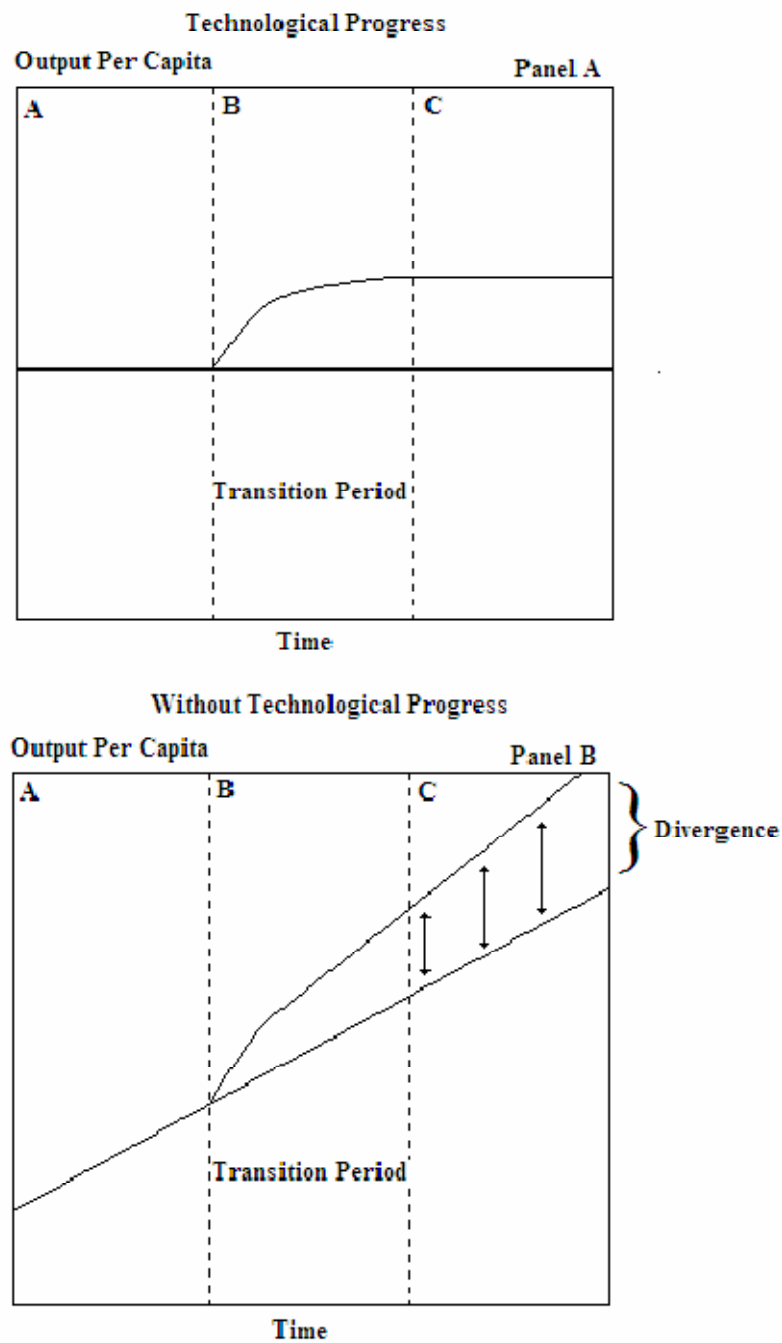
2.1.4.3. Endogenous Growth Theory

To overcome the limited long term effects of the Solow Model; human capital is introduced into the theory. Human capital is not subject to diminishing returns (Romer, 2006) allowing growth to occur continuously at a rate of human capital accumulation. This addition into the growth theory changes very little, with foreign capital and policy distortions having the same impact in the short run. However, this endogenous model does drop the assumption of diminishing returns which allows for unbounded long term growth. This is because non diminishing returns to capital mean that the returns on investment projects will never equal the cost (depreciation) which allows for a profit on each subsequent investment. This endogenous model, inspired by Romer (2006), suggests equilibrium can be reached where continuous long term growth exists. This means that foreign aid will increase growth well into the long run.

Romer (2006) states that growth is closely related to the level of human capital. Firms directly benefit from knowledge accumulation due to new innovations and designs that allow for greater productivity. Increase foreign capital leads to greater accumulation of human capital via increase education and widespread Research and Development. Additional human capital causes a higher

rate of technological progress, via new innovations. Higher technological progress increases output per capita allowing for unbounded long run growth.

Figure 3.4: The Effects of an Increase in the Savings Rate in the Neoclassical Model of Economic Growth, with and without Technological Progress.



Source: Congressional Budget Office

The endogenous growth model basically differs from the neo-classical one because the former endogenizes improvements in technology. In the endogenous growth setup, the role of externality that arises from research and development is considered as growth stimulant factor, unlike the neo-classical model. Because of this, rate of growth continues even in the steady state (Johns, 1998). Therefore, new growth models acknowledge that policy measures could have significant impact on long run growth.

In both Harrod-Domar and Solow growth models, foreign capital is treated as a component of total saving. However, the Solow model argues that foreign capital is most productive when the country is poorest (Bulir and Lane, 2002). To capture the macroeconomic complication associated with foreign capital, modern theories have extended their analysis to examine the influence of foreign capital inflows on several other variables. This includes examining the impact of capital inflows on saving, investment and economic growth.

2.1.5. National Growth, Savings and Investment: Causality Issues

In the Keynesian and post-Keynesian traditions investment plays a critical role both as a component of aggregate demand (probably the most volatile) as well as a vehicle of creation of productive capacity on the supply side. In post Keynesian demand-driven models investment still plays a crucial role in determining medium run growth rates. Most of these models assume unemployment and idle productive capacities. A variant but assuming full employment of labor is provided by Nicholas Kaldor who postulated growth models with changes in functional income distribution as a mechanism of macroeconomic adjustment acting through national savings in which capitalists have a greater marginal propensity to save than workers.

In a different vein we have the Austrian school of Von Mises, Hayek and others. In this school, the real interest rate (relative to the prospective return on physical assets) is the equilibrating variable between the supply of loans (savings) and the demand of loans for productive purposes (investment). An investment boom is created when banks or monetary policy keep the interest rate below the “natural rate” (a concept developed by the Swedish economist Knut Wicksell), say the interest rate which equilibrates the demand for loans (investment) with the supply of funds (savings).

In the 1950s neoclassical economics gave rise to a celebrated long run, supply driven, growth models such as Solow (1956). In this model, the rate of technical change, the savings ratio and the rate of population growth are the three parameters that determine the rate of growth of the economy in steady – state. In this model, the investment ratio plays a role only in the *transition* between steady –states (in practice that transition may take a few decades) but not in the configuration of long run growth equilibrium of the economy. We will see that these transitions are empirically very relevant; in fact, new papers in growth economics are starting to focus more on this rather than on long run growth. In the Solow model, as said before, there is no independent investment function (a concept central to the Keynes of the *General Theory*). Full wage-price flexibility solves any ex-ante discrepancy between intended savings and desired investment avoiding the sort of macroeconomic fluctuations that were the concern of Keynes and Austrian economists alike. In the “endogenous” growth theory developed since the mid 1980s a new role was recreated for investment to affect long run growth by making the rate of technical change and productivity growth linked either to the accumulation of physical capital or the accumulation of human capital.

The issue of causality between savings, investment and growth has plagued growth economics since the start. The controversy can be cast in terms of two leading theoretical perspectives: the “Marx–Schumpeter-Keynes view” versus the “Mill- Marshall-Solow view“(Chakravarty, 1993 and Solimano, 1997).

The first view posits that investment (Keynes, and to some extent, Marx) and innovation (Schumpeter, Marx) are the two variables that drive output growth. In this context, savings adjusts passively to meet the level of investment required to hold macroeconomic equilibrium and deliver a certain growth rate of output (Ibid). In this view growth *leads* savings. In contrast, in the Mill-Marshall-Solow approach that channel of causality is reversed as it assumed that all savings is automatically invested and translated into output growth under wage–price flexibility and full employment. As a result, in the Mill-Marshall-Solow approach savings *leads* economic growth. The two schools deliver alternative lines of causality between savings, investment, innovation and growth. These causality issues are still relevant in an open economy with capital mobility, as we shall see in a later section.

2.1.6. National Savings and Investment under International Capital Mobility

In an era of globalization, another important theme is the correlation between domestic savings and domestic investment under international capital mobility. In an influential paper Feldstein and Horioka, FH, (1980) argued that in a world with perfect capital mobility domestic savers would seek the higher rate of return irrespective of the home or foreign origin of the assets to be invested. In turn, attractive investment projects would find adequate financing irrespective of the funds would come from the pool of national savings or from foreign savings. The authors pose that under perfect capital mobility, national savings and domestic investment would be largely *uncorrelated*. However, FH found empirically that, contrary to the predictions of perfect capital mobility theory there was a strong correlation (and statistically significant) between domestic savings and domestic investment (a high “savings retention coefficient”) when the relation was test for cross section data of industrial economies with (5 years-average) data of the 1960s and 1970s.

Other authors that tested the relation between national savings and domestic investment using a larger sample of countries and longer time periods further investigated the results of Feldstein and Horioka.

Taylor (1996) reports those results of various studies included his own that basically find a close correlation between national savings and national investment, a finding that is relatively robust across space and time although it varies in periods of higher capital mobility (i.e. during the gold standard and since the 1970s, a second period of financial globalization). The high correlation of national investments and domestic savings demonstrates that the financial markets are not more integrated today than at the beginning of the 20th century, although a change occurred between the two periods in the composition of capital flows, especially an increase of the short-term capital flows relatively to long-term capital flows (Baldwin and Martin 1999, Taylor, 1996). In any case, the results of the FH tests reported by Taylor (1996) suggest the existence of “home bias” in terms of the allocation of savings towards national assets and towards national investment projects seems to hold.

Let us now briefly review some historical evidence pertaining to this topic. One feature is that countries change their position of net exporter (or net importer) of capital overtime. From the 19th century until the 1980s the United States was, on average a net exporter of capital. After World War I British financial hegemony was replaced by the United States as the main capital exporter of the world economy. The US role as a *net* capital exporter lasted until the early 1980s when it started to run current account deficits, importing savings from the rest of the world to finance a level of expenditure above its real output, financing the gap with savings from the rest of the world, mainly from positive net savings economies in Asia and also from international reserves held by Central Banks in developing countries held mostly in U.S securities. In addition, the U.S became a net debtor as its foreign liabilities exceed its net foreign assets. Interestingly, under current conditions, there is a transfer of savings from developing countries (and from “emerging economies”) to the richest economy in the world that spends more than its income generated by nationally owned factors of production.

Thus, national savings are diverted from the financing of growth at home to finance consumption and investment in the richest world economy. In the 19th century and up to World War I, a period known as the first wave of globalization, the most important flow of capital occurred from Great Britain to a group

of countries known as the “New World Countries” (Argentina, Australia, Canada, New Zealand, and the United States). London constituted the financial center of the global capital market and was called the “banker of the world”. It is estimated that the surplus of domestic savings over investment in the U.K was around 50 percent in the first decade of the 20th century (Obstfeld and Taylor, 2004).

The British pound was the dominant currency in the context of the international gold standard. The United Kingdom contributed to a peak average of 80 percent of total global foreign investment. In the early 20th century capital flows were characterized by the accumulation of enormous one-way positions and a great portfolio diversification by the principal creditor countries, in particular Great Britain, and inversely little diversification and high foreign capital “dependence” by the debtor New World countries. It is interesting to note that capital flew to rich and labor-scarce New World countries instead of going to poor and labor abundant Asian and African countries, where it could, in principle, have been more profitable given the abundance of cheap labor (Obstfeld and Taylor, 2004). This is the so-called “Lucas Paradox”. In today’s global capital markets in which capital flows and foreign investment aim for risk sharing and diversification instead of long-term financing to build infrastructure and housing as was the case in the pre 1914 world. Regarding the direction of international capital flows we face also the “Lucas Paradox” in which there is *too little capital flows to capital-scarce, poor countries*. We may think in various factors why capital does not go to low income countries: the lack of educated and properly trained work force in poor countries, lack of enforceable property rights, bureaucracy, political instability, weak institutions, small domestic markets and other factors (Obstfeld and Taylor, 2004).

