THE EFFECT OF EXPORT EARNINGS FLUCTUATION ON ECONOMIC GROWTH IN ETHIOPIA

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Mulugeta Andualem

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"The Effect of Export Earnings Fluctuation on Economic Growth in Ethiopia."

By

Mulugeta Andualem Jemberie

Approved by the Board of Examiners:

Dr. Eyad Hasan Dayeh **Advisor**	**Signature**
Dr. Manobar Rao **Examiner**	**Signature**
Prof. Mizan Ahmad Khan **Examiner**	**Signature**

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Acronyms

ADF	Augmented Dickey- Fuller
AIC	Akaike Information Criterion
AR	Autoregressive
BOP	Balance Of Payments
CSA	Central Statistical Authority
CTA	Coffee and Tea Authority
ECuA	Ethiopian Customs Authority
DCs	Developed Countries
DF	Dickey- Fuller
DSP	Difference Stationary Process
DW	Durbin Watson statistic
ECT	Error Correction Term
EPRDF	Ethiopian peoples Republic Democratic Front
FIRA	Federal Inland Revenue
GARCH	General Autoregressive conditional hetroscedasticity
HQ	Hannan-Quinn
IFS	International Financial Statistics
IMF	International Monetary fund
LDCs	Less Developed Countries
MoFED	Ministry of Finance and Economic development
MoTI	Ministry of Trade and Industry
NBE	National Bank of Ethiopia
NBE	National Bank of Ethiopia
OLS	Ordinary Least Squares
PCI	Per Capita Income
SC	Schwarz Criterion
SSA	Sub-Saharan Africa

TGE	Transitional Government of Ethiopia
TSP	Trend Stationary Process
UNCTAD	United Nations conference on trade and Development
VECM	Vector Error Correction Model
WB	World Bank

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Abstract

The study tries to examine the relationship between export earnings fluctuation and economic growth in Ethiopia using a time series data of the last four decades. The study is based on the general production function in which exports enter as one of the inputs in the production process.

Empirical research on the relationship between growth and exports has shown mixed results (positive and negative). After splitting the actual export earnings in to stable and unstable components using a five years moving average, the instability of export earnings is found to have a negative effect on economic growth, while the stable component has a positive relation with economic growth.

Moreover, the study tries to show that expansion of exports has a vital effect to economic growth and that growth of exports stimulates growth of non-exports. Exports affect economic growth not only directly but also indirectly by enhancing productivity of other inputs in the non-export sector. In addition the study tries to evaluate the performance of the Ethiopian export sector using different indicators, each of which is believed to highly contribute to instability earnings from the sector. The results show that the export sector of the country has underperformed in the period considered.

2. Review of Related Literature

2.1 Theoretical Literature

Ricardo's famous law of comparative advantage maintains that the gain of both trading parties from international trade will be maximized if each specializes in exporting those products which have the greatest comparative advantage. Thus most underdeveloped nations ought to concentrate in exporting raw materials because it is in these areas that they will most nearly approximate the productivity levels of the developed nations. Developed nations on the other hand are apt to have greater comparative advantage in goods which have been subjected to industrial transformation.

Although there can be no question that economic growth is an important function of exports, it is misleading to assess the contribution of the export sector solely in terms of foreign exchange earnings. Perhaps the tendency to evaluate exports only in terms of representing a source of foreign exchange partially explains why many developing countries while stressing the immediate importance of exports, also hope to reduce their relative dependence on foreign markets as economic development proceeds at a more rapid pace (Hultman,1967).

Total export earnings reflect the receipts of numerous products which are changeable and distinct in varying degrees in terms of supply, demand and market conditions.

Fluctuations in export earnings are thus induced by changes in individual products and by the interaction of these changes. Short run variations in supply and demand originate from economic, natural and other forces which may be internal or external, for example, crop failure, cyclical decline in economic conditions, changes in commercial policy which affect tariffs and taxes. Thus changes in the country's domestic supply where as import demand is negatively affected by similar changes in the importing countries, which is said to cause an even greater fluctuation of export proceeds relying heavily on them (Naya, 1973). It would appear that whereas industrial countries enjoy an additional benefit from exports of manufactured goods in the form of improvements in technology, such gains are generally smaller for exporters of minerals and primary products (Balassa, 1963)

Jaffe and Stokes (1982) argued negatively on the concentration of primary products in the export sector. They argued that a hyper developed export sector is responsive to the demands of the world market, rather than to the internal developmental needs. They emphasized that the situation is particularly true of raw materials which typically has very limited "up chain" or "down chain" effects on the rest of the economy. As a consequence, export revenues rise or fall in response to the world market but don't generate a long term process within the larger domestic economy.

According to Lim (1974) export instability is transmitted to the rest of the economy and economic instability may lead to inflation. An autonomous increase in the export

proceeds generates increased incomes in the export sector which in turn may most probably lead to successful trade union pressures for higher wages. A subsequent fall in the export earnings may not result in a proportionate decrease in the labor costs as wages are generally sticky downwards and this may lead to unemployment and its attendant social and political results. The effect of this is to shift demand to domestically produced goods and unless production of such goods can respond adequately, this may lead to a rise in the cost of living.

Marginal propensity to save will tend to be higher under unstable conditions because of the need to have a larger amount of reserves to cope with the contingencies (Ibid, 1974). Thus the argument that instability may lead to higher investment depends on the presumption that instability encourages higher marginal propensity to save.

Export instability is related to comparative advantage in such a manner that a country experiences relatively less instability in the export earnings of a product when it has a comparative advantage in that product. The source of such a comparative advantage is lower manufacturing cost of export products. However, mainly in the case of differentiated products, considerations other than price, such as market structure, ease of market entry, and quality are important determinants of comparative advantage.

Naya (1973) argued that if exports are highly concentrated, the chances of more unstable items canceling out are smaller – thus little diversified exports are likely to lack

the flexibility required to adapt to changes in demand and supply. The same reasoning applies to the destination of exports i.e. if exports are largely directed to a small number of countries, they become vulnerable. On the other hand if export destination is diversified changes in export receipts caused by falls in the country's import demands can be offset by changes in demand in other countries, making total earnings more stable.

Developing countries should foster the growth of their export industries by directing resources to where they would have the greatest comparative advantage. Relative price stability should sought and exchange rate be realistically valued (Stein, 1970).

According to Sebastian (1988) LDCs are likely to absorb a high percentage of demand fluctuations because they can place only a relatively small share of their production on world markets in recession years, when most demand is satisfied by the mature products in DCs, but they can increase their exports sustainably in expansion years if the increased demand is not satisfied by the established producers. They are also residual buyers of imports for the manufacture of growth products for the same reasons.

Instability in export revenues implies instability in government revenue, hence adversely affecting the implementation of development plans and completion of development projects. Moreover, a large share of government revenues to finance development is

derived from export taxes in African countries. An alternative to reliance on unstable export revenues to finance development projects in these countries is deficit financing, given the lack of any organized capital markets, which means borrowing from the central bank and monetizing the deficit. This leads to inflation, distortion of relative prices and slow economic growth (Brempong, 1991).

Mac Bean (1966) claimed that there is no statistical evidence to support the hypothesis that fluctuations in export proceeds inflict any significant damage on the stability and growth of an average underdeveloped country, or that there is any relation between growth in per capita real income and export instability.

In economies with free mobility of capital, short run fluctuations in export can be encountered by capital flows. However, Sub-Saharan African countries are characterized by capital immobility, currency inconvertibility, and exchange and trade controls. Thus instability in exports is not cushioned by capital flows in opposite direction. The lack of capital flows to counter short-term fluctuations in export earnings makes the output of goods and services fluctuate with export earnings (Brempong, 1991).

Jaffee (1985) remarked that nations that are heavily dependent on a single export commodity for their international exchange find themselves in a vulnerable position given the vagaries of the world market. Countries that export the most unstable products are the ones that are most severely damaged economically by export

dependence. He, however, found that narrow range products and more diverse range of products do have no significant difference statistically. According to him export dependence has only a mediating influence on economic growth, and also found same result in the relationship between export processing capacity and economic growth. The difference in export processing doesn't have a significant impact on economic growth.

Kaldor (1964) pointed out that if primary exporting regions were to continue to depend mainly on the exports of primary products, their export receipts to the outside world could not be expected to increase by more than three percent annually, even if their export prices remained constant. Their import requirements on the other hand, would be bound to increase faster than their domestic product- mainly because their import requirements for the capital goods increase faster than their domestic fixed capital formation, and also because their own income elasticities of imports of consumer goods and raw materials are high.

Because LDCs export mainly primary products, it has been claimed that their economic growth suffers from deleterious effects of export instability they experience. The detrimental effects of export instability have been attributed to either the price instability of primary products per se or the resulting fluctuations of export proceeds (Glezakos, 1984).

It is highly probable that rapid growth of the export sector for most countries will result in a noticeable growth of their economies as a whole; the degree to which any expansion in the export sector would be transmitted to other sectors depends on the nature of the export sector of the economy (Glezakos, 1984). As far as increased processing of primary products results in the use of more labor in the host country and contributes to the development of a skilled labor force, the greater the likelihood that the potential impact of growth of export base will be transmitted to the rest of the economy. Hence basic commodities which loose a good deal of weight or size are inclined to be subjected to significant processing prior to export and may play a key role in the growth process (Hultman (1967).

The manufacture of a growth product tends to be located in the country that developed it, and because DCs tend to spend more on research and product development than LDCs, the manufacture of growth products tends to be located in DCs. Consequently, the DCs are initially the only exporters of growth products and therefore hold a "natural monopoly" in the world trade for these products, making entry of newcomers more difficult (Sebastian, 1988). Specialization in the production of raw materials for export leads to displacement of energy and resources from economic activities, which would ultimately be more productive. Since there is a short run gain from the export of such raw materials, such activities tend to monopolize available capital to the determent of other activities, foreign investment likewise tends to be drawn in to the more developed and dynamic export sector (Stokes and Jaffee, 1982).

2.2 Instability and Instability Indices

Export instability is usually measured as the short term or yearly fluctuation of export proceeds around the growth trend of exports. Thus, in measuring instability, the variation net of the growth trend of exports is considered. Unless this is done, according to Naya (1973), the instability of countries with a faster growth rate would tend to be biased upward and that of others downward.

According to Sebastian (1988) export instability is influenced by both the characteristics of the individual product and the degree of development of the exporting country i.e. on whether it is a DC or an LDC.

Naya (1973) used different theoretical frameworks to find the major factors that affect instability of exports. The main factors she mentioned are: specialization in primary and agricultural products, changes in import demand due to cyclical variations in income level, the degree of diversification of export products (whichever way diversified lead to greater stability), the size of export proceeds and intraregional trade[6].

Massel (1970) tried to measure instability of exports in relation to different factors. According to him it is a function of the composition of exports, export diversification, domestic consumption (positively associated with export instability), country's share of

[6] Intraregional trade according to Naya (1973) is measured as the volume of exports to another continent as percentage of total exports

the world markets, per capital income, raw materials ratio (positively related with export instability) and the value of exports.

Jaffe (1985) also pointed out some major factors that determine export instability. According to him the extent to which a nation is vulnerable is contingent upon the degree to which its export commodities are subject to price fluctuation, the pattern of export commodity specialization, the level of commodity concentration and more generally the economic state of the world economy. He mainly emphasized that high vertical trade[7] is particularly hazardous to the economy.

The absence of a generally accepted instability index has made many researchers to develop different instability indices. Some researchers like Sebastian (1988), Brempong (1991) and Lim (1974) have tried to use more than one instability index in their models. The most commonly used methods are the moving average, linear and exponential trending. The following part will be a review of some types of instability indices that were used by previous researchers.

One striking feature on the empirics of instability indices is that an index used by one author no longer remains acceptable by others. This has resulted in many different formulations of the index. We can take the following chain of critics on the formulation of such indices. Glezakos (1973) criticized Mac Bean (1966) for using weak instability

[7] Jaffee (1985) defined vertical trade as a measure of the extent to which nations export only raw materials and import only manufactured goods

index and compound annual rate of growth. Once again the instability index used by Glezakos (1984) was criticized by Savvides (1984) and both Glezakos (1984) and Savvides (1984) were in turn highly criticized by Brempong (1991) as using a poor approach and indices. Once more Gelb (1979) claimed that the instability indices used by Mac Bean (1966) and Massel (1970) are less rigorous. Also Lim (1976) criticized Glezakos (1973) for using a poor instability index, and Mac Bean (1966)'s approach was criticized by Maizels (1968). These things altogether prove that instability indices have been formulated in as many ways as possible and yet no generally accepted index has been developed by one.

According to Gelb (1979) instability is an imprecisely measured phenomenon and though it is centrally important, no unifying principle has underlain its quantifications. He claimed that this has led to three major consequences:

i. Measurements of instability proliferate which has resulted in the presence of more than 16 distinct indices in the development literature. He said that this destroys cross country comparability

ii. Many existing indices fail to indicate clearly the type of fluctuations being measured, no rigorous classification of fluctuations is employed

iii. Relative emphasis on some types of fluctuations is based on the type of index rather than the type of data which may lead to faulty policy measures.

Glezakos (1973) emphasized that the development of a marginal meaningful measure of export instability is of crucial importance. The index used by him is the absolute value of the yearly changes of the time series exports corrected for the trend and expressed as a percentage of the average of all observations. That is

$$I_X = \frac{100}{\bar{X}} \frac{\sum_{t=2}^{n} [X_t - X_{t-1} - b]}{n-1}$$, where b=the slope of the linear trend

$X_t = a + b_t$ is estimated using OLS

According to him the yearly change in export proceeds can be divided in to two components: part of the change would be expected on the basis of the positive or negative trend in export proceeds experienced in the past. The other part that is $[X_t - X_{t-1} - b]$ would be the unexpected and probably the disturbing part of the change. In his later work Glezakos (1984) used two different indices: one based on a linear trend as used in his previous work and the other based on a log-linear trend.

Akpokodge (2000) used a moving average method which is widely used in the literature. His index was based on four years and he mentioned the following advantages for using it. It distinguished between rise and fall, temporary and permanent, and stochastic and predictable changes. He criticized the use of the log variance method, in which the index equals the antilog of the square root of the logarithmic variance of the time series, as resulting in a highly sensitive index and the expectation component is solely determined by the first and the last year of the series and is thus sensitive to the

particular period chosen by the researcher. Moreover the method is very complex. He used the following index in the model

$F_X = \frac{X_t - X_{4j}}{\delta_{4j}}$, where $X_{4j} = \frac{1}{4}\sum_{j=t-3}^{t} X_j$ is the four year moving average where, δ_{4j} is the standard deviation within those four years and F_X is the fluctuation index.

Lim (1974) measured instability around the trend so that the growth over the period as a whole has been separated from the year to year deviations from the growth path and used three types of instability indices which are based on: the moving average method (three years), linear OLS regressions and actual change less average annual increase. According to him failure to eliminate the trend will place a country, whose exports has been growing rapidly or growing at a constant rate artificially high on the instability scale. His result suggests that using a three years moving average gives more conclusive results than the remaining two indices he used in the model but still he suggested that using a relatively larger year gives an even better result. Leith (1970) cited in Lim (1974) used a least square's linear trend line and fitted for the period and calculated the instability index as percentage deviations from the trend line.

Reynolds (1987) measured instability of export earnings in terms of the value of the variable between the present year and the past year divided by the value of exports which is greatest of the two years. He then took an average of all percentage changes

over the period considered, disregarding sign to get average degree of instability. This measure however does not correct for trend and gives a down bias for fluctuations.