The literature of growth under increasing returns suggests that capital, skilled labor, superior institutions *tend to go together* and concentrate in a certain group of countries (Easterly 2001) in which they find favorable conditions for international investment. Another difference between the first wave of globalization and contemporaneous financial globalization is the importance of capital flows as proportion of savings and investment in both source and receiving countries. Although financial globalization since the 1970s and 1980s has expanded very rapidly in relative terms it is lower

than in the pre-1914 world. In fact, Obstfeld and Taylor (2004) report that in 1900-1913 overseas investment represented about one half of domestic savings of the U.K (and one-third, on average, between 1870 and 1914). In other capital exporter countries such as Germany, overseas investment represented about 10 percent of national savings in 1910-1913. In turn, as said before, around 50 percent of the capital stock of Argentina in 1914 was in hands of foreigners (in Canada and Australia that percentage was in the range 20-30 percent). These numbers are lower in the new wave of globalization (Obstfeld and Taylor, 2004). After 1970 the ratio of net capital outflows over savings in the capital exporting countries never exceeded 5 percent (this is influenced by the large current account deficits of the United States). In turn, capital inflows, on average, in the same period never exceeded 15 percent of investment in capital importing countries (Obstfeld and Taylor, 2004).

2.1.7 Capital Inflows in Africa

Capital flows are neither a necessary nor a sufficient condition to trigger economic transformation. Lack of economic transformation in Africa is due to a combination of shortcomings in policy, institutions and physical and human infrastructure. Overcoming these constraints is important for economic transformation, which is critical for attaining sustainable growth and reducing Africa's vulnerability to shocks. The analysis of the links between capital flows and economic transformation in Africa indicates that:

Capital flows to Africa during the last four decades have not been accompanied by economic transformation. In countries such as Mauritius and Tunisia, with relatively greater degrees of economic transformation, structural change was not due to capital flows but rather to a

combination of sound policies and reforms that attracted domestic and foreign investment into sectors that were more conducive to export promotion and economic diversification;

For most of the time, ODA has been the most important source of capital inflows to Africa. However, ODA flows to Africa have been largely channeled to primary education and other services with very little flow to infrastructure. ODA, in its current structure, has had limited impact on economic transformation. Higher flexibility in donor policy to ensure a more balanced and productive allocation of ODA flows among various sectors would enhance the effects of ODA on economic transformation;

FDI to SSA is mainly directed to extractive sectors, especially oil and minerals. Such FDI will not induce economic transformation unless revenues from oil and minerals are adequately used to develop infrastructure and institutions and to spur investment in other sectors;

Portfolio flows to Africa are unlikely to affect economic transformation as they are quite small in volume and go to countries with more diversified economies and active capital markets; and

Research indicates that remittances have been largely driven by the motive to support family consumption and have had little impact on economic transformation. The absence of a notable relationship between capital flows and structural change in Africa is attributable to lack of appropriate policies to influence the nature and allocation of these flows. As the policy environment improves, private capital flows are likely to follow with a greater impact on growth and economic transformation through productivity enhancement, technology transfer, greater access to foreign markets and reallocation of resources in favour of more competitive sectors.

(ECA, 2006).

2.2 Empirical Literature

A number of studies have dealt with the impact of foreign capital on savings, investment and economic growth during the last three decades. Most of the earlier studies showed that foreign capital inflow has a negative impact on savings, investment and economic growth of developing countries.

2.2.1 Foreign Capital and Economic Growth

Many studies have been conducted about the link between foreign capital inflow and economic growth. Some of these include: Papanek (1973) disaggregated foreign capital inflows into three principal components: foreign aid, foreign private investment and all other foreign inflows. He used cross section data of 34 countries in the 1950s and 51 countries in the 1960s. He found that all three flows (foreign aid, foreign private investment, and other foreign inflows) had a statistically significant positive impact on growth and the effect of foreign aid on economic growth was stronger than other factors.

Stoneman (1975) tested the impact of foreign capital on the economic growth of poor countries. He criticized his predecessors for failing to distinguish between two main effects of foreign capital: the direct balance of payments effect (inflows of capital enable higher investment and consumption); and effects on the structure of the economy (foreign inflows reduce exports, change the capital output ratios, affecting income distribution etc). He performed an Ordinary Least Square (OLS) regression analysis for a five-year period between 1955 and 1970, on a main sample of 188 countries and several sub-samples, using the following explanatory variables: gross domestic savings, net inflow of direct investment, net inflow of foreign aid, other foreign long-term flows and the stock of foreign direct investment. The dependent variable was annual average growth in GDP. His results confirmed the favorable impact of foreign aid and domestic savings on economic growth, but suggested that the stock of foreign direct investment retarded growth and that the significance of this increased when the lag of the dependent variable was used.

Balassa(1978) showed using a simple growth model that labour inputs(L),foreign capital inflows(K_f) and capital formation from domestic savings (K_d) were positively related to output growth(Y), using pooled data of ten countries for the period 1960-73.However the effects of foreign capital inflows on output growth were smaller as compared to domestic capital.

Mosley (1980) also disaggregated foreign capital inflows in to aid and other financial inflows and lagged foreign aid inflows by five years. Using a Two Stage Least Square (2SLS) regression, he investigated the impact of capital inflows on growth for 83 countries, during the period of 1966-77.The effect of foreign aid and other inflows on growth was negative but statistically insignificant in the case of all 83 developing countries. However, for the 30 poorest countries, foreign aid was significantly positive when lagged by five years.

Dowling and Hiemenz (1983) tried to find the relationship between foreign aid, savings and growth in the presence of policy variables. Their sample covered 52 countries of the Asian region for the period 1968-79.They performed an OLS regression using standard explanatory variables, i.e. foreign aid, other capital inflows and savings, and four policy variables. All three variables were found to be positively and significantly related to economic growth. They reported that economic policies have been conducive to a productive allocation of foreign aid and other resources.

Shabbir and Azher (1992) employed a two equation simultaneous model for economic growth and saving ratio (National saving as a ratio of GNP) using annual time series data for Pakistan during the period 1959-60 to 1987-88.The model was estimated by the 2SLS method. Their results showed that foreign private investment had a positive and significant effect on economic growth measured by GNP growth rate when total disbursements were excluded. However, this positive impact became insignificant when total foreign disbursements were included. The impact of foreign private investment on national savings turned out to be negative and significant in both cases, i.e. with and without foreign disbursements.

Khan and Rahim (1993) also tried to estimate the impact of foreign assistance on economic development of Pakistan. They employed a single –equation model for estimating savings and economic growth functions for the period 1960 to 1988. They also separated different types of foreign capital and estimated their effects on GNP growth and savings rate using the OLS method. They came up with a negative but insignificant impact of foreign assistance on savings held that different types of foreign capital had different effects. For example, foreign aid was found to have no measured effect on savings, foreign direct investment was inversely related to savings but insignificant and loans were negatively related to domestic savings but with a significant coefficient. Their second equation produced a significant positive effect of foreign capital assistance (one year lagged) on the growth rate of GNP. Foreign loans and grants had positive effects on economic growth.

Iqbal Zahid (1998) used a multiple regression framework to separate out the effects of key macroeconomic factors on the economic growth of Pakistan over the period 1959-60 to 1996-97. The quantitative evidence from the OLS regression showed that human capital (proxied by primary school enrollment as a ratio of labour force) was an important prerequisite for accelerating growth. The empirical results also suggested that the openness of the economy promoted economic growth. The budget deficit and external debt were found to be negatively related to economic growth.

Bowen (1998) tried to measure the direct and indirect relationships between foreign aid and economic growth using a cross-country data for 67 less-developed countries for the period 1970 -88. The direct aid-growth relationship was not significant. However, indirect aid-growth relationship, via its interaction with domestic savings, was significant and negative. The results obtained using 2SLS regression analysis showed that low per-capita income rather than low savings rate led to high aid levels.

Burnside and Dollar (2000) estimated a model using a panel data for 56 countries. They used the 2SLS method to estimate simultaneous equations model for growth, aid and policy. They found that foreign aid had a robust positive impact on economic growth in a good policy environment.

Hansen and Tarp (2001) examined the relationship between foreign aid and growth in real GDP in 56 countries covering the years 1974-1993 in five periods was regressed on several policy institutional control variables and foreign aid. Their results showed that foreign aid in all likelihood increased the growth rate and this was not conditional on “good” policy (as suggested by Burnside and Dollar (2000)). They found decreasing returns to foreign aid and the estimated effectiveness of foreign aid was highly sensitive to the choice of estimator and the set of control variables.

2.2.2 Foreign Capital and Domestic Savings

A number of studies have been conducted to examine the relationship between savings and foreign capital. To mention some, Griffin (1970), estimated the relationship between foreign aid and domestic savings with an empirical study using data from 32 LDCs for the 1962-1964 and found a negative relationship between foreign aid and domestic savings. However, he used the current account deficit as a measure of foreign capital and estimated gross domestic savings as the difference between gross domestic investment and the capital account balance. Hansen (2002) later argued that Griffin’s regression results were based on an identity rather than a behavioural equation. Consequently, using data derived from an ex post accounting relationship tends to yield a biased and spurious negative correlation and regression coefficient. Similarly, as argued by Papanek (1972), a current account deficit can be financed by various ways, such as foreign aid, foreign private investment, short-term capital borrowing, change in foreign exchange reserves, liquidation of private assets abroad, even errors and omissions. Therefore, treating the current account deficit as foreign aid serves as a poor proxy.

Weisskopf (1972a) also tested the hypotheses that the level of domestic savings in under developed countries was behaviourally related not only to the level of national income but also to the level of net foreign capital inflow. His empirical results from time series data for at least seven years for 44 under

developed countries showed a negative impact of foreign capital inflows (proxied with trade deficit) on domestic savings. He concluded that approximately 23percent of net foreign capital inflow substituted for domestic savings. He further explained that the negative impact of foreign capital inflow is applied to ex ante savings but not to ex post savings.

Bowles(1987) tried to address the issue of causal relationship between foreign aid and domestic savings, applying the bivariate Granger causality tests to the annual data related to 20 countries over the period 1960-81.He came up with mixed results. In half of the 20 countries, time series data did not indicate any causal relationship between foreign aid and domestic savings. In three cases, domestic savings caused aid, in five cases, aid caused domestic savings and in two cases, there was a feedback between foreign aid and domestic savings in the Granger sense.

Bowen (1998) also conducted a study to measure the direct and indirect relationship between foreign aid and economic growth using a cross-country data for 67 less-developed countries for the average of variables for the period 1970-88. His model uncovered an indirect aid growth relationship via its interaction domestic savings, which was significant and negative.

Razzaque and Ahmed (2000) performed a time-series study over the period 1973-1998 to re-examine the relationship between foreign aid and domestic savings in Bangladesh using co-integration technique. They found a negative relationship between foreign aid and domestic savings.

2.2.3 Foreign Capital and Domestic Investment

Studies relating foreign capital to domestic investment in developing countries are not that much investigated. Halevi (1976) examined the relationship between long-term capital inflows in aggregate capital formation and in its components, private and public investment and consumption for 44 countries in the late 1960s.When all variables were expressed in per capita terms, he found a positive and significant relationship between long-term capital (aggregate) and private and public inflows and

investment. He also found that long-term capital was positively related to public consumption and negatively related to private consumption. He concluded that there was a significant link between long-term capital inflow, investment and growth but such capital inflow also tended to increase public consumption.

Mosley (1987) found a positive relationship between foreign aid and private investment. Bhalla (1991) estimated a simple investment-growth model for Sri Lanka for the period 1956-86 and found a positive relationship. Snyder (1996) examined the relationship between foreign aid and private investment using annual panel data for 36 developing countries over the period 1977-1991 and found a negative relationship.

CHAPTER THREE

Model Specification and Methodology

Different types of studies were undertaken in order to understand the impacts of foreign capital inflows (FCIs) on economic growth in developing countries. And different variables and methods were used to analyze it. Some studies focused on the impacts of foreign capital inflow on the domestic savings and investment, while some other focused to study the impact of foreign capital inflow on GDP growth and on the different sectors of the economy.

It is difficult to analyze the impact of foreign capital inflows on all sectors and variables in a single paper, and as described earlier in the introduction part that the major objective of this paper is to analyze the impact of foreign capital inflows on savings, investment and GDP growth in Ethiopia. Therefore I narrow down my analysis only to the impact of FCIs on savings, investment and GDP (economic) growth.

3.1 Model Specification

In line with the theoretical propositions reviewed in the literature, the impacts of foreign capital inflows on savings, investment and economic growth will be examined by specifying the following three equations.

3.1.1 Growth Equation

The growth model, which is used in this study, is based on endogenous growth model. The endogenous growth models developed by Lucas-Romer extend the old neo-classical model by emphasizing the role of endogenous factors (i.e., human capital stock and R&D activities) as the main engines of economic growth. While early neo-classical models assume total factor productivity growth (or technical progress) as exogenously given, the newer endogenous growth models attribute this component of growth to the ‘learning by doing’ effect occurring between

physical and human capital, which result in increasing returns to scale in production technology (Lucas, 1988).

Therefore, the production function under endogenous growth theory can be written as:

$$Y_t = f(K_t, L_t, HC_t) \dots\dots\dots (3.1)$$

Following the theoretical and empirical review and work performed by Rana and Dowling (1988), Growth and Savings equations are developed. Moreover, attempt is made to incorporate other factors that are believed to affect growth and savings.