Sebastian (1988) used two instability indices to measure the instability of synthetic and natural fibers in a different group of countries for two periods, to check whether the results of the study depend on the instability indices used and the period considered. But his result was not dependent on the instability indices used rather same results were obtained out of the two indices. The first instability index he used is the standard error of the estimate of the regression linking exports to time and the second index he used was the absolute value of the sum of deviations of exports from the trend, normalized by the projected exports according to trend, and divided by the number of years in the time series.

According to Naya (1973) the difference between the actual and expected (in log) values of the country's exports is the error term of the regression of exports on time and the instability index she used is the standard error of this error term. This index is however based on a constant growth of exports for a given country.

Murray (1978) also used two types of instability indices and he found the same results out of the two indices used in the analysis. The first index he used is based on a five years moving average and the second was based on the log-linear trend. According to him, even though export proceeds instability may happen due to price and quantity

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capital out of which he managed to derive the same model as the former researchers. Sinha (1999) also used the same approach using Feder (1983)'s framework where the growth rate of GDP is made a function of the mentioned inputs i.e. exports, labor and capital.

2.4 Empirical Results

Although a large number of cross national and country specific studies have been conducted to explain the association between exports and economic growth, no consensus has been reached. Some feel that a steady income stream will increase the share of income devoted to productive capital formation, others argue that short periods of very high profits will induce a greater share of income invested and that downswings will not cause this share to fall proportionally. More simply explained, some find negative relationships between export earnings fluctuation and economic growth, while some others find a negative relationship and still some other class of researchers found no significant relationship. What is more interesting is that there are still some group of researchers who found mixed or inconclusive results. Savvides (1984) and Mac Bean (1966), for example, found positive relationships.

Those who find a negative relationship between export instability and economic growth in LDCs stress the negative effect export instability has on the supply of output and through the generation of uncertainty in the long-term planning as well as due to shortages of inputs at critical times during the production process. Those who find a

positive relationship between export instability and growth argue that LDCs respond to export instability by reducing consumption. This process, if repeated over a period of time, increases savings and hence the rate of investment. Those who find no significant relationship between export instability and economic growth argue that LDCs are able to anticipate the fluctuations in export earnings and plan for such fluctuations, hence fluctuations in export has no appreciable influence on economic growth.

Brempong (1991) used cross-sectional data from 34 SSA countries to estimate the effects of export instability on economic growth from 1960-1986. The result he found was that export instability has a negative and significant effect on economic growth rate in SSA countries. He used three types of export instability indices but he found that the negative effect doesn't depend on the measure of export instability used or a consideration of growth rate of total GNP or GNP net of exports.

MacBean (1966) found that in highly trade oriented countries, fluctuations in GNP appear to be quite heavily dampened. He stated that, "even more categorically, in most cases fluctuations in income do not appear to be at all closely related to fluctuations in export earnings. This lack of relationship can not be explained simply by the relative importance of exports in their economies for, even with countries chosen for high ratios of exports to gross national product, no correlation can be found."

Sinha (1999) used a time series study of nine Asian countries to look at the relationship between export instability and economic growth. The results he found were not uniform across countries. For Japan, Malaysia, Philippines and Sri Lanka he found a negative relationship where as positive relationships for Myanmar, Pakistan and Thailand between exports instability and economic growth. For India however the results found were mixed and inconclusive. But still he argued that there is always a positive association between economic growth and domestic investment and cross-section studies which lump together all countries may lead to misleading conclusions since the results differ among across countries.

MacBean (1966) showed that changes in the reserves have generally been compensatory, though the amount of the changes in reserves has seldom corresponded to changes in export proceeds. Using cross-section regressions he tried to show that there is no significant relationship between the degree of export fluctuations and the rate of growth in domestic fixed capital formation. His statistical analysis showed that there is a positive relationship between export fluctuations and the average rate of increase in domestic prices, but no significant relationship between export fluctuation and growth rate of national income.

Jaffee (1985) used data from five different countries with different export dependence, processing, vertical trade, trade intensity and export fluctuations. And he found that the greater the reliance on exports, the lower the economic growth. According to him

nations gain less than they otherwise might where export activity is controlled, or heavily influenced by foreign interests. A reliance on export does not in itself promote economic stagnation. However, where this form of trade is accompanied by the export of unstable products, the exchange of primary for manufactured goods and the presence of extensive foreign capital, the economic growth effects of export dependence are either negative or , at least, significantly reduced.

MacBean (1966) showed that while for individual developing countries, fluctuations in export earnings may have seriously reduced their ability to achieve high rates of economic growth, for developed countries in, in his evidence, export fluctuations has not been an important obstacle to economic development. Mac Bean's inference however was criticized for that data were missing for some years and for some variables short period data were only considered.

Glezakos (1973) found that export instability has a significant negative effect on the real per capita income growth rate of LDCs, he used in his sample. According to his findings export instability is responsible for about nine-fourth of the observed variation in the income growth rates of the LDCs under consideration. But taking a comparison of the case with DCs, he confirmed that export instability is harmful only to the economic growth of LDCs. Growth rate of exports was however found to be an important factor for the economic growth of both DCs and LDCs. Moreover, the growth rate of exports is a more important factor in the economic growth of the DCs than that of the LDCs.

Savvides (1984) used the same methodology as Glezakos (1973) to test the hypothesis that export instability is a factor detrimental to the growth of LDCs, by extending data to a latter period. He used cross-sectional regressions from both LDCs and DCs but the results he found didn't confirm the examined hypothesis. Rather the results contradict that obtained by Glezakos (1973), who used the same methodology but at an earlier time period. He concluded that the growth rate of exports is determined endogenously and are not exogenous as his pioneers assumed. He found that export instability is more significant in explaining variations in income growth and is responsible for one-third of the observed variations in the income growth rates of LDCs. But found that export instability is not a significant factor in the per capita GDP growth rate of DCs.

Since exports of LDCs consist mainly of primary products with limited backward and forward linkage effects, a given growth rate of exports would not result in income growth of same magnitude as in the DCs (Glezakos, 1984).He found that the most significant relationship for LDCs lies between export instability and the growth rate of exports. This result supports that price instability acts as a more serious deterrent to export and income growth than volume instability. It is not surprising, therefore to find that farmers more frequently demand government protection against price fluctuations than against crop fluctuations. Since prices are likely to be easier to control. These results suggest the government of LDCs which wishes to promote domestic stabilization should concentrate on producer's income stabilization scheme.

The degree to which countries specialize in the export of raw materials does have a significant negative effect on their economic growth (Stokes and Jaffee, 1982). Sebastian (1988) also found that export instability is related to industrialization. Instability on growth products is higher for LDCs than for DCs, where as the export instability of mature products is not significantly affected by industrialization. So, LDCs have to move towards producing mature products to reduce export instability.

Love (1992) quoted in Sebastian (1988) challenged the idea that instability of exports of LDCs is the same as that of the DCs on the ground that LDCs usually experience periodic input shortages and that they operate in unfamiliar markets.

The key to the relationship between export instability and economic growth lies in the relationship between the fluctuating export earnings and the changing level and composition of the domestic share (Reynolds, 1987). He considered the effect of export earnings fluctuation on economic growth in the Chilean case using the case of copper exports instability, and he found that instability is mainly from export earnings to the export economy by way of destabilizing tax and expenditure policy of the government.

Massel (1970) explained that export instability itself depends on a number of things. He then tried to measure instability of exports in relation to the following factors. According to him it is a function of the composition of exports (goods with unstable demand and

supply tend to have high export instability), export diversification measured in Hirschman commodity concentration index (more diversified exports tend to reduce instability in exports), domestic consumption (positively associated with export instability), country's share of the world markets (negatively related to export instability), per capital income (higher PCI is associated with lower export instability), raw materials ratio (positively related with export instability) and the value of exports. He found that the more widely a country's exports are spread among different export commodities, and the more dissimilar these goods are, the smaller will be the tendency for changes in receipts from different commodities.

Ram (1985) included 73 LDCs in to his model to estimate the relationship between exports and economic growth and he found that the effect of export performance is much larger for low income countries than the middle income countries. In a latter work Ibid (1987) used two different equations (the first equation is exactly the one used in his previous work and the second was a bit modified to include inter country differences for a cross-country regression) to estimate the relationship between exports and growth in his cross-country regressions on 88 LDCs. He found a positive relationship between the growth of exports and economic growth in most of the cases.

Sebastian (1988) after working out the effect of economic development on export earnings instability both for DCs and LDCs concluded that LDCs should diversify in to mature products, their export instability may increase if those manufactures are not

mature products, that is, are not products in which LDCS have comparative advantage, consequently resulting in low export instability. So, if LDCs want to reduce export instabilities in the short run they should diversify in to commodities in which they have comparative advantage. He also found that the instability of both the quantity and the unit value of exports of growth products was higher for LDCs than for the DCs.

Naya (1973) used data from 18 DCs and 48 LDCs to measure whether export instability has differential effects on structure of exports of the two groups of countries. The different factors that are expected to affect the structural characteristics of a country's exports were taken in to account as variables that determine the major factors behind fluctuation of export commodities. Among the variables she used are: commodity concentration, geographic concentration, primary product ratio and intraregional trade. Some of the results found were amazing, like, the larger the volume of exports to its neighboring countries, the greater the level of export instability. She theorized that specialization in primary and agricultural commodities, according to her, is the major cause of LDC export problems. She recommended that LDCs diversify their exports and try to increase their export proceeds, because countries with smaller export proceeds tend to have a greater degree of commodity, geographic concentration and interregional export reliance than those with large export proceeds. She found a significant relationship from most of the variables considered in the model except the sources which are traditionally said to give rise to instability. These include limited number of

exportable products and high specialization in primary products. The findings also confirmed that LDC instability is greater than that of the DCs.

Brempong (1991) concluded that export growth stimulates economic growth in the non-export sectors of sub-Saharan African economies. Exports not only affect economic growth directly, but also affect economic growth indirectly by enhancing the productivity of other inputs, and this effect could be very large.

3. The Performance and Structure of the Ethiopian Export Sector

3.1 Structure of the Ethiopian Export Sector

Ethiopia is a country whose exports base is highly dominated by a few primary commodities and usually in serious trade imbalance except in few years. The export sector accounts to a good share of the national income and in turn the single mono crop export commodity (coffee) accounts for the largest share of total exports and is almost dominated by it during the last four decades. On the other end of the external trade, Ethiopian imports mainly comprise very critical intermediate commodities for both industry and agriculture, for instance, fertilizer and industrial raw materials, and fuel are imports without which the economy cannot function. Ethiopia mostly faces unpredictable external shocks: rising oil prices; deteriorating terms of trade, drought and loan disbursement conditionality of the creditors like through tied aid are other impediments as most loans and assistance are tied to certain requirements of the creditors and are thus based on the objectives of the creditors and ignoring the objectives of the debtors.

According to Kaldor(1964) if primary exporting regions continue to depend mainly on the exports of primary products, their export receipts to the outside world could not be expected to increase by more than three percent annually, even if their export prices remained constant. Their import requirements, on the other hand, would be bound to

increase faster than their domestic product, mainly because their import requirements for capital goods increase faster than their domestic fixed capital formation, and also because their own income elasticities of imports of consumer goods and raw materials are high.

Until 1960s Ethiopia's trade policy was characterized by export -oriented and later an inward-looking strategy. In ward orientation here is measured by overvalued exchange rate, which helps importers to import cheaply by taxing exporters implicitly, high tariff rates, foreign exchange control and non-tariff barriers such as restrictions on some items and heavy tax on export. According to Balassa (1971) while protection of a manufacturing sector and too much inward orientation may permit rapid growth at an early stage of import substitution, it will eventually have adverse consequences for economic growth.

The Derg regime is the one that overthrew the Imperial regime, in the1974 revolution. This regime highly restricted the private sector participation in the export sector in particular and the economy at large. Its overall policies were expanding collective and public enterprises and manage the economy through central planning. Like the Imperial regime, this period was inward looking behind highly protective tariffs and quantitative restrictions. The regime planned the reduction of the share of the traditional export commodities (coffee, hides and skins, oil seeds and pulses) from its level of 73.5 % in 1984/85 to 53.2% in the end of the plan period. The other effort considered to be

relevant for export diversification was the directive issued to ban the export of rawhides and skins in 1989/90.

The EPRDF-led Transitional Government of Ethiopia overthrew the military and centrally planned regime in May 1991. It came up with a new economic policy aimed at reorienting the controlled economy into a free market one. With the coming into power of EPRDF (TGE), outward orientation was taken as a strategy and to this end a number of measures were taken and are still being applied. The exports measures taken were aimed at diversifying the country's few commodity based exports by changing the structure of the sub-sector in particular and the whole economy in general to bring about rapid socio-economic development.

Domestically, the tax base is narrow, the tax collection and administration is poor and the existence of a large informal sector and the subsistence nature of the economy hampered the revenue mobilization efforts of the government and thereby low level of investment on infrastructure, which in turn affects private sector involvement in the economy. Although more than half of the countries export earnings comes from coffee, most coffee growing farmers are found far from the centers where the auction is conducted. The major problem is the poor or absence of feeder roads, which serve for the evacuation of coffee to sites of primary collection. This is the main reason why a significant percentage of coffee is consumed domestically and cross the border (Amin, 2002). Moreover, frequent change of policies due to frequent change of government

systems have accounted for diverse policies and attempts to change the performance of the sector have resulted in no further change in the performance of the sector. In the following section an evaluation and a descriptive analysis of the export sector of the country will be discussed based on the data available for the three regimes that existed in the country. The export sector will thus be seen from different perspectives to make an in-depth analysis.

3.2 Export composition, Diversification and Commodity concentration

Diversification of export commodities is explained by many researchers to have a good effect on the stability of export proceeds. According to Sebastian (1988) it is recommended that LDCs should diversify their exports in order to reduce total earnings instability. If all exports are simultaneously unstable diversifying would cause export fluctuations to cancel out each other to a certain extent. Thus, the more widely the country's exports are spread among export goods and the more dissimilar they are, less fluctuation would occur (Massel, 1970).

Commodity concentration is measure the total export accounted for by the leading export commodity and noted that nations that are heavily dependent on a single export commodity for international trade find themselves an a vulnerable position given the vagaries of the world market. The most commonly used measure of commodity concentration is the Hirschman concentration index which is given by

$$C = \left[\sum (X_i / X)^2\right]^{\frac{1}{2}},$$

where X_i is the country's leading commodity and X is the total export earnings of the country. The following table summarizes the average concentration index of Ethiopian five leading export commodities, which altogether accounted for more than 80% of the total export earnings of the country in the period under study.

Table 3.1 – commodity concentration of the five major commodities

PERIOD	PERIOD AVERAGE					
	COFFEE	HIDES AND SKINS	OIL SEEDS	PULSES	CHAT	OF THE FIVE COMMODITIES
1970/71-1974/75	0.37	0.09	0.13	0.11	0.01	0.71
1975/76-1990/91	0.63	0.11	0.02	0.03	0.02	0.81
1991/92-2004/05	0.53	0.12	0.06	0.03	0.10	0.84
1970/71-2004/05	0.55	0.11	0.05	0.04	0.05	0.81

Source: NBE and author's calculation using Hirschman concentration index

The commodity structure of the country is highly dominated by agricultural primary products. The above table depicts that the commodity structure of Ethiopia hasn't shown dynamic structural changes between the three regimes. This is shown from the commodity concentration index derived from the export data between 1970/71 and 2004/05. Though most of the export commodities not included in the above

computation are still primary products, the above five major commodities still account for the greatest percentage almost near to the fact that these five commodities are the only reliable export commodities. Moreover, the fact that a single most dominantly outstanding commodity (coffee) contributes more than half of the total export proceeds on the average reveals the fact that Ethiopian exports are very much concentrated.