Rana and Dowling (1988) pointed out that the impact of foreign capital on economic growth of developing countries is controversial and available researches indicate that while foreign capital is a partial substitute for domestic savings these inflows have nevertheless made a positive contribution to economic growth. (Rana and Dowling 1988). The evidence is less clear-cut regarding the relative importance of various types of foreign capital flows as contrasted with other factors (e.g., the degree of export orientation, saving performance, etc.) and whether foreign capital improves or hinders economic efficiency. (Ibid).

As argued by Rana and Dowling (1988), these studies have short coming of inclusion of important variables. Growth performance should include the domestic saving rate, foreign capital and export performance as explanatory variables; while foreign capital, per capita income, gross domestic product and export performance are important determinants of savings behaviour. Regression estimates will be biased if any of these variables are omitted.

Specifying saving and growth equations including export performance was seen as a remedy to the problems that the previous studies encounter.

The growth equation of the Rana and Dowling (1988) model is derived from a two sector model comprising export and non-export sector. The export variable is included in the growth equation for at least four reasons Rana and Dowling (1988). First, exports enable countries to specialize in the production of commodities in which they have a comparative advantage; resources which are saved in this way can then be used for investment .Second, trade provides a vent for surplus commodities which bring otherwise unemployed resources in to use. Third, trade can expand production possibilities through its effect on such factors as competition, access to new knowledge, technology and ideas; these are the so-called dynamic gains from trade. Fourth, trade enables countries to purchase goods from abroad. If there are no domestic substitutes, the ability to import can relieve bottlenecks in production and thus increase savings and investment; and imports may simply be more productive than domestic resources.

In addition to the aforementioned variables, according to Acemoglu (2007), human capital can play a major role in economic growth and cross-country income differences. Human capital refers to all the attributes of workers that potentially increase their productivity in all or some productive tasks. The term is coined because much of these attributes are accumulated by workers through investments. Human capital theory, developed primarily by Becker (1965) and Mincer (1974), is about the role of human capital in the production process and about the incentives to invest in skills, including pre-labor market investments, in form of schooling, and on-the-job investments, in the form of training.(Acemoglu ,2007)

Physical-human capital interactions could potentially be important, since a variety of evidence suggests that physical capital and human capital (capital and skills) are complementary, meaning that greater capital increases the productivity of high human capital workers more than that of

low skill workers. This may play an important role in economic growth, for example, by inducing a “virtuous cycle” of investments in physical and human capital. (Ibid)

Hence, with the expected signs indicated below the variables, growth function is given by:

$$GDP = f(AID, FDI, S, X, LF, HC) \dots\dots\dots (3.2)$$

$$(\pm) \quad (\pm) \quad (+) \quad (+) \quad (+) \quad (+)$$

Where,

GDP = real gross domestic product

AID=foreign aid as a percentage of GDP

FDI=foreign direct investment as a percentage of GDP

S=gross domestic saving as a percentage of GDP

X= export as a percentage of GDP

LF= labor force

HC=human capital proxied by education expenditure

Taking the natural logarithm to all but FDI the growth equation can be rewritten as:

$$LGDP = \alpha_0 + \alpha_1 LAID + \alpha_2 FDI + \alpha_3 LS + \alpha_4 LX + \alpha_5 LLF + \alpha_6 LHC + U_t \dots (3.3)$$

Where *L* represents the natural logarithm of the respective variable and *U_t* is the error term.

3.1.2 Saving Equation

The other equation is the standard-type saving function augmented by the export variable, per capita income and gross domestic product. Export performance is also expected to influence the saving rate for several reasons Rana and Dowling (1988). First, exports (especially of primary products) often produce highly concentrated income and standard savings theory shows that the propensity to save from such income is high. Second, countries whose export performance is good tend to face fewer foreign exchange constraints on investment and therefore tend to provide more of an incentive to save. Third, to the extent that trade taxes are a major source of revenue, exports tend to increase government savings. The inclusion of the gross domestic product and per capita income in the saving equation is fairly standard. The gross domestic product variable is justified on the ground that rapid growth leads to changes in relative income and life-time consumption patterns and increase in transitory income in relation to permanent income; the former influences the saving rate more than the later. The per capita income variable reflects the state of development of a country and is expected to have a favorable (positive) influence on saving. As discussed in the literature, foreign inflows could affect domestic saving positively or negatively depending on the substitutability and complementarity between them.

Demographic factors also have an important influence on aggregate saving rate Blanchard and Fischer (1989). According to the life cycle model, individuals will have negative savings when they are young and have low or zero income, positive savings during their productive years and once again, negative savings when they are old and retired. Thus aggregate savings will be affected by the age distribution of the population - if the share of inactive or dependent population is high, the savings ratio will be low. We use the age dependency ratio, the ratio of

dependent population (those under 15 years of age and 65 years or older) to the working age population (aged 15 to 64 years), as a reasonable proxy to capture this effect (even though it is true that not everyone aged 15-64 years would be working and saving and not everyone under 15 or over 64 would be necessarily dependent or dis saving). Holding other factors constant, a country's aggregate saving rate is low if it has more dependent population. Therefore, it is expected that dependency ratio negatively influences the saving rate.

$$GNS = f(AID, FDI, GR, X, GDPN, DEPEND) \dots \dots \dots (3.4)$$

(±) (±) (+) (+) (+) (-)

Where,

GNS=gross national saving as a percentage of GDP

AID=foreign aid as a percentage of GDP

FDI=foreign direct investment as a percentage of GDP

GR=growth rate of real gross domestic product

X= export as percentage of GDP

GDPN= GDP per capita and

DEPEND= the age dependency ratio

Accordingly, the model to be estimated is specified as follows:

$$GNS = \gamma_0 + \gamma_1 \cdot AID + \gamma_2 FDI + \gamma_3 GR + \gamma_4 X + \gamma_5 GDPN + \gamma_6 DEPEND + V_t \dots \dots \dots (3.5)$$

Where V_t is the error term.

3.1.3 Investment Equation

The model for investment we specify here is an adaptation from a framework used by Jenkins (1998), which derives from models of financial constraints or repression. Moreover, attempt is made to incorporate other factors that are believed to affect investment. Domestic investment will be financially constrained by domestic savings and resources flowing in to the country:

$$I = f(St, RFt) \dots \dots \dots (3.6)$$

Where,

I=Aggregate Investment

S=Gross Domestic Savings

RF=Net Resource Flows

In addition to Jenkins(1988), Hansen and Tarp (2000) pointed out that most empirical studies on investment are built up on a behavioral equation that links total investment to the overall saving. That is, investment is assumed to depend on domestic savings and inflow of foreign resources. Though studies show that the relationship between saving and investment is ambiguous from a theory point of view, the literature on foreign resources inflow emphasizes the existence of positive correlation between foreign inflow and investment. For instance, Harod-Domar and Gap theories consider foreign inflow as an important growth inducing element through bridging the gap between the available resources and the required investment.

Standard economic theory, of course, predicts that capital inflows unambiguously increase investment rates in developing countries. The argument runs as follows. In developed countries, savings are abundant but return to investment is low because capital per worker is already high. In developing countries, on the other hand, return to investment is high as capital per worker is low, but savings are scarce. Hence if capital were allowed to move freely across national frontiers, a part of the savings of the developed world would be invested in the developing world. So the investment rate would fall below the saving rate in developed countries and rise above the saving rate in developing countries. International capital mobility, therefore, is expected to help poorer nations to achieve faster growth and thus promote economic convergence.

Since foreign capital inflow has a debt component, current inflow of debt necessitates its future payments in the form of debt service. If recipient's repayment capacity fails to increase, debt servicing is likely to crowd out investment activity by consuming the available foreign exchange. Therefore, it is important to assess the issue of whether debt servicing weakens investment or not.

Political and social instability tends to deter investment by affecting the incentive framework. Such instability affects investment negatively by raising the value of waiting, threatening property right and making prediction of investment returns difficult (Serven, 1996). One of the factors that induce political and social instability is war. Therefore, this paper checks the potential impact of war in depressing investment using defense expenditure as proxy.

Hence, with the expected signs indicated below the variables, the investment function is given by:

$$I = f(S, AID, FDI, DF, DX) \dots\dots\dots (3.7)$$

Where,

I = gross fixed investment as a percentage of GDP

S = gross domestic saving as a percentage GDP

AID = foreign aid as a percentage of GDP

DF= the share of defense expenditure as a percentage of GDP (a proxy of war) and

DX= the share of debt service to export

Accordingly, the model to be estimated is specified as follows:

$$I_t = \beta_0 + \beta_1 S + \beta_2 AID + \beta_3 FDI + \beta_4 DF + \beta_5 DX + \varepsilon \dots\dots\dots (3.8)$$

Where ε is the error term.

Where β_0 is the constant term, $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are slope coefficients Regression Coefficients (to be estimated) measures how much units of **I** would be changed with a unit change in the independent variables and U_i is white noise error term.

3.2 Data Type, Source and Description

As the success of any econometric analysis ultimately depends on the availability and accuracy of data, it is, therefore essential to discuss about the source and nature of data. Regarding the type of data, the study used secondary data. Therefore, such data will be collected from different sources. The major data sources for the problem under investigation are publications of National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED) and Central statistics Authority (CSA) of Ethiopia. Besides, IMF CD-ROM, WB CD-ROM, and WDI were used.

3.3 Methodology

3.3.1 Stationarity and Non – Stationarity

The standard classical methods of estimation are based on the assumption that all variables are stationary. However, most economic variables are not stationary (Gujarati, 1995). A data series is said to be stationary if its error term has zero mean, constant variance and the covariance between any two – time periods depends only on the distance or lag between the two periods and not on the actual time which it is computed (Harris, 1995).

3.3.2 The Unit Root Test

Several tests are usually employed to test whether time series variables are stationary or non-stationary; the Dick-Fuller (DF), the Augmented Dick-Fuller (ADF) test, Auto-Correlation Function (ACF) and Phillips-Peron test. In this study the researcher is going to employ the ADF test to determine the existence of a unit root. By incorporating the autoregressive process of order p, this model becomes superior to DF. Basically this test has been chosen for its consistency, accuracy and resourcefulness. The general form of the ADF equation where only an intercept is included is as follows:

$$\Delta Y_t = A_o + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \dots\dots\dots (3.9)$$

For the case where the auto regression includes the intercept and a trend, the equation is of the following form:

$$\Delta Y_t = A_o + \gamma_1 t + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \dots\dots\dots (3.10)$$

Where, Y_t is any variable in the model to be tested for stationarity, ε_t is an error term and Δ is the first difference operator.

The null hypothesis of ADF is $\delta=0$ against alternative hypothesis that $\delta<0$. Where $\delta=\gamma-1$. A rejection of this hypothesis means that the time series is stationary or it does not contains a unit root while not rejecting means that the time series is non-stationary (Enders, 1995).

3.3.3 Cointegration Test

Most macroeconomic variables are found to be non stationary and showing trending overtime (Johanson, 1992). However, one can difference or de trend the variables in order to make the variables stationary. If variables become stationary through differencing, they are in the class of difference stationary process. On the other hand, if they are de trended, they are trend stationary. Cointegration among the variables reflects the presence of long run relationship in the system. (Gujarati, 1995). There are two approaches used in testing for Cointegration. They are: (i) the Engle-Granger (two step algorism) and: (ii) the Johansen Approach.

A) Engle-Granger (Two Step Algorithm)

The Engle-Granger (E-G) method requires that for co-integration to exist, all the variables must be integrated of the same order. Hence, once the variables are found to have the same order of integration, the next step is testing for cointegration. This needs to generate the residual from the estimated static equation and test its stationarity. By doing so we are testing whether the deviation (captured by the error term) from the long run are stationary or not. If the residuals are

found to be stationary it implies that the variables are cointegrated. This in turn ensures that the deviation from the long run equilibrium relationship dies out with time (Enders, 1996).

Although, the Engle-Granger (EG) procedure is easily implemented, it is subject to the following important limitations. First, in tests using three or more variables there may be more than one co-integrating vector. In fact, if there are n variables in a model there may be n co-integrating vector or less. The Engle Granger method has no systematic procedure for separate estimation of the multiple cointegrating vectors. This method makes the implicit assumption that the cointegrating vector is unique, which means that we are bound to end with a model that is a linear combination of independent co integrating vectors. Second, the EG approach relies on a two-step estimator. The first step is to generate the error series and the second step uses these generated errors for estimation, thereby carrying over errors obtained from regression using the residuals. Hence any error introduced in the first step is carried in two the second step. Third, cointegration test may depend on the variable put in the left side of the cointegration. That is, the test is not invariant to the variable used for normalization (Enders, 1996). Finally, the method does not allow the variables in the right hand side to be potentially endogenous (Harris, 1995). (Therefore, this paper chooses to use the Johansen maximum Likelihood Procedure (1988) since it addresses the above stated weakness of the E-G method.

B) Johansen (1988) Maximum Likelihood

The Johansen (1988) procedure enables estimating and testing for the presence of more than one co-integrating vector. Moreover, it permits to estimate the model without priory restricting the variables as endogenous and exogenous. Under this procedure, the variables of the model are represented by a vector of potentially endogenous variables.

The starting point in this procedure is formulation of unrestricted vector autoregressive (VAR) model in the following form¹.

Considering K-lags of Z_t ,

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \dots + A_k Z_{t-k} + \mu + \varphi D_t + \xi_t \dots \dots \dots (3.11)$$

Where Z_t is a $(n \times 1)$ vector of stochastic $I(1)$ variables, A_i ($i=1, \dots, k$) is $(n \times n)$ matrix of parameters, μ is a vector of deterministic component (i.e., a constant and trend), D is a vector of dummies and $\xi_t \sim IN(0, \Sigma)$ is a vector of error term and $t = 1, \dots, T$ (T is the number of observation).

The above model can be re-parameterized to give a vector error correction model (VECM).

That is, adding and subtracting $(A_{k-1} \dots A_2 - A_1 - I) Z_{t-k}$ from equation 4.11 (I being the identity matrix) results the following specification.

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \dots + \Gamma_{k-1} \Delta Z_{t-k+1} + \pi Z_{t-k} + \mu + \varphi D_t + \xi_t \dots \dots \dots (3.12)$$

¹The detailed consideration is taken from Juselius (1994) and Enders, (1996).

Simplifying equation (11) gives

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \pi_j Z_{t-k} + \mu + \phi D_t + \xi_t \dots \dots \dots (3.13)$$

Where, $\Gamma_i = -[I - \sum_{j=1}^i A_j]$ containing information of the short run adjustment to change in Z_t
and (i=1,2,....., k-1).

$$\pi_j = -[I - \sum_{j=1}^k A_j], \text{ containing information of the short run adjustment to change in } Z_t$$

The long run relationship among the variables is captured by the term $\pi_j Z_{t-k}$. In the Johansen (1988) procedure, determining the rank of π (i.e., the maximum number of linearly independent stationary columns in π) provides the number of cointegrating vector between the elements in z . In this connection, there are three cases worth mentioning. First, if the rank of π is zero, it points that the matrix is null which means that the variables are not co-integrated. Second, if the rank of π equals the number of variables in the system (say n), then π has full rank which implies that the vector process is stationary. Therefore, the VAR can be tested in levels. Finally, if π has a reduced rank [i.e., $1 < r(\pi) < n$] it suggests that there exists $r < (n-1)$ co-integrating vector where r is the number of co-integration in the system.. Therefore, the matrix π equals to $-\alpha\beta'$ where α and β are $n \times r$ matrices, β represents the co-integration parameters with a showing their corresponding feedback or adjustment mechanism to equilibrium (i.e., it shows the speed with which disequilibrium from the long run path is adjusted). In identifying the number of cointegrating vectors, the Johansen procedure provides n eigenvalues denoted by λ (also called characteristics roots) whose magnitude measures the extent of correlation of the cointegration relations with the stationary elements in the model.

In general, to identify the number of cointegrating vectors in the system, the Lambda max ($\lambda_{\max}$) and Lambda trace (λ_{trace}) statistics are used. They are obtained from the following formulas.

$$\lambda_{\max} = -T \log (1 - \hat{\lambda}_{r+1}) \quad , r = 0, 1, 2 \dots n-1 \dots \dots \dots (3.14)$$

$$\lambda_{\text{trace}} = -T \sum_{i=r+1}^n \log (1 - \hat{\lambda}_i) \dots \dots \dots (3.15)$$

Where T is the sample size and λ_i is estimated eigenvalues.

$\lambda_{\max}$ Statistics tests the null hypothesis that there are 'r' cointegrating vectors against the alternative of 'r+1'. The trace statistics, on the other hand, tests the hypothesis of less than or equal to 'r' cointegrating vectors against the alternative of 'r+ 1'. The distributions of both test statistics follow Chi-square distributions (Enders, 1995). Reimers (1992) (cited by Harris, 1995) points that the Johansen approach tends to over reject the null hypothesis when the sample size is small. While testing for co-integration, therefore, he suggests adjustment to be made for the degrees of freedom. This is done by substituting 'T-nk' in place of T in equations (3.12) and (3.13), where n is the number of variables and k is the lag length set in the test for cointegration.

The other important thing in the cointegration analysis is the issue of identifying endogenous and exogenous variables in the system. This is required because the Johansen procedure do not restrict the variables behaviour a priori. If a variable is weakly exogenous, it implies that its error correction term (i.e., the corresponding α -coefficient) does not enter in the error correction model. This implies that the dynamic equation for that variable contains no information

concerning the long run relationship in the system. Hence, variables that are weakly exogenous should appear in the right hand side of the VECM. This restricts the exogenous variables to be contemporaneous with the dependent variable (Harris, 1995). The first step in the test is formulation of the null hypothesis which states that the variable is weakly exogenous against the general alternate. That is,

$$H_0: \alpha_{ij} = 0 \quad \text{for } j = 1, \dots, r \text{ (r being the number of cointegrating vectors)}$$

$$H_0: \alpha_{ij} \neq 0$$

The test (for weak exogeneity) is conducted using the following formula.

$$-2 \log(Q) = T \sum_{i=1}^r \log \left(\frac{1 - \lambda_i^*}{1 - \hat{\lambda}_i} \right) \dots \dots \dots (3.16)$$

$$\text{Where } Q = \frac{(\text{restricted maximized likelihood})}{(\text{unrestricted maximized likelihood})}$$

T = the number of observations, r = the number of rank, and $\hat{\lambda}_i$ and λ_i^* represents Eigen values for unrestricted and restricted models respectively. If the result obtained from the above formula is less than the Chi-squared distribution, then the null hypothesis will not be rejected. This implies that the variable is weakly exogenous.

3.3.4 Vector Error Correction Model (VECM)

Economic variables have short run behaviour that can be captured through dynamic modeling. If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic and long run interaction between the variables. In the previous discussion, we show that if two variables that are non-stationary in levels have a stationary linear combination then the two variables are cointegrated. Cointegration means the presence of error correcting representation. That is, any deviation from the equilibrium point will revert back to its long run path. Therefore, an ECM depicts both the short run and long run behaviour of a system. Engle and Granger (1987) (cited in Alogoskoufis and Smith, 1995) defined ECM as "a particular representation of a vector autoregression appropriate for cointegrated results." This means if there exists long run relationship (i.e., cointegration among the variables) we can rewrite equation (3.12) to come up with the following VECM specification.

$$\Delta Z_t = \sum_{i=1}^{K-1} \Gamma_i \Delta Z_{t-1} + \alpha(\hat{\beta}'_1 Z_{t-1} + \hat{\beta}'_2 Z_{t-1} + \dots + \hat{\beta}'_n Z_{t-1}) + \mu + \varphi D + \varepsilon \dots \dots (3.17)$$

Where, the figure in the parenthesis represents the error correcting terms.

If there is only one cointegrating vector and if the endogenous and exogenous variables are identified in the long run analysis, we can develop the VECM by conditioning on the exogenous variables. In this case, only the error correcting terms of the endogenous variables appear in the error correction model. Thus, assuming that Y_t is endogenously determined in the model and X_{jt} represents weakly exogenous variables, we can model for Y_t . This is performed using the lagged first difference of Y_t , the current and lagged first differences of the explanatory variables as well

as the error correcting term (designed to capture adjustment speed to the long run equilibrium).

That is,

$$\Delta Y_t = \alpha + \sum_{i=1}^K \beta_i \Delta Y_{t-i} + \sum_{i=0}^K \theta_i \Delta Y_t X_{jt-i} + \gamma ECT_{t-1} \dots \dots \dots (3.18)$$

Where ΔX_{jt-i} and ECT_{t-1} represents a vector of the first differences of the explanatory variables and the error correcting term respectively. To achieve parsimony in the model, insignificant regressors from the general model are removed. In the process the adequacy of the model must be checked to support the reduction approach. This process is called "General to Specific Modeling". The next section provides results of the estimation using the above discussed procedure. The estimation is performed using PCGIVE software.

CHAPTER FOUR

ESTIMATED RESULTS AND INTERPRETATION

4.1 UNIT ROOT TEST

Non-Stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables lead to spurious regression results, from which further inference is meaningless. Hence, the first step in time series econometric analysis is to carry out unit root test on the variables of interest. The test examines whether the data series is stationary or not. To conduct the test, the conventional Dickey-Fuller (DF) and Augmented Dickey – Fuller (ADF) test are used with and without a trend. The null hypothesis in these tests claims that the series under investigation has unit root. On the other hand, the alternative hypothesis claims that the series is stationary. The results of the test for the variables at level and first difference are presented in Table 4.1 and 4.2 below respectively.

Table 4.1: Unit Root Tests of the Variables at Level

Variables	Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
	Lag Length 0		Lag Length 1		Lag Length 2	
	T_v	T_t	T_v	T_t	T_v	T_t
LGDP	1.940	-0.1481	1.513	-0.5360	2.252	0.4554
LAID	- 2.224	-2.134	-2.099	-1.944	-2.544	-2.733
FDI	-2.067	-2.544	-1.555	-2.109	-1.195	-1.582
LS	-3.469	-2.741	-2.608	-2.593	-3.404	-3.389
LX	-2.022	-2.155	-2.145	-2.292	-1.990	-2.145
LLF	-0.1104	-1.806	-0.1549	-1.843	-0.5093	-2.356
LHC	3.225	1.038	1.932	-0.3378	1.916	-0.1943
GNS	-2.979	3.825	-2.608	3.842	-3.204	1.802
X	-1.728	-1.921	-1.832	-2.061	-1.773	-2.030
GDPN	-1.796	-1.378	-1.901	-1.494	-1.667	-1.101
DEPEND	-0.06777	3.867	-2.019	-3.480	-3.238	0.9024
I	-2.609	-2.964	-1.620	-1.883	-2.130	-2.527
DF	-1.301	-2.306	-1.826	-3.272	-1.898	-3.208
DX	-1.544	-2.112	-2.014	-2.491	-1.245	-1.762

Table 4.2: Unit Root Tests of the Variables at First Difference

Variables		Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
		Lag Length 0		Lag Length 1		Lag Length 2	
		T _v	T _t	T _v	T _t	T _v	T _t
DLGDP		-3.908**	-4.693**	-3.805**	-4.808**	-4.348**	-3.754**
DLAID		-6.057**	-6.681**	-3.093*	-3.693*	-3.785**	-3.344**
DFDI		-6.555**	-6.726**	-5.091**	-5.194**	-4.549**	-3.594**
DLX		-5.187**	-5.280**	-4.065**	-4.140*	-4.020**	-4.102**
DLHC		-4.619**	-4.804**	-4.514**	-4.665**	-4.429**	-4.599**
DLLF		-5.036**	-5.276**	-5.776**	-5.944**	-3.516**	-4.688**
DLS		0 -8.120**	-8.004**	-3.911**	-3.945*	-3.481*	-3.355**
DGDPN		-5.377**	-5.686**	-4.477**	-4.869**	-3.197*	-3.596*
DEPEND		3.274 **	3.3316**	-4.740**	-7.552**	-4.9848**	-3.398**
DI		-8.621**	-8.524**	-3.468*	-3.496*	-3.114*	-3.166 **
DGNS		-8.829**	-8.828**	-3.754**	-3.961*	-3.247*	-3.961*
DAID		-5.826**	-5.903**	-3.072*	-3.055**	-2.814**	-2.701**
DFDI		-6.555**	-6.522**	-5.091**	-5.160**	-2.549	-1.758*
DDF		-4.147**	-4.122*	-3.362*	-3.311**	-3.984**	-3.977*
DDX		-4.388**	-4.427**	-5.012**	-5.220**	-4.288**	-4.719**
Critical Value	1%	-3.646342and -2.945 with and without trend, respectively.					
	5%	-2.954021and -2.616 with and without trend, respectively.					

Note: ** and * denotes rejection of the null hypothesis at **1%** and **5%** significance level respectively.

T_v is estimated value of test statistics when a drift term (constant) is included in the auxiliary regression for unit root test.

T_t is estimated value of test statistics when a drift term (constant) and trend are included in the auxiliary regression for unit root test

The ADF test statistics as depicted in Table 4.1 and 4.2, illustrates that all variables are non-stationary at levels. That is, it is not possible to reject the null hypothesis of unit root both with and without trend in the auxiliary regression of unit root. But the ADF test applied to the same variables in their first difference becomes stationary at the conventional 1% and 5% level of significance. The variables are, therefore, integrated of order one ($I \sim I(1)$).