Between the years 1970/71 and 2004/05 coffee and hides and skins accounted for on the average 66% of the total export proceeds, while the first five commodities (namely Coffee, hides and skins, oil seeds, pulses and chat) altogether on the average contributed to 81% of the total proceeds during the same period. This tells us that the total exports proceed is dominated by the first five leading commodities. The export commodity whose share increased significantly during the last four decades is Chat. Its share in the total export earning was 1, 2.2 and 9.9 percent during the Imperial, Derg and the present regime, respectively or simply its share has grown from 1% in the imperial regime to 10% in the present regime.

Hirschman commodity concentration index is a measure of the extent to which the country's export is dominated by the single leading export commodity. The higher the index the less diversified and the more dominated by that single export commodity the export commodities are. The concentration index of coffee during the past three regimes in the period considered is 0.37, 0.63 and 0.53 respectively. The attempts of the current government to diversify exports has little caused a fall in the value of the

index compared to the previous regime which is not however promising when the first five commodities are taken together. The concentration of coffee in the current regime has fallen from 0.6 in 1991/92 to 0.40 in the year 2004/05 and was accompanied by a fall in the concentration of the first five commodities from 0.83 to 0.76 during the same period but was as high as 0.97 during 1995/98 (see annex-1). The highest commodity concentration was registered in 1978/79 during the Derg regime whereby the concentration of the first five commodities was 0.98 which tells us that these five commodities have almost been the only commodities exported. The index for chat has grown from 0.01 in the imperial period, 0.02 in the Derg period to 0.10 in the current regime.

The attempts to diversify the export products of the country can also be easily revealed through export commodities which never used to be exported before but whose shares are growing alarmingly from time to time. These items include cut flowers, cereals and flour, natural gum, animal fodder, spices, beverage, organic honey, marble, cotton, civet, hop, textile and textile and textile products etc... The exports of these items were negligent during the first two regimes and even up to 2001/02 of this regime, but have now tremendously grown in the last five years. This shows the current regimes plan to diversify exports is coming to effect and improves the economy's capacity to shoulder export fluctuations.

3.3 Vertical Trade

Vertical trade is simply the measure of the extent to which nations export only raw materials and import only manufactured goods. Being an under developed economy, the structure of Ethiopian exports is dominated by agricultural products. Mainly coffee, hides and skins, pulses and oil seeds, and chat altogether contribute more than 80 % of export earnings during the past four decades, as mentioned above. On the other end of the external trade, Ethiopian imports comprise mainly of very critical intermediate commodities and manufactured goods. Imports like petroleum and petroleum products and fertilizers are so much critical inputs in the economy and a rise in the price of these imports may even cause a rise in the price of many other local products. In the last six years the import of crude oil is negligent despite its share in the total imports was one of the greatest between 1979/80 and 1995/96. Recent trend shows a large increment in the overall volume of imported products and the value of total imports in the last 10 years has more than quadrupled.

Ethiopian imports are mainly constituted by manufactured products and its exports are primary agricultural products. In the last 10 years the import of machinery and aircraft, metal and metal products, medical and pharmaceuticals has increased by more than five times. These all figures tell us that the trade sector of the country has become more vertical. Naya (1973), Massel (1970) and Murray (1987) emphasize the bad effect vertical trade would contribute to the export instability of a given country.

The country is also highly dependent on external trade. Openness, measured by the share of external trade in GDP, increased significantly from around 11.2 percent in 1964/65 to 47.9 percent in 2004/05 (see annex-2). During this period, the share of imports in GDP has grown from 16.93% to 38.5%. Many empirical studies echo the relevance of openness in international trade to the economic growth of LDCs. For instance, Dollar (1992), covering many countries (95 developing countries) reports that outward-oriented developing countries grow more rapidly and Africa would gain 2.1% per capita growth by shifting to the outward orientation level of Asia.

With the coming into power of EPRDF, outward orientation was taken as strategy and to this end a number of measures were taken and are still being taken. Measures taken in the export sector were aimed at diversifying the country's few commodity based exports by changing the structure of the sub-sector in particular and the whole economy in general to bring about rapid socio-economic development.

3.4 Geographic Concentration

Geographic concentration is a measure of the proportion of exports shipped to a given country as a proportion of the total exports. According to Massel (1970) high geographic concentration leads a country to a vulnerable position. If export destination is diversified changes in export receipts caused by falls in the country's import demands can be offset by changes in other countries, making total earnings more stable (Naya, 1973). This is simply because the exporting country will be very much attached to the economic

conditions of the country. Economic factors like exchange rate fluctuations that took place in the destination country are very much likely to affect the exporting country as well and the international fate of the country will be very much determined in relation to the importing country's situation. Geographic concentration is measured the same way as commodity concentration except in that the numerator is different. Naya (1973) measured it using the following formula:

$$G = \left[\sum (X_j / X)^2\right]^{\frac{1}{2}};$$

Where X_j refers to the country's exports directed to country j, X is the total export value and G is the measure of geographic concentration. The lower the value of G the more evenly export is distributed to different destinations.

Both Massel (1970) and Naya (1973) found that geographic concentration and export earnings are negatively related to economic growth. This is because the export earnings of the country would be so much influenced by the economic situation of the importing country to which the exports are shipped at great concentration. Geographic concentration also reduces the exporting country's bargaining power as the goods are finally resorted to that seemingly sole destination. Particularly geographic concentration of the most dominant items would highly harm the economy.

In the Derg regime geographic concentration was too high and more than 45% of the entire export was destined to the U.S.A. and Germany, and of the two Germany was the dominant importer of our products. This trend has gradually declined so much but

Germany remained one of the most dominant importers of our commodities till 2004/05 but its share in the total exports has declined from 31% in 1985/86 to 10% in 2004/05, while the share of U.S.A. gradually declined to less than 5% over the same period. The other outstanding importers of the country's products are Djibouti and Saudi Arabia. But recently, particularly in the last five years, exports to china have so much increased. In 2004/05 China imported the greatest share of Ethiopian exports which is about 13% of the entire export commodities, but before this period nearly no exports were destined to China.

In general, between 1985/86 and 2005/06 on the average 77% of the entire export commodities was destined to only 15 countries of the world. This index showed the highest figure in the Derg regime (in 1990/91) of up to 95% of the total exports destined to the fourteen countries presented in Annex-3. The current regime has gradually lowered this figure to on the average 60% in the period. Recently, not more than 15% of the total exports destined to a single country as the figure shows.

3.5 Trade balance and percentage of exports covering import bills

Even though the importance of exports is beyond developing importing capacity, as Hultman (1967) emphasized, trade balance is a good measure that can show the country's participation in international trade. Trade balance is measured as a simple difference between total exports and total imports. In the Ethiopian case, it is not unusual to see negative trade balances. This is mainly attributable to the fact that the

country's export commodities are mainly primary products whereas most of the imported products are manufactured goods. In this section the trade balance of the country in the past three regimes will be analyzed using the proportion of exports covering import bills and the trade balance calculated figures.

Table 3.2- The country's export and import relationship

PERIOD	PERIOD AVERAGE	
	TRADE BALANCE (IN THOUSANDS OF BIRR)	PERCENT OF EXPORTS COVERING IMPORT BILLS
1964/65-1974/75	-62483	84.55
1975/76-1990/91	-742110.3125	61.91
1991/92-2004/05	-9636336.635	30.30
1964/65-2004/05	-3740622.084	56.55

Source: MoFED, NBE and author's calculation

As can be seen from the table Ethiopian position of trade balances was better during the last decade of the imperial regime than the remaining three decades, but neither a positive average trade balance nor average exports covering import bills was registered in the period considered. The performance of the export sector as measured by a positive trade balance has registered its worst performance during the first decade of the transitional government, exports also most failed to cover import bills during this period.

The imperial regime however registered a relatively better performance as per this measure. The regime has managed to register a positive trade balance and exports covering about 104% and 112% of the total import bills in the last two years. The Derg has also achieved the same performance but the same thing in 1978/79 and 1982/83 of 112% and 147% (see annex-4), but hasn't performed well compared to the imperial regime in the remaining years under consideration. The Derg regime was characterized by high percent of arms imports as percent of total imports. Arms imports accounted to about 80.6%, 93.8%, 64.2% and 94% of the total imports[8]. This value was 6.7%, 6.6%, 8.5% and 10% of the national income which is very high compared to the current regime whose import of arms has not exceeded 1% of the total imports and 4% of the national income between the period 1992/93 and 1997/98. In addition, the public expenditure on military activities was as high 10% of the GDP in 1989/90 during the Derg regime.

Coming to the current regime much lower results have been registered in this measure of export performance. During this period the average performance of exports covering import bills was the lowest (about 30.3%). Moreover the trend shows that the percent of exports covering import bills is keeping falling and more negative trade balances are being scored.

[8] Source: World Bank Africa, data base (2002)

3.6 Growth and Instability (in Value and volume) of exports

It is so clear that the fluctuation of the five main export commodities of the country may easily cause fluctuations in the overall export proceeds. As can be seen in Annex-5 almost all of these major commodities have registered negative growth rates in many years both in the proceeds and the percentage value, which refers to a fall from the previous year's value. Mainly the negative growth rate of coffee is so sensitive in this case because it has got the greatest share in export proceeds in all of the years considered in this study.

The commodity which registered the best growth between 1964/65 and 2005/06 is Chat. Its share from the total export has grown by 72.25% and its proceeds has grown on the average by 37.34%, and now it has become the second most important export commodity taking over the position of oil seeds. The share of chat during the imperial regime was so insignificant. During the period considered total export proceeds has grown by 27.52%. One can easily see from the table that the total export proceeds has shown negative growth rates in times when coffee registered the same trend. For instance, in the year 1979/80 the export receipts from coffee has fallen by 46.32% and in the same year the total export proceeds have fallen by 30.89% (see annex-5).

In the literature, fluctuation of export proceeds occurs when either the price or the volume of exports fluctuates. Between the years 1989/90 and 2005/06 the price per k/g of coffee has grown by about 5 times but the volume in metric tone has only doubled.

In the same period the volume of chat has increased by more than 12 times but its price has only tripled. An even higher growth in volume in metric tones has been registered by oil seeds of by about 38 times, its unit price also grew by more than five times. However, this doesn't tell us the fluctuation between the periods since the unit price of almost every commodity has risen and fallen in the same period, and their volume too has shown rise and fall. These are the main factors that caused the fluctuation of the total export proceeds. The only commodity whose unit price has continuously grown is that of Chat. No fall in the unit price was registered of this export item between 1989/90 and 2005/06. Taking the case of oilseeds, for instance, both its volume and unit price shows no constant trend. In the year 1990/91 the total volume of oilseeds in metric tones exported to the rest of the world was 2,558 and this value has fallen to 176 in 1991/92. In the year under consideration the price of pulses hasn't shown significant increment but its volume has grown by more than 5 times. These all things tell us that instability may be caused by either price or volume fluctuations.

According to Jaffee (1985) export dependence exists when a large share of the country's gross domestic product is generated by exports. In the Ethiopian case the share of exports in GDP hasn't shown remarkable growth it hovered around 15%. Neither a significant increase nor a significant decrease was so far registered. This value is not however small compared to other countries. The share of international trade taxes in total tax revenue was on the average 28% between 1983/84 and 2004/05[9]. Tax

[9] World Bank (2005)

revenue accounts for a large share of the GDP, thus export instability causes international trade tax revenue to fall which in turn affects GDP.

Generally, all the meters that are considered above are the major factors that many researchers believe would contribute to export earnings fluctuation. In Ethiopia all of these meters don't show good figures. The Export sector in the three regimes (not relative to one another) was geographically concentrated, commodity concentrated, exports often fail to cover import bills, exports are mainly agricultural products, both price and volume of exports fluctuate, coffee still remained the most dominant export product and most of the country's imports are manufactured goods. Thus in the sample considered in this study (1964/65-2005/06), the export sector hasn't shown remarkable improvements. Ethiopian exports are dominated almost entirely by the first five commodities each of which are primary agricultural commodities with very small elasticity of demand and supply. Moreover these agricultural products are likely to fluctuate both in volume and price and highly dependent on natural factors like rain. If one or two of these agricultural products face demand problems, the overall export sector will be endangered.

The export performance of all the three regimes was not appreciable since an almost similarly poor trend was observed in the period considered. But some changes, particularly in the last few years are encouraging. Even though exports still fail to cover import bills, the current regimes effort to improve the performance of the export sector

has shown a relatively better diversification efforts both geographically and commodity wise. The geographic concentration index which was dominated by two major countries in the early periods of the study has gradually declined and moreover new commodities have been introduced in to the export sector. This to a certain extent shows a shift in policy to diversify from the previous two regimes to the current one.

4. Methodology and Analysis

4.1 The Model

Uncertainty existing in the international trade is usually explained by uncertainty observed in the export sector, which is revealed and measured by export earnings instability. Glezakos (1973) attributed export instability as being due to either the price instability of the products or to the resulting fluctuations of export proceeds which may result from fluctuations in the volume of exports.

It is however difficult to find a well established and satisfactory theoretical framework that reveals the impact that such uncertainty would put on the dynamic benefit of international trade, especially in the long run. A satisfactory theoretical model relating exports instability and economic growth does not appear to exist and this has led many researchers to use growth models as their point of departure (Savvides, 1984).

The failure to integrate trade and export growth theories is partially due to the fact that traditional trade theory is based on a number of static assumptions which may be inconsistent with the dynamic export models. Trade occurred within the static framework of productive resources and technical knowledge which remained constant in quality and quantity. Such assumptions therefore warrant some modification in the dynamic models to allow for growth (Hultman, 1967).

Empirical studies on the relationship between exports and economic growth used different techniques like simple rank correlation coefficient, single equation model, simultaneous equation model and causality tests. Michaely (1977) tested the export-economic growth relationship using spearman rank correlation coefficient. From the estimated coefficient he found a positive and significant relationship between exports and economic growth among the more developed countries but not among the LDCs. A number of authors dealt with the above criticisms by formulating a conceptual framework based on neo-classical production function where exports were considered as one of the inputs.

Brempong (1991) argued that exports can be used as one of the inputs in the production function in LDCs and criticized Glezakos (1984) for taking instability indices as exogenously determined. He then expanded the equation to allow for the inclusion of instability indices.

Ram (1985) also pointed out several reasons on why we can use exports as a production input, in the sense that the level of exports affects aggregate output for a given level of labor and capital. Thus high level of exports (and trade) stimulates better allocation of resources. According to him exports also facilitate exploitation of economies of scale that make for increased capacity utilization and strengthen inducement for technological change and moreover relax the foreign resource constraint and may raise

the productivity of labor and capital. It is also true that exports are part of the national income.