4.2 Estimation of the Reduced Form VAR and Test for Cointegration

The first step in estimating a VAR model is to determine the optimal lag length of the VAR (Alemayehu et al, 2009). Hence, the optimal lag length for this study has been determined using the Akaike Information Criterion (AIC) as this method has been proven in most empirical papers to be superior to other tests. According to the Akaike Information Criteria, the VAR estimate with the lowest AIC in absolute value is the most efficient one. In addition, the optimal lag length that is obtained from the AIC is also confirmed by the model reduction test. This result is reported in the following two consecutive tables.

Table 4.3: Model reduction Test for Growth Equation

Progress to date							
Model	T	p		log-likelihood	SC	HQ	AIC
SYS(3)	31	56	OLS	150.37721	-3.4984	-5.2444	-6.0889
SYS(2)	31	105	OLS	193.51470	-0.85357	-4.1273	-5.7106
SYS(1)	31	154	OLS	321.16888	-3.6614	-8.4629	-10.785
Tests of model reduction (please ensure models are nested for test validity)							
SYS(2) --> SYS(3): F(49,55) = 0.82236 [0.7560]							
SYS(1) --> SYS(3): F(98,27) = 1.3407 [0.1937]							

As shown in the table above the VAR estimates was conducted successively from lag length three to one. Based on AIC and HQ criterion, the second lag was found to be optimal for growth equation. Though the model reduction test ,i.e., model reduction from *VAR (2) to VAR (1)* or from *SYS (2) --> SYS (3)*, is not rejected based on the overall F test at any level of significance, based on AIC and HQ criterion VAR(2) is the data congruent model .

The optimal lag length determination procedure for saving equation, similar to growth equation, is presented as follows in Table 4.4 below.

Table 4.4 Model reduction Test for Saving Equation

Progress to date							
Model	T	p		log-likelihood	SC	HQ	AIC
SYS(3)	32	56	OLS	-625.16631	38.076	33.360	31.022
SYS(2)	32	105	OLS	-500.86243	42.676	39.461	37.866
SYS(1)	32	154	OLS	-342.35429	45.138	43.423	42.573
Tests of model reduction (please ensure models are nested for test validity)							
SYS(2) --> SYS(3): F(50,112)= 0.89792 [0.6599]							
SYS(1) --> SYS(3): F(25,109)= 0.63549 [0.9041]							

The above table indicates that reducing the model from VAR (2) to VAR (1) and VAR (3) to VAR (1) is acceptable based on the overall F test at different levels of significance. That is, model reduction from SYS (2) --> SYS (3) and SYS (1) --> SYS (3) is not rejected at different conventional level of significance. Therefore, the optimal lag length that is used for saving equation is one. This result is also in line with AIC and HQ lag length determination procedure.

Table 4.5 Model reduction test for Investment Equation

Progress to date							
Model	T	p		log-likelihood	SC	HQ	AIC
SYS(3)	32	42	OLS	-374.08451	27.929	26.643	26.005
SYS(2)	32	78	OLS	-325.15519	29.580	26.089	24.358
SYS(1)	32	114	OLS	-275.73054	28.770	26.381	25.197
Tests of model reduction (please ensure models are nested for test validity)							
SYS(2) --> SYS(3):				F(36,64) =	1.7960	[0.0204]*	
SYS(1) --> SYS(3):				F(72,49) =	1.4355	[0.0903]	

As indicated in the above table the VAR estimates was conducted successively from lag length three to one. Based on AIC and HQ criterion, the second lag was found to be optimal for investment equation. This is also confirmed by the model reduction test, i.e., model reduction from *VAR (2) to VAR (1)* or from *SYS (2) --> SYS (3)*, is rejected based on the overall F test at 5% level of significance. Therefore, it is not plausible to eliminate lag length two as it leads to loosing much information. Hence, this study is going to employ the optimal lag length of two for investment equation.

4.2.1 Growth Equation

Table 5.1 and 5.2 showed that all the variables contained in the growth equation are I(1). This permits to conduct the test for cointegration among the variables. The λ_{trace} statistics adjusted for degrees of freedom confirms that the null hypothesis of at most one cointegrating vector is not rejected at 1% significance level. This points the presence of one cointegrating vector. The test is reported in the following table.

Table 4.6: Johanson's Cointegration Test for Growth Equation

H₀: r ≤	Trace Statistics	Eigen Value	P - value
0	144.09	0.82019	[0.002] **
1	85.755	0.65020	[0.200]
2	50.042	0.51810	[0.637]
3	25.221	0.34398	[0.909]
4	10.888	0.18483	[0.959]
5	3.9399	0.094980	[0.902]
6	0.54676	0.015953	[0.460]

The result, depicted in Table 4.6, reports that there is one cointegrating vector in the system. The null of no-cointegration vector ($r \leq 0$) is rejected by λ_{trace} statistics at 1 % significance level. On the other hand, the null that there exists at most one cointegrating vector ($r \leq 1$) is accepted. The existence of one cointegrating vector suggests that the first row of β and first column of α matrices are important for further analysis. Thus, table 4.7 below reports the β and α matrices of growth equation.

Table 4.7: Standardized Beta (β) Coefficients

LGDP	LAID	FDI	LS	LX	LHC	LLF
1.0000	-0.20241	0.11474	-1.6839	-0.18087	0.17548	-1.3662
9.0740	1.0000	0.25588	1.5863	-1.4448	-3.9988	3.1017
-0.42977	-3.1999	1.0000	1.7842	-4.9463	1.0706	-4.3069
-6.0044	-0.49702	-0.084943	1.0000	-0.20647	1.7999	2.2815
-0.92778	0.32367	0.095385	0.11702	1.0000	0.64193	-1.5866
-2.4263	0.54721	-0.053609	0.93974	-1.5122	1.0000	-0.91896
-2.0128	0.79423	0.13476	-0.38673	0.53819	-0.12418	1.0000

Table 4.8: Standardized α Coefficients

LGDP	0.050390	-0.007417	-0.00178	0.036595	0.036489	0.0073048	0.0029386
LAID	0.038389	-0.16711	0.070847	0.054325	-0.009701	-0.041660	-0.037899
FDI	-0.32183	-0.49580	-0.48732	0.31785	-0.54782	0.17052	-0.13718
LS	-0.40398	-0.10221	-0.02613	-0.10992	-0.060211	0.043510	0.018695
LX	-0.16445	0.0077347	0.040942	0.013475	-0.097051	0.067636	0.014338
LHC	0.13627	0.038483	-0.00457	0.035685	0.0061876	-0.008084	0.00077996
LLF	-0.00291	0.025316	-0.00433	-0.047082	0.026861	0.015523	-0.015875

Since the existence of only a unique cointegrating vector is statistically supported in the Johansons's cointegration test, only the first row of β and the first column of α in Table 4.7 and 4.8 respectively are happen to be the relevant entries. The values of α obtained from the cointegration show the speed of adjustment of the long run parameters towards the steady state and the deviation from long run equilibrium. For instance, the α coefficients of net foreign direct

investment inflow to GDP ratio (FDI) ,gross domestic saving to GDP ratio(LS) ,export GDP ratio(LX) and labour force(LLF) are negative indicating that their speed of adjustment towards long run equilibrium. That is, the speed of adjustment of FDI, LS LX and LLF adjusts to their long run equilibrium by 32.18, 40.4, 16.44 and 0.3 percent respectively. However, the α coefficients of LAID and LHC are positive, which indicates the extent to which those variables deviate from their long run steady state path after a certain shock.

To identify the variables that are endogenously determined and conditional on other variables in the VAR, the test for weak exogeneity is conducted. This requires imposing zero restriction on the first column of α coefficients. The results, using the likelihood ratio test as shown in the Table 4.9 confirm that only the dependant variable rejects the null at 5% while all the explanatory variables did not reject. Therefore, other than real GDP all the explanatory variables are not endogenous to the system.

Table 4.9: Test of Weak Exogeneity (Test for Zero Restriction on α Coefficients)

α -Coefficients	LR test of restrictions: Chi ² (1)	Probability Value
LGDP	3.8897	[0.0486]*
LAID	0.10854	[0.7418]
FDI	0.32379 [0.5693]	[0.5693]
LS	2.024	[0.0875]
LX	0.0064055	[0.9362]
LHC	0.82871	[0.3626]
LLF	0.73584	[0.3910]

**denotes rejection of the null hypothesis of weak exogeneity at 5% significance level.*

Once the long run relationship is defined, the next task is to formulate test of significance on the long run parameters. This test can be obtained by imposing restriction on β coefficients, which is termed as exclusion test. It helps to determine which are relevant or statistically significant in the cointegrating vector. The result of the test along with their respective probability values are reported on Table 4.10 below.

Table 4.10: Test of Zero restriction on the Long – run β Paramete (Significance of long run Coefficients)

β -Coefficients	LR test of restrictions: $\chi^2(1)$	Probability Value
LGDP	17.707	[0.0000]**
LAID	7.3150	[0.0016]*
FDI	16.1812	[0.0005]**
LS	17.707	[0.0000]**
LX	7.3150	[0.0016]*
LHC	0.15555	[0.6933]
LLF	6.6292	[0.0100]*

*** and * denotes rejection of the null hypothesis at 1% and 5% significance level respectively.*

As it is explained from the table, the long – run results depict that all explanatory variables, except human capital (LHC), for LGDP were found to be significant from zero. That is, the result rejects the null hypothesis that the β coefficients are jointly significant at 1% and 5% level of significance. Moreover, the variables are with the hypothesized sign. Hence, the long run growth equation with the corresponding signs and significance is presented as follows:

$$\begin{aligned}
 LGDP = & 0.20241LAID - 0.11474FDI + 1.6839LS + 0.18087LX \\
 & [0.0016]^* \quad [0.0005]** \quad [0.0000]** \quad [0.0016]^* \\
 & -0.17548LHC + 1.3662LLF \dots\dots\dots (4.1) \\
 & [0.6933] \quad [0.0100]^*
 \end{aligned}$$

Single Equation Diagnostic Tests

Vector AR 1-2 test: $\chi^2(98) = 0.037844 [1.0000]$
Vector Normality test: $\chi^2(14) = 89.735 [0.0000]**$
Vector hetero test: $\chi^2(392) = 410.62 [0.2488]$

***denotes rejection of the null hypothesis at 1% level of significance*

The result of the diagnostic test confirms the adequacy of the model. That is, the null of no serial correlation and homoscedasticity are not rejected at any conventional significant level. The null hypothesis of normality, however, is rejected at 1% level of significance. Nonetheless, the Johansen result still holds.

In line with the standard growth theory, the regression result shows that, foreign aid produced significant and positive influence on growth. On the other hand, foreign direct investment variable produced significant and negative impact on growth. The result implies that LAID variable play a major role in inducing growth. The long run elasticity of LGDP with respect to LAID is 0.20241, implying one percent increase in foreign aid produces 0.20241 percent increment in output. Moreover, domestic saving has also significant and positive effect on growth of GDP. However, human capital (LHC) has a negative and insignificant effect on output. This might be due to high level of illiteracy rate in the nation. Agriculture, being the dominant sector in the Ethiopian economy, is the great contributor to GDP and labour forces

engaged in the sector are almost illiterate. Moreover, using expenditure on education may not be a good proxy for human capital.

4.2.2 Saving Equation

Table 4.1 and 4.2 showed that all the variables contained in the saving equation are I(1). This permits to conduct the test for cointegration among the variables. The λ_{trace} statistics adjusted for degrees of freedom confirms that the null hypothesis of at most one cointegrating vector is not rejected at 5% significance level. This points the presence of one cointegrating vector. The test is reported in the following table.

Table 4.11: Johanson's Cointegration Test for Saving Equation

$H_0: r \leq$	Trace statistics	Eigen Value	P - value
0	1171.1	1.0000	0.000] **
1	87.844	0.69832	[0.154]
2	50.693	0.51400	[0.609]
3	28.325	0.39537	[0.799]
4	12.728	0.21829	[0.901]
5	5.0935	0.13591	[0.797]
6	0.56499	0.018061	[0.452]

The result, depicted in Table 4.11, reports that there is one cointegrating vector in the system. The null of no-cointegration vector ($r \leq 0$) is rejected by λ_{trace} statistics at 1 % significance level. On the other hand, the null that there exists at most one cointegrating vector ($r \leq 1$) is accepted. The existence of one cointegrating vector suggests that the first row of β and first column of α matrices are important for further analysis. Thus, table 4.12 below reports the β and α matrices of growth equation.

Table 4.12: Standardized Beta (β) Coefficient

GNS	AID	FDI	GR	X	GDPN	DEPEND
1.0000	0.1635	-0.075076	- 0.51412	0.031144	-0.48751	0.14371
-0.010418	1.0000	-4.8734	0.068944	0.78746	0.074535	-0.018714
0.0061416	0.50929	1.0000	-0.32166	-0.11301	0.028911	-0.048592
0.0020946	0.57855	-1.1402	1.0000	-6.9252	-0.68772	5.4443
0.0027756	4.1587	-9.3555	-0.05554	1.0000	-42.736	0.0012424
-2.7437	5125.6	-1890.7	-0.01565	-6860.6	1.0000	2.7399
-1.9661	-593.55	1113.1	0.93142	-557.97	50.272	1.0000

Table 4.13: Standardized α Coefficients

GNS	-0.2038	0.37418	0.17381	-0.24838	0.34700	0.0015010	0.0021980
AID	0.41176	-0.038914	-0.30576	-0.44125	-0.001875	-1.7481	2.9004
FDI	0.36866	0.024132	-0.28286	0.043488	0.0011506	4.8908	2.6592
GR	-0.11210	-0.10398	0.0034348	-0.025468	0.00054256	-0.005797	0.036497
X	0.15479	-0.010816	0.15243	-0.28811	0.0040888	1.3517	1.9936
GDPN	-0.1382	0.15615	-2.1384	-4.9396	-0.17149	0.00012207	-0.0002607
DEPEND	-0.10414	0.024283	-0.034581	-0.042610	0.00017736	0.0015010	0.0021980

The first column of table 4.13 shows the speed of adjustments towards the long run steady state equilibrium for the variables. Values -0.2038 , -0.11210, -0.1382 , and -0.10414 indicate the speed of adjustment of savings, GR, per capita income (GDPN) and dependency ratio (DEPEND) towards the long run steady state path, respectively. On the other hand the α coefficient of AID and FDI is positive, which indicates the extent to which these variables deviate from the long run steady state path after a certain shock.

Once testing for cointegration rank, the next procedure is weak exogeneity test. For testing it, a likelihood ratio test (LR – test) is employed by imposing a zero restriction on the α coefficients. This is simply a test whether the speed of adjustment α is significantly different from zero in the equation for the variables tasted.

Table 4.14: Test of Weak Erogenity (Test for Zero Restriction on α Coefficients)

α -Coefficients	LR test of restrictions: Chi ² (1)	Probability Value
GNS	8.6533	[0.0033]**
AID	0.22799	[0.6330]
FDI	1.8530	[0.1734]
GR	0.030357	[0.8617]
X	2.2257	[0.1357]
GDPN	0.50070	[0.4792]
DEPEND	0.87507	[0.3496]

***denotes rejection of the null hypothesis of weak exogeneity at 1% significance level.*

Results reported in Table 4.14 shows, the null hypothesis of weak exogeneity is rejected for saving at 1 % level of significance. However, for the remaining variables, the null hypothesis is not rejected at different level of significance. Thus the long run relationship can be formulated by taking **S** as endogenous variable, while, AID, FDI, GR, X, GDPN and DEPEND as exogenous variables. Before writing the long run saving equation, the long run coefficients of respective variables should be tasted for significance to determine which variables strongly constitute the cointegrating vector. This test is conducted by imposing a zero restriction on each coefficient

(β 's) and the result for the Likelihood Ratio (LR) statistics are summarized in the following table.

Table 4.15: Test of Zero restriction on the Long – run Parameters (Significance of long - run Coefficients)

β -Coefficients	LR test of restrictions: Chi ² (1)	Probability Value
GNS	14.521	[0.0001]**
AID	0.041943	[0.8377]
FDI	7.2708	[0.0070]**
GR	5.9849	[0.0144]*
X	0.87507	[0.3496]
GDPN	4.3454	[0.0371]*
DEPEND	11.201	[0.0008]**

*** denotes rejection of the null hypothesis at 1% significance level.*

The test statistics reported in Table 4.15 rejects the null hypothesis of $\beta = 0$ for all explanatory variables, except for AID and X, at 1% and 5% level of significance. That is, except AID and X all variables are statistically significant in explaining the long run savings in Ethiopia.

Hence, the long run saving equation with the corresponding signs and significance is presented as follows.

$$GNS = -0.1635 AID + 0.075076 FDI + 0.51412 GR$$

$$[0.8377] \quad [0.0070]** \quad [0.0144]*$$

$$-0.031144 X + 0.48751 GDPN - 0.14371 DEPEND + \dots \dots \dots (4.2)$$

$$[0.3496] \quad [0.0371]* \quad [0.0008]**$$

Single Equation Diagnostic Test

Vector AR 1-2 test: $F(98, 46) = 22.7405 [0.2540]$

Vector Normality test: $Chi^2(14) = 41.159 [0.0002]**$

Vector hetero test: $Chi^2(280) = 300.52 [0.1908]$

The result of the diagnostic test confirms the adequacy of the model. That is, the null of no serial correlation and homoscedasticity, are not rejected at any conventional significance level. Though the null of normality is rejected at 1% level of significance, the saving equation is reasonably acceptable.

The figures in the parentheses confirm, the null hypothesis of no significance is rejected for the net FDI to GDP ratio, and DEPEND variables at 1% level of significance and for GDP and GDPN at 5% level of significance. This suggests that the above mentioned variables are statistically significant in influencing saving.

The results in general point out that GDP and GDPN have significant and positive coefficients which are in line with growth theories. This implies that for the period under consideration, the role of these variables was significant in improving saving. Foreign direct investment also has positive and statistically significant effect to saving. It might be due to the complementarity

between domestic investment and foreign investments which are financed by domestic savings and foreign resource inflows. Dependency ratio has negative and significant effect on saving implying that the ratio of dependent (in active) population to independent (working) population is high in the country.

On the other hand, the result points out that aid and export variables have insignificant effects on savings. Foreign aid has insignificant and negative coefficient. This implies that for the period under consideration, the role of foreign aid was negligible in improving the domestic saving. This could be probably explained by aid was used for consumption purpose rather than raising the level of saving. Moreover, export variable has also a negative and insignificant effect on savings. This shows that its impact was negligible for the period under consideration.

4.2.3 Investment Equation

Once the order of integration among variables, as shown in Table 4.1 and 4.2, determined, i.e. $I(1)$, the next step is to test whether integrated variables sharing common stochastic trend are co integrated so that a meaningful long run relationship can be established by using Johansen's Cointegration test. The test is reported in the following table.

Table 4.16: Johansen's Cointegration Test for Investment Equation

$H_0: r \leq$	Trace Statistics	Eigen Value	P - value
0	122.54	0.80840	[0.000] **
1	42.893	0.35201	[0.135]
2	33.958	0.090475	[0.509]
3	19.406	0.31849	[0.475]
4	7.9028	0.15515	[0.483]
5	2.8450	0.38435	[0.092]

The λ_{trace} test statistics, as shown in Table 4.16, rejects the null of no-cointegration vector ($r \leq 0$) at 5% significance level. While, the null hypothesis of at most one cointegrating vector ($r \leq 1$) is not rejected. Hence there is unique cointegrating vector in the system. This implies, there is only one relevant linear combination of variables, represented by the first row of β and the first column of α matrices. The following table reports the β and α matrices of investment equation.

Table 4.17: Standardized beta (β) coefficients

I	S	AID	FDI	DF	DX
1.0000	-0.23252	-0.24951	-0.34667	0.22364	0.059367
-11.395	1.0000	8.8151	-14.278	3.0376	-2.2079
-6.5683	-0.092203	1.0000	0.63854	0.75387	0.22318
1.2522	-0.52612	-0.32544	1.0000	0.22889	0.067119
1.0421	-0.29241	-0.0096068	4.9991	1.0000	0.45915
-1.7698	0.68582	2.0788	-7.5985	1.4952	1.0000

Table 4.18: Standardized α Coefficients

I	-0.090772	0.00077321	0.075899	0.19814	-0.029034	-0.003502
S	-0.3178	-0.096455	0.11481	0.67644	0.19224	-0.00451
AID	-0.1720	-0.062241	-0.024743	0.42515	0.033566	0.0054675
FDI	-0.0064549	-0.016313	-0.0087655	0.022497	-0.051534	0.012091
DF	0.38057	-0.12363	-0.0051372	-0.37537	-0.080510	-0.010455
DX	-0.7256	-0.7256	-0.25871	0.76903	-0.13175	-0.039545

The first column of table 4.18 shows the speed of adjustments towards the long run steady state equilibrium for all variables. For example -0.090772, -0.3178, -0.1720, -0.0064549 and -0.7256 indicates the speed of adjustment of investment, savings, foreign aid, foreign direct investment and debt service to export ratio towards the long run steady state path, respectively. That is, the speed of adjustment of I, S, AID, FDI and DX adjusts to their long run equilibrium by 9.0, 31.78, 17.2, 0.6 and 72.56 percent respectively. However, the α coefficient of DF is positive, which indicates the extent to which this variable deviates from its long run steady state path after a certain shock.

Once testing for cointegration rank, the next procedure is weak exogeneity test. For testing it, a likelihood ratio test (LR – test) is employed by imposing a zero restriction on the α coefficients. This is simply a test whether the speed of adjustment α is significantly different from zero in the equation for the variables tested.

Table 4.19: Test of Weak Exogeneity (Test for Zero Restriction on α Coefficients)

α -Coefficients	LR test of restrictions: Chi ² (1)	Probability Value
I	11.026	[0.0009]**
S	0.17679	[0.6741]
AID	3.4111	[0.0648]
FDI	0.15417	[0.9012]
DF	0.85293	[0.3557]
DX	1.7283	[0.1886]

***denotes rejection of the null hypothesis of weak exogeneity at 1% significance level.*

Results reported in Table 4.19 shows, the null hypothesis of weak exogeneity is rejected for investment at 1 % level of significance. However, for the remaining variables, the null hypothesis is not rejected at different level of significance. Thus the long run relationship can be formulated by taking **I** as endogenous variable, while, S, AID, FDI, DF and DX as exogenous variables. Before writing the long run investment equation, the long run coefficients of respective variables should be tested for significance to determine which variables strongly constitute the cointegrating vector. This test is conducted by imposing a zero restriction on each coefficient (β 's) and the result for the Likelihood Ratio (LR) statistics are summarized in the following table.

Table 4.20: Test of Zero restriction on the Long – run Parameters (Significance of long - run Coefficients)

β -Coefficients	LR test of restrictions: Chi ² (1)	Probability Value
I	8.2604	[0.0041]**
S	11.271	[0.0008]**
AID	9.2460	[0.0024]**
FDI	1.2510	[0.2634]
DF	11.712	[0.0006]**
DX	1.6256	[0.2023]

*** denotes rejection of the null hypothesis at 1% significance level.*

The test statistics reported in Table 4.20 rejects the null hypothesis of $\beta = 0$ for all explanatory variables, except for FDI and DX, at 1% level of significance. That is, except FDI and debt service to export ratio (DX), all variables are statistically significant in explaining the long run investment in Ethiopia.

Hence, the long run investment equation with the corresponding signs and significance is presented as follows.

$$I = 0.23252 S + 0.24951 AID + 0.34667 FDI - 0.22364 DF - 0.059367 DX \dots \dots \dots (4.3)$$

[0.0008]** [0.0024]** [0.2634] [0.0006]** [0.2023]

Single Equation Diagnostic Test

Vector AR 1-2 test: $F(72, 22) = 0.91151 [0.6296]$

Vector Normality test: $Chi^2(12) = 17.030 [0.1485]$

Vector hetero test: $Chi^2(504) = 532.70 [0.1819]$

The result of the diagnostic test confirms the adequacy of the model. That is, the null of no serial correlation, homoscedasticity, and normality are not rejected at any conventional significance level. Therefore, the investment equation is reasonably acceptable.

The figures in the parentheses confirm, the null hypothesis of no significance is rejected for the saving to GDP ratio, aid to GDP ratio and defense expenditure to GDP ratio variables at 1% level of significance. This suggests that the above mentioned variables are statistically significant in influencing investment.

The result in general point out that saving has significant and positive coefficient. This implies that for the period under consideration, the role of saving was significant in improving investment. Possibly, the high correlation between national investments and domestic savings demonstrates that the financial markets are not more integrated (Baldwin and Martin 1999, Taylor, 1996). Foreign aid also has positive and statistically significant effect to investment. It implies that foreign aid played important role in financing capital imports, and supported domestic capital formation activity. Therefore, we can argue that for the period under consideration aid played a positive role in improving the level of investment by filling the saving-investment gap. This result is consistent with Tolessa (2001) and Wondwosen T. (2003).

On the other hand, the result points out that net FDI and debt export ratio (DX) have insignificant effects on investment. Net FDI has insignificant effects but positive coefficient. This implies that for the period under consideration, the role of net FDI was negligible in improving aggregate investment. That is, a one unit increase in net FDI leads to 0.35 unit increases in investment respectively. This could be probably explained by low level of net inflow of foreign direct investments and/or the substitutability between FDI and domestic investments.

The result further shows that political instability has negative and significant impact to investment. This implies that war reduces investment through creating an environment that is not conducive for investment, by destroying existing property and infrastructure as well as by consuming the available resource that could otherwise be invested. This result coincides with the results obtained by Dawit and Yemisrach (2001) and Wondwosen T. (2003).