The conventional specification of the model relating exports and economic growth is based on the production function in which exports enter as an input in the production process (Ibid, 1987). The inclusion of exports is meant to capture international factors not explained by labor and capital. Thus our assessment of the effect of exports and/or export instability on economic growth is carried out in a production function framework in which exports enter as an additional input in the production process. Following the works of different authors (such as: Ram (1985) and (1987), Balassa(1970), Brempong (1991), Moran (1983) cited in Brempong (1991) and Sinha (1999) etc...), the model to be used for our analysis can be derived from the general production function in which exports enter as one of the inputs with the following form:

$$Y = Y(L, K, X) \quad \text{.....4.1}$$

Where Y is real aggregate output, L and K are the conventional labor and capital inputs and X is real exports. We shall therefore use the neoclassical[10] production function as our frame of analysis. After taking the total differentiation the model to be estimated takes the form given in equation 4.2 below.

[10] Ram (1985), Brempong (1991), Sinha (1999) and Balassa (1971), Love (1992) cited in Sinha (1999) and Feder (1983) all used the neoclassical production function

$$dY = \frac{\partial Y}{\partial L}dL + \frac{\partial Y}{\partial K}dK + \frac{\partial Y}{\partial X}dX \quad \text{..... (4.2)}$$

The above equation[11] can be written taking the form of growth rates as:

$$\frac{dY}{Y} = \frac{\partial Y/Y}{\partial L/L}\frac{dL}{L} + \frac{\partial Y/Y}{\partial K/K}\frac{dK}{K} + \frac{\partial Y/Y}{\partial X/X}\frac{dX}{X} \quad \text{..... (4.3)}$$

Where $\beta_1 = \frac{\partial Y/Y}{\partial L/L}, \beta_2 = \frac{\partial Y/Y}{\partial K/K}$ and $\beta_3 = \frac{\partial Y/Y}{\partial X/X}$, thus equation 4.3 can be written in the following form.

$$\dot{Y} = \beta_1 \dot{L} + \beta_2 \dot{K} + \beta_3 \dot{X} \quad \text{..... (4.4)}$$

Where the dots over the symbols imply the growth rate of the variables L, K, X and β_1, β_2 and β_3 are the elasticities of output with respect to L, K, and X (in equation 4.4) or $\frac{dY}{Y}, \frac{dL}{L}, \frac{dK}{K}$, and $\frac{dX}{X}$ (in equation 4.3) are the growth rates of output, labor, capital and real exports respectively.

In the literature $\dot{K}$ is usually proxied by $\frac{dK}{Y}$ which can be approximated by investment-real income ratio[12]. Our equation can be made to capture that relationship by introducing the following modification

[11]The derivation is based on Ram(1985)'s framework
[12] Because investment is simply a change in the stock of capital

$$\dot{Y}=\beta_1\dot{L}+\frac{\partial Y}{\partial K}\frac{K}{Y}\frac{dK}{K}+\beta_3\dot{X} \quad \text{..... (4.5)}$$

Where, $\frac{\partial Y}{\partial K}\frac{K}{Y}\frac{dK}{K}$ can be simplified to give $\frac{\partial Y}{\partial K}\frac{dK}{Y}$ and we get the following equation

$$\dot{Y}=\beta_1\dot{L}+\frac{\partial Y}{\partial K}\frac{dK}{Y}+\beta_3\dot{X} \quad \text{..... (4.6)}$$

By using I (where I denotes investment), which is usually referred to as a change in the stock of capital, instead of dK in equation 4.6 we get

$$\dot{Y}=\beta_1\dot{L}+\alpha_2\frac{I}{Y}+\beta_3\dot{X} \quad \text{..... (4.7)}$$

Where, α_2 is the marginal physical product of capital. Thus adding a constant term (β_0) and a stochastic Gausian disturbance term (u_t) we get the following equation

$$\dot{Y}=\beta_0+\beta_1\dot{L}+\alpha_2\frac{I}{Y}+\beta_3\dot{X}+u_t \quad \text{..... (4.8)}$$

Finally, the first model to be estimated becomes

$$\ln Y=\beta_0+\beta_1\ln L+\beta_2\ln K+\beta_3\ln X+u_t \quad \text{..... (4.9)}$$

In equation 4.9, lnY is the natural logarithm[13] of GDP per capita, lnK is the natural logarithm of the stock of capital proxied by the investment to GDP ratio, lnL is the natural logarithm of the labor force which is proxied by the population of the country[14] and LnX is the natural logarithm of the total export proceeds of the country.

According to Glezakos (1973) since LDCs have higher rates of population growth, the use of the growth rate of GNP or GDP rather than the respective per capita growth rates introduces an upward bias in to the rates of economic growth of LDCs. Thus in our model we shall use the growth of per capita GDP instead of the growth rate of GDP.

The other model that will be estimated in this paper is obtained by introducing an instability index component in to the equation. To do that, we split the export component in to stable and unstable. The stable export value refers to the trend export which is calculated by using the five years moving average, where as the unstable one is the deviation of the actual export earnings from the trend value. The second equation to be estimated will thus be

$$\ln Y = \beta_0 + \beta_1 \ln L + \beta_2 \ln K + \beta_3 \ln TX + \beta_4 \ln I_x + u_t \quad \text{..... (4.10)}$$

[13] We use natural logarithms since the first difference operator converts it in to a relationship of the growth rates between the variables

[14] This is done by assuming that the labor force is a fixed proportion of the total population and as the population grows the labor force grows by that same proportion. This is because data on labor force for developing countries is not usually available. Authors like Brempong (1991) support this approximation

Where, $\ln I_x$ is the logarithm of the instability index which is calculated as a deviation of actual exports from the trend value calculated using a five-year based moving average, $\ln TX$ being the natural logarithm of the trend export value and U_t is the Gausian disturbance term. This model has been estimated by some researchers like Sinha (1999), Brempong (1991).

The final equation that needs to be estimated is useful to check whether the export earnings fluctuation is detrimental to the growth and productivity performance of the non-export sector. This will be done by using GDP net of exports rather than the growth rate of GDP. This is also very important to confirm whether export growth stimulates economic growth in the non-export sectors of the country[15]. We therefore take equation *4.9* and modify it the desired way so that it can reflect the relationship between the growth of the non-export GDP per capita and the growth of the export sector. Our equation then becomes

$$\ln \frac{(Y-X)}{L} = \beta_0 + \beta_1 \ln L + \beta_2 \ln K + \beta_3 \ln TX + \beta_5 \ln I_x + u_t \quad \text{..... (4.11)}$$

[15] Brempong (1991) used this approach to check if growth of exports stimulates economic growth in the non-export sector.

5. Econometric Analysis

5.1 Expected Signs of the Parameters

In the first equation (equation 4.9) the growth rate of investment to GDP ratio ($\ln K$) and the growth rate of exports ($\ln X$) are expected to have a positive relationship with the growth rate of GDP accordingly β_2 and β_3 are expected to have positive signs. Many theoretical and empirical literatures suggest that growth of exports and growth of GDP do have a positive relationship with the growth rate of GDP per capita, thus we expect positive signs on the parameters of these variables. However, the labor force coefficient (β_1) may be positive or negative depending on whether the country is labor surplus or not i.e. if there is excess labor force the parameter (β_1) will have a negative sign. Neoclassical theory suggests that if there is labor surplus the marginal productivity of labor declines thus the growth rate of this variable becomes negative.

In the second equation (equation 4.10), two new variables are introduced i.e. the trend level of exports and the unstable part (which is the deviation from the trend value of exports). The former is expected to have a positive and significant relationship with the growth rate of GDP where as it is not possible to foretell the signs and relationship with the instability index because in the literature different opposing empirical results have been reflected on this variable i.e. negative, positive and mixed results have been found on this variable by different researchers. This will therefore be left to the empirical

findings of this paper. In the last model (equation 4.11) one additional variable has been introduced i.e. the dependent variable has been modified as GDP net of exports per capita which is not expected to affect the signs on the parameters of the explanatory variables mentioned before, thus the signs are expected to be like the second model.