The debt service to export ratio variable indicates statistically insignificant negative impact. It suggests that for the period under consideration the influence of debt service in crowding out investment was almost negligible. The possible reasons for such insignificant result of debt service on investment include the practice of postponing debt payments (particularly in the Derg period), and successive debt relief provided under the current regime (Dawit and Yemisrach, 2001)

4.3. The Short Run Dynamic Modelling (Vector Error Correction Model)

4.3.1 Growth Equation

The existence of stationarity and cointegration permits to develop the following error correction model for growth.

$$\Delta LGDP = \sum_{i=1}^k \Delta LGDP + \sum_{i=0}^k \Delta LAID + \sum_{i=0}^k \Delta FDI + \sum_{i=0}^k \Delta LS + \sum_{i=0}^k \Delta LX + \sum_{i=0}^k LHC + \sum_{i=0}^k \Delta LLF - ECT_{-1} \dots \dots \dots (4.4)$$

Where k represents the lag length and ECT_{-1} denotes the error correcting term.

Following the above specification, a dynamic equation for growth function is reported as:

Table 4.21 Short Run Dynamics Result for Growth Equation*Dependent variable DLGDP*

Variable	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	-0.00354809	0.02904	-0.122	0.904	0.0006
DLAID_1	0.0350499	0.04277	0.820	0.421	0.0284
DFDI	-0.00577771	0.008853	-0.653	0.520	0.0182
DFDI_1	-0.0161146	0.009778	-1.650	0.113	0.1056
DLS_1	0.0326047	0.05701	0.572	0.573	0.0140
DLX_1	0.0705969	0.06336	1.110	0.277	0.0512
DLHC	0.352603	0.2524	1.400	0.176	0.0782
DLLF_1	0.109701	0.1192	0.920	0.367	0.0355
ECM_1	-0.141675	1.118	-0.127	0.900	0.0007

Diagnostic tests

$R^2 = 0.403655$ $F(9, 23) = 5.759 [0.000]**$ $DW = 1.91$

AR 1-2 test: $F(2, 21) = 2.3037 [0.1246]$

ARCH 1-1 test: $F(1, 21) = 0.76345 [0.3921]$

Normality test: $\chi^2(2) = 2.4555 [0.2930]$

Hetero test: $F(18, 4) = 0.24093 [0.9852]$

RESET test: $F(1, 22) = 0.0021235 [0.9637]$

The various diagnostic test of the model points no problem regarding the regression analysis.

That is, there is no an indication of serial autocorrelation as shown by the Breusch Godfrey LM test for serial correlation. The white test for heterocedasticity also does not reject the null

hypothesis of homocedasticity errors. Moreover, the ARCH test (Engle, 1982) indicates the absence of autoregressive conditional heteroscedasticity errors. Similarly, the general test for misspecification as provided by Ramsey's (1969) RESET test does not reject the null hypothesis of no functional misspecification in the estimated equations. And finally, the Jarque Bera test for normality indicates that the null hypothesis of normality distributed error terms is not rejected. The goodness of fit of the above models (R^2) shows that (40.37%) of the total variation in the dependent variable (LGDP) is explained by the independent variables in the model. In addition, the reported F-statistics rejects the null hypothesis that the coefficients of all explanatory variables except the constant term are jointly zero. In general, no problem is detected by the diagnostic statistics of the model which lends support to the reasonableness of the specification.

The short run model shows that both current and past net FDI has a negative influence on growth. This could be possibly due to the fact that benefits from FDI are not realized in the short period of time and out flows exceed inflows. Moreover, both aid and saving produced statistically significant positive result. The short run model further shows that labour and human capital have a positive effect on real gross domestic product of Ethiopia which is consistent with what growth theories hypothesized.

The lagged error correction term (ECT_{-1}) included in the model to capture the long run dynamics between the cointegrating series is correctly signed (negative). This coefficient indicates a speed of adjustment 14.17 percent from actual growth in the previous year to equilibrium rate of economic growth. This implies that in one year the real gross domestic product adjusts itself to the equilibrium by 14.17%.

4.3.2 Saving Equation

The existence of stationarity and cointegration permits to develop the following error correction model for saving.

$$\Delta GNS = \sum_{i=0}^k \Delta AID + \sum_{i=0}^k \Delta FDI + \sum_{i=0}^k \Delta GR + \sum_{i=0}^k \Delta DX \sum_{i=1}^k \Delta GDPN + \sum_{i=0}^k \Delta DEPEND - ECT_{-1} \dots (4.5)$$

Where, ECT_{-1} is the error correcting term.

Following the above specification, a dynamic equation for saving function is established.

Eliminating insignificant variables (from the above specification) through the general to specific modeling strategy, the following parsimonious result is reported.

Table 4.22: Short Run Dynamics Result for Saving Equation

Dependent variable DGNS

Variable	Coefficient	Std.Error	t-value	t-prob	Part.R ²
DGNS_1	0.446838	0.1811	2.47	0.023	0.2427
DGNS_2	0.550071	0.1437	3.83	0.001	0.4355
Constant	-110.993	498.0	-0.223	0.826	0.0026
DAID	-339.709	161.9	-2.10	0.049	0.1882
DFDI	953.519	315.5	3.02	0.007	0.3247
DFDI_2	756.995	443.3	1.71	0.104	0.1331
DGR	0.516780	0.1326	3.90	0.001	0.4442
DGR_1	-0.365146	0.1674	-2.18	0.042	0.2004
ECM_1	-0.09719	0.1839	-5.97	0.000	0.6521

Diagnostic Tests

$R^2 = 0.899428$ $F(8, 19) = 21.24$ $[0.000]**$ $DW = 2.64$

AR 1-2 test: $F(2, 17) = 2.0446$ $[0.1601]$

ARCH 1-1 test: $F(1, 17) = 0.0080221$ $[0.9297]$

Normality test: $\chi^2(2) = 5.1295$ $[0.0769]$

hetero test: $F(16, 2) = 1.8549$ $[0.4065]$

RESET test: $F(1, 18) = 3.7100$ $[0.0955]$

The above result reveals that the overall fit of the model is acceptable. The explanatory variables explain about 89.9 percent of the variation in the model. The F statistics rejects the null hypothesis that all the coefficients in the model are jointly insignificant. Moreover, the various diagnostic tests perform well indicating no problem about the regression analysis. That is, the test does not reject the null of white noise error terms suggesting no problem of error autocorrelation. In addition, the test for autoregressive conditional heteroscedasticity (ARCH) points that no ARCH structure in the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance. The Jacque Bera test for normality does not reject the null hypothesis of normality. It points out that the error term is normally distributed. Moreover, the Ramsey RESET test for functional form mis-specification accepts the regression specification of the dynamic model.

The regression result indicates that, in the short-run, foreign direct investment and current gross domestic product produce significant and positive impact on savings. The positive relationship between saving and FDI in the short run might be accounted for the substitutability between FDI and domestic investment. That is, if what is saved is not used in undertaking investment projects

and people's consumption habit is highly affected by permanent income rather than transitory income (in which saving is mainly affected), it may result high saving rate. On the other hand, foreign aid and past GDP resulted in significantly negative influence on savings. The fact that aid has a negative impact on saving reveals that resources coming from abroad in form of aid might be used for consumption purpose rather than being saved.

The above preferred model also confirms that the error correcting term is significant at 1%. It points out that about **9.72 %** of the disequilibrium from the long run path will be corrected in one year.

4.3.3 Investment Equation

The existence of stationarity and cointegration permits to develop the following error correction model for investment.

$$\Delta I = \sum_{i=1}^k \Delta I + \sum_{i=0}^k \Delta S + \sum_{i=0}^k \Delta AID + \sum_{i=0}^k \Delta FDI + \sum_{i=0}^k \Delta DF + \sum_{i=0}^k \Delta DX - ECT_{-1} \dots \dots \dots 4.6$$

Where, ECT-1 is the error correcting term.

Following the above specification, a dynamic equation for investment function is established.

Eliminating insignificant variables (from the above specification) through the general to specific modeling strategy, the following parsimonious result is reported.

Table 4.23 Short Run Dynamics Result for Investment Equation**Dependent variable DI**

variable	Coefficient	Std.Error	t-value	t-prob	Part.R ²
DS_1	0.105663	0.03763	2.81	0.010	0.2473
DAID_1	0.158004	0.07628	2.07	0.049	0.1517
DDF_1	-0.162909	0.07497	-2.17	0.043	0.1991
ECT_1	-0.208430	0.07096	-2.94	0.009	0.3240

Diagnostic test

$R^2 = 0.592102$ $F(15, 13) = 2.916 [0.009]**$ $DW = 2.04$

AR 1-2 test: $F(2, 23) = 0.16878 [0.8457]$

ARCH 1-1 test: $F(1, 23) = 0.44147 [0.5130]$

Normality test: $\chi^2(2) = 4.5112 [0.1048]$

RESET test: $F(1, 24) = 0.0026930 [0.9590]$

The above result reveals that the overall fit of the model is acceptable. The explanatory variables explain about 59 percent of the variation in the model. The F statistics rejects the null hypothesis that all the coefficients in the model are jointly insignificant. Moreover, the Durban Watson (DW) test result suggests that there is no autocorrelation problem. Moreover, the various diagnostic tests perform well indicating no problem about the regression analysis. That is, the test does not reject the null of white noise error terms suggesting no problem of error autocorrelation. In addition, the test for autoregressive conditional heteroscedasticity (ARCH) points that no ARCH structure in the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance. The Jacque Bera test for normality does not reject

the null hypothesis of normality. It points out that the error term is normally distributed. Moreover, the Ramsey test for functional form mis-specification accepts the regression specification of the dynamic model.

The regression result indicates that, in the short-run, foreign aid and domestic saving produce significant and positive impact. On the other hand, defense expenditure (a proxy of war) resulted in significantly negative influence on investment. It points the impact of political instability in constraining investment. The above preferred model also confirms that the error correcting term is significant at 1%. It points out that about 20.84 % of the disequilibrium from the long run path will be corrected in one year. The speed of adjustment further indicates that it takes about four and half years for the deviation to be fully adjusted.

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

5.1 Conclusions

This paper analyzes the impact of FCI on saving, investment and economic growth of a developing economy, Ethiopia. In doing so, it utilizes the Johansen Maximum Likelihood Procedure in analyzing the data.

The study has investigated the relationship between several variables and is conducted on annual data covering the period 1974/75 to 2008/09. In the study, three equations are identified – saving, investment and growth equations. The time series property of the variables contained in the three equations is addressed through the test for stationarity and the result found that all the variables are stationary after first differencing. Therefore, VAR and error correction models are estimated to assess the impact of FCI. The test for cointegration is performed in all the three equations and the result confirmed the existence of long run relationship among the variables in the model.

First, the growth equation is developed to examine its interaction with FCI (FDI and AID), saving and other variables. The main outcome of the empirical assessment confirms that foreign aid and domestic saving variables produced significant and positive influence on growth both in the long and short run. Moreover, both in the long run and short run net FDI has a negative influence on growth.

The second equation developed is the saving equation. The result reveals that both in the long and short run Foreign direct investment has positive and statistically significant effect on saving. It might be due to the substitutability between domestic and foreign investments which are

financed by foreign resource inflows in this case and what was saved earlier is neither invested nor consumed as the latter is highly affected by permanent income. Moreover, gross domestic product has a positive and significant contribution to saving in both long and short run models.

On the other hand, the result points out that aid has insignificant and negative effects on savings in the long run while it has significantly negative influence in the short run. This implies that for the period under consideration, the role of foreign aid was negligible in improving the domestic saving in the long run and aid was used for consumption purpose rather than raising the level of saving for the period under consideration.

The other investigation is concerned with the relationship between investment and capital inflows. The results reveal that in the long run, Foreign aid has positive and statistically significant effect on investment. It implies that foreign aid played important role in financing capital imports, and supported domestic capital formation activity. Therefore, we can argue that for the period under consideration aid played a positive role in improving the level of investment by filling the saving-investment gap. Domestic saving has significant and positive impact on investment and also stimulates investment. On the other hand, the result points out that net FDI and debt export ratio (DX) have insignificant effects on investment. Net FDI has insignificant effects but positive coefficient.

The result further shows that political instability has negative and significant impact to investment and the debt service to export ratio variable indicates statistically insignificant negative impact.

In the short-run, foreign aid and domestic saving produce significant and positive impact on investment. On the other hand, defense expenditure (a proxy of war) resulted in significantly

negative influence on investment. It points the impact of political instability in constraining investment.

5.2 Implications

In the context of recommendations, it is clear that aid contributes positively to economic growth both in the long run and short run. Hence, there is a need to concentrate on the national economic policies, as aid can be more helpful in boosting economic growth of the country in the presence of appropriate national economic policies like monetary, fiscal and trade. On the other hand, FDI show a negative impact on economic growth both in the long and short run. So, Ethiopia should focus on aid in the long run for the sake of economic growth. In addition to this, the negative impact of FDI on growth may partly be explained by the substitutability between domestic and foreign investments. Therefore, emphasis should be given in allowing foreign companies that are complementary with domestic investment projects.

Moreover, the regression result points out, domestic saving facilitates the economic growth process of Ethiopia. Thus, to achieve sustainable growth, the government should give due considerations to raise domestic saving.

The result obtained from the investment equation stress that the problem of political instability to the growth of investment. Thus, the government should give emphasis to improve the political situation in order to boost investment.

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APPENDICES

APPENDIX A: DIAGNOSTIC TESTS

A. DIAGNOSTIC TEST FOR GROWTH MODEL

GDP	: AR 1-2 test:	$F(2,18) = 2.3096$	[0.1280]
S	: AR 1-2 test:	$F(2,18) = 7.2916$	[0.0048]**
AID	: AR 1-2 test:	$F(2,18) = 2.0719$	[0.1549]
FDI	: AR 1-2 test:	$F(2,18) = 0.91976$	[0.4166]
HC	: AR 1-2 test:	$F(2,18) = 1.3430$	[0.2860]
LF	: AR 1-2 test:	$F(2,18) = 0.45569$	[0.6411]
GDP	: Normality test:	$\chi^2(2) = 1.4789$	[0.4774]
S	: Normality test:	$\chi^2(2) = 5.6737$	[0.0586]
AID	: Normality test:	$\chi^2(2) = 4.3190$	[0.1154]
FDI	: Normality test:	$\chi^2(2) = 2.6737$	[0.2627]
HC	: Normality test:	$\chi^2(2) = 8.1909$	[0.0166]*
LF	: Normality test:	$\chi^2(2) = 15.712$	[0.0004]**
GDP	: ARCH 1-1 test:	$F(1,18) = 0.60132$	[0.4481]
S	: ARCH 1-1 test:	$F(1,18) = 0.026605$	[0.8722]
AID	: ARCH 1-1 test:	$F(1,18) = 0.39843$	[0.5358]
FDI	: ARCH 1-1 test:	$F(1,18) = 0.021056$	[0.8862]
HC	: ARCH 1-1 test:	$F(1,18) = 5.4327$	[0.0316]*
LF	: ARCH 1-1 test:	$F(1,18) = 0.13631$	[0.7163]
GDP	: hetero test:	$F(18,1) = 0.030979$	[1.0000]
S	: hetero test:	$F(18,1) = 0.092333$	[0.9959]
AID	: hetero test:	$F(18,1) = 0.055867$	[0.9995]
FDI	: hetero test:	$F(18,1) = 0.047189$	[0.9998]
HC	: hetero test:	$F(18,1) = 2.8960$	[0.4359]
LF	: hetero test:	$F(18,1) = 0.022723$	[1.0000]

MULTIVARIATE DIAGNOSTIC TEST

Vector AR 1-2 test:	$F(72,22) = 0.73598$	[0.8337]
Vector Normality test:	$\chi^2(12) = 39.564$	[0.0001]**
Vector hetero test:	$\chi^2(378) = 390.05$	[0.3236]

B. DIAGNOSTIC TEST FOR SAVING MODEL

GNS	: AR 1-2 test:	$F(2, 23) = 0.19460$	[0.8245]
AID	: AR 1-2 test:	$F(2, 23) = 0.34402$	[0.7125]
FDI	: AR 1-2 test:	$F(2, 23) = 1.6812$	[0.2082]
X	: AR 1-2 test:	$F(2, 23) = 0.32170$	[0.7281]
GDPN	: AR 1-2 test:	$F(2, 23) = 0.20783$	[0.8139]
GR	: AR 1-2 test:	$F(2, 23) = 1.5672$	[0.2301]
DEPEND	: AR 1-2 test:	$F(2, 23) = 0.19460$	[0.8245]
GNS	: Normality test:	$\chi^2(2) = 1.3038$	[0.5211]
AID	: Normality test:	$\chi^2(2) = 2.0433$	[0.3600]
FDI	: Normality test:	$\chi^2(2) = 5.4315$	[0.0662]
X	: Normality test:	$\chi^2(2) = 5.9995$	[0.0498]*
GDPN	: Normality test:	$\chi^2(2) = 19.507$	[0.0001]**
GR	: Normality test:	$\chi^2(2) = 0.61185$	[0.7364]
DEPEND	: Normality test:	$\chi^2(2) = 1.3038$	[0.5211]
GNS	: ARCH 1-1 test:	$F(1, 23) = 0.11613$	[0.7364]
AID	: ARCH 1-1 test:	$F(1, 23) = 1.9698$	[0.1738]
FDI	: ARCH 1-1 test:	$F(1, 23) = 0.57764$	[0.4550]
X	: ARCH 1-1 test:	$F(1, 23) = 0.59136$	[0.4497]
GDPN	: ARCH 1-1 test:	$F(1, 23) = 0.035344$	[0.8525]
GR	: ARCH 1-1 test:	$F(1, 23) = 0.65545$	[0.4265]
DEPEND	: ARCH 1-1 test:	$F(1, 23) = 0.11613$	[0.7364]
GNS	: hetero test:	$F(11, 13) = 1.9946$	[0.1184]
AID	: hetero test:	$F(11, 13) = 0.52065$	[0.8573]
FDI	: hetero test:	$F(11, 13) = 1.1227$	[0.4160]
X	: hetero test:	$F(11, 13) = 0.31876$	[0.9672]
GDPN	: hetero test:	$F(11, 13) = 2.6583$	[0.0485]*
GR	: hetero test:	$F(11, 13) = 0.74018$	[0.6877]
DEPEND	: hetero test:	$F(11, 13) = 1.9946$	[0.1184]

MULTIVARIATE DIAGNOSTIC TEST

Vector AR 1-2 test:	$F(50, 62) = 0.70262$	[0.9008]
Vector Normality test:	$\chi^2(10) = 39.909$	[0.0000]**
Vector hetero test:	$F(120, 40) = 0.58546$	[0.9859]
Vector hetero-X test:	$\chi^2(255) = 245.80$	[0.6490]

C. DIAGNOSTIC TEST FOR INVESTMENT MODEL

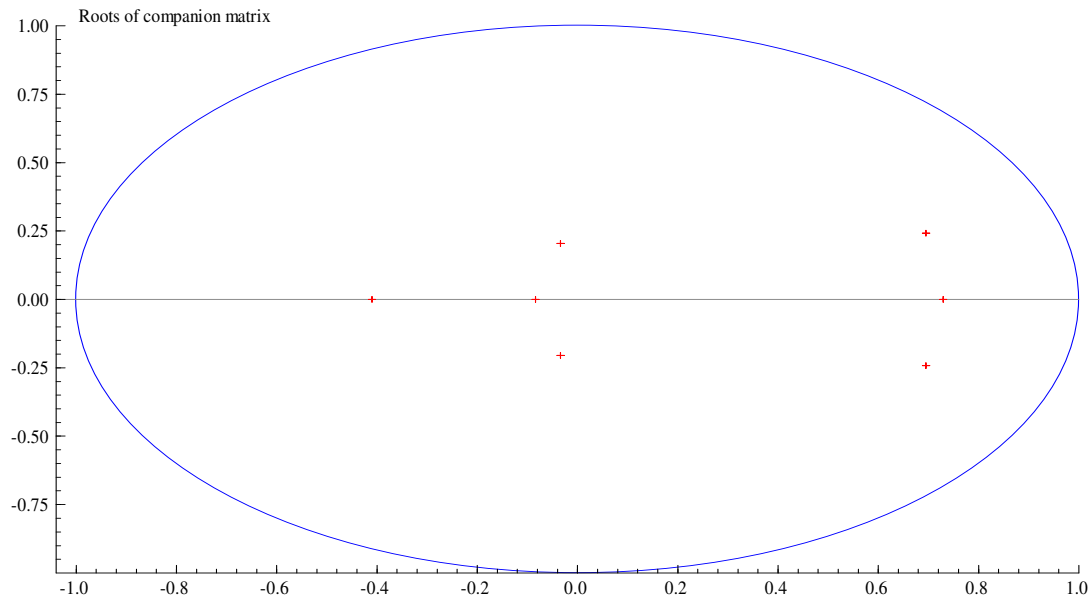
I	: AR 1-2 test:	$F(2,18)$	=	1.2405	[0.3128]
S	: AR 1-2 test:	$F(2,18)$	=	2.7957	[0.0876]
AID	: AR 1-2 test:	$F(2,18)$	=	0.63023	[0.5438]
FDI	: AR 1-2 test:	$F(2,18)$	=	0.10360	[0.9021]
DF	: AR 1-2 test:	$F(2,18)$	=	0.44464	[0.6479]
DX	: AR 1-2 test:	$F(2,18)$	=	2.1789	[0.1421]
I	: Normality test:	$\chi^2(2)$	=	5.1708	[0.0754]
S	: Normality test:	$\chi^2(2)$	=	1.3136	[0.5185]
AID	: Normality test:	$\chi^2(2)$	=	1.7171	[0.4238]
FDI	: Normality test:	$\chi^2(2)$	=	2.2574	[0.3235]
DF	: Normality test:	$\chi^2(2)$	=	0.49681	[0.7800]
DX	: Normality test:	$\chi^2(2)$	=	15.941	[0.0003]**
I	: ARCH 1-1 test:	$F(1,18)$	=	1.7055	[0.2080]
S	: ARCH 1-1 test:	$F(1,18)$	=	0.19207	[0.6664]
AID	: ARCH 1-1 test:	$F(1,18)$	=	0.89209	[0.3574]
FDI	: ARCH 1-1 test:	$F(1,18)$	=	0.046775	[0.8312]
DF	: ARCH 1-1 test:	$F(1,18)$	=	0.11281	[0.7408]
DX	: ARCH 1-1 test:	$F(1,18)$	=	0.17177	[0.6834]
I	: hetero test:	$F(9,10)$	=	1.6890	[0.2129]
S	: hetero test:	$F(9,10)$	=	1.2013	[0.3871]
AID	: hetero test:	$F(9,10)$	=	0.25262	[0.9749]
FDI	: hetero test:	$F(9,10)$	=	0.48018	[0.8577]
DF	: hetero test:	$F(9,10)$	=	1.5068	[0.2656]
DX	: hetero test:	$F(9,10)$	=	0.39590	[0.9105]

MULTIVARIATE DIAGNOSTIC TEST

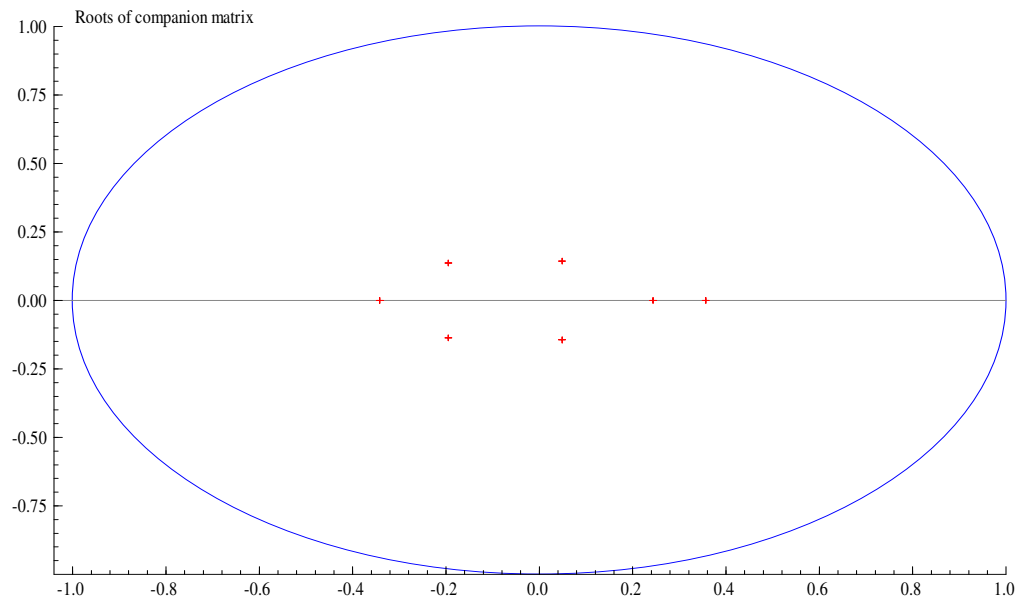
Vector AR 1-2 test:	$F(72,22)$	=	1.1246	[0.3921]
Vector Normality test:	$\chi^2(12)$	=	29.934	[0.0029]**
Vector hetero test:	$\chi^2(189)$	=	191.10	[0.4436]

APPENDIX B: VAR STABILITY TEST

A. COMPANION ROOT MATRIX FOR GROWTH MODEL



B. COMPANION ROOT MATRIX FOR SAVING MODEL



C. COMPANION ROOT MATRIX FOR INVESTMENT MODEL