5.2 The Data

The estimation of the above models has necessitated the use of a long time series annual data (from 1964/65 to 2004/05) on the variables included in the model. The main sources of data for the variables are the Ministry of Finance and Economic Development (MoFED), The National Bank of Ethiopia (NBE), Ethiopian Customs Authority (ECuA) and various publications of International Monetary Fund (IMF) and World Bank (WB).

Sine the use of a five-years moving average necessitates dropping of a four-years data either from the beginning or the end, data on exports has been collected from 1960/61 onwards which is done to keep the length of estimation. Interpolation or forecasting could off course have been applied if the data was to be dropped at the end of the period, but such measures will not give as precise a value as the actual data on the variable. Taking this in to account and not to drop data from the end of the period, the aforesaid measure was taken.

Moreover, real variables are used to net out price factors and the effects of price fluctuations and thus monetary variables have been estimated at constant factor costs. Glezakos (1973) and Savvides (1984) strictly recommend the use of variables at constant factor cost which is done to net out the effect of domestic price fluctuations and to be able to estimate the real growth rate. This could be done using GDP deflators and consumer price index. World Bank Africa (data base) various publications provide us with a various list of such indices which can be applied for the calculation of real variables. As has been seen from the model most of the variables that are used in the analysis are derived variables (like, the real GDP per capita, investment GDP ratio, trend export value, the instability index and the GDP net off exports per capita), thus a good deal of care has been taken during the derivation of these new variables.

5.3 The Fluctuations Index

Instability simply refers to short term fluctuation of exports from their trend expected value. The main difference in the calculation of instability indices lies in the method of trending used in the approach. The most commonly used methods of trending include moving average, linear trending and exponential trending. All of these have been used by different researchers in past literature nonetheless no harmony was reached in the derivation of trends and/or indices.

The absence of a generally accepted instability index has forced many researchers to resort in to the development of different indices. Some researchers have tried to use

more than one instability index and though their results were the same from using different indices, the differences lie in the magnitude and significance of the parameters of the instability and the explanatory power of the index.

The moving average is one of the most widely used methods in the literature. Many prefer its flexibility, ease of computation, ability to accommodate different trends, ability to distinguish between rise and fall and ease to use the index. The use of linear and exponential trends involves the calculation of a single trend which obscures the different trends that can be obtained from the variable. Deviations in this method are calculated from that single trend line which undermines the possibility to adjust through time. The coefficient of variation method is as well claimed to be a faulty measure and not a comprehensive one for not showing deviations from the trend very well.

To be able to detect correct swings from the normal value, the fluctuation index that will be employed has taken in to account the various strengths mentioned before. And it is given as the absolute value of the deviation of actual exports from the trend value. The trend is calculated using a five-years moving average and is given as follows.

$$I_t = \left| X_t - X_{5j} \right|$$

Where $X_{5j} = \frac{1}{5} \sum_{j=t-4}^{t} X_j$, I_t is the export earnings instability in year t, X_t is the actual export earnings in year t and X_{5j} is the five-years based moving average.

This instability index is free from the effect of inflation because the export variable used is the real export earnings not a nominal one. This helps us to concentrate on the two factors that cause instability of export proceeds namely, fluctuation of export proceeds, which may be due to international price fluctuations and fluctuation of the volume of exports.

Lim (1991) used three types of indices in his estimation to test the relationship between export instability and economic growth. He found that the moving average derived index had a better explanatory power. He saw that the moving average method explained 18 of the 24 cases, where as the linear regression and actual change less average annual increases methods explained only 17 out of 26 and 15 out of 25 changes in income resulting from changes in exports.

Akpokodge (2000) used a four-years based moving average and Lim (1991) a three-years, where as Sinha (1999) and Love (1983) quoted in Sinha used a five-years based moving average to trend the actual export proceeds of the countries included in their analysis. But Lim (1991) suggested that even better results can be obtained by using a larger-year based moving average. Thus considering the effect of a short and a long year moving average, the model used in this paper uses a five-years moving average.

5.4 Estimation Procedure and Results

5.4.1 Unit Roots

It is essential to test the existence of unit roots in the variables and hence to establish their order of integration, before any meaningful regression is performed with the time series variables. The variables used in the analysis need to be stationary and/or shouid be cointegrated in order to infer a meaningful relationship from the regression in the long run. The cointegration relationship to be tested in this section requires all the time series variables in the model to be integrated of order one.

Testing whether a time series data on variables used for the study is stationary[16] is the first and most central element in time series analysis. The first procedure that should be performed is testing the stationarity of data. Empirical studies show that stationarity of the variables under consideration with time series data is crucial to avoid problems of spurious regression[17], which may give very high R^2 value and significant t-ratios without true relationship among the variables. That is if non-stationary variables were regressed

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[16] A stochastic process is said to be stationary if its mean and variance are constant overtime and the value of the covariance between the two time periods depends only on the distance or gap between the two time periods and not the actual time at which the covariance is computed. In other words, If neither the mean μ_t nor the covariance γ_{jt} depend on the time t, then the process Y_t is said to be covariance stationary or weakly stationary:
$E(Y_t) = \mu$ for all t and $E(Y_t-\mu)(Y_{t-j}-\mu) = \gamma_j$ for all t and j

[17] To see the importance of a stationary time series data, consider the following two uncorrelated random walk models: $Y_t = Yt\text{-}1 + u_t$; $U_t \sim iiN(0,1)$; $X_t = X_{t-1} + V_t$; $V_t \sim iiN(0,1)$ where U_t and V_t are assumed to be serially uncorrelated as well as mutually uncorrelated. These time series are non-stationary; that is, they are I (1) or exhibit stochastic trends. Now, let us consider the regression: $Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$ since Y_t and X_t are uncorrelated random walk processes, we would expect that the R^2 from this regression tends to be zero; that is, there should not be any relationship between the two variables. However, this is not the case: parameterβ, detects correlation i.e. spurious correlation persists even in large samples of non-stationary time series.

using OLS, the results obtained would be spurious which implies that the variables have common trend in time and they may not have a long run economic implication or causal relationship. For the classical regression model to hold all the variables involved in the regression must be stationary.

To circumvent the problem of spurious regression that may arise from making regressions of a non-stationary time series on one or more non-stationary time series, we have to transform our data in to a stationary series. The method applied to transform is differencing and detrending the non-stationary series. Thus a time series may be either a trend stationary process (TSP) or difference stationary process (DSP) depending on whether the former or the later method is used to transform the data.

Difference Stationary and Trend Stationary techniques are of key importance in time series analysis. These concepts can be illustrated using the following two regression models.

$$Y_t = \beta_1 + \beta_2 t + U_t$$

Where Y_t is the time series under study and t is the trend variable measured chronologically. The regression represents a TSP if one subtracts the trend, (i.e. $\beta_1 + \beta_2 t$) from the equation i.e. $U_t = Y_t - \beta_1 - \beta_2 t$ will be stationary. U_t is known as a (linearly) de-trended time series. However, if we take the equation $Y_t = Y_{t-1} + U_t$ (pure random walk without drift), it is non stationary. But $\Delta Y_t = Y_t - Y_{t-1} = U_t$ is a stationary series and a transformation of such kind is difference stationary process.

Therefore, we have to check the presence of unit roots in our data before we make any meaningful regression. Dickey Fuller (DF) and Augmented Dickey-Fuller (ADF) tests are the most commonly used methods to perform unit root tests. The ADF test compared to the ordinary Dickey-Fuller unit root test, allows the inclusion of lagged dependent variable terms in order to correct for serially correlated residuals. The following equation is used to test for presence of unit roots in the series.

$$\Delta Y_t = a_0 + a_1 t + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \varepsilon_t$$

Where a_0, a_1, γ and β_i are parameter estimates, t is a time trend and ε_t is the error term. The number of augmented lags is denoted by p whose lag order is determined by minimizing information criteria. The null hypothesis of the ADF test in this specification is that $\gamma = 0$ (the data needs to be differenced to make it stationary) and the alternative hypothesis is that $\gamma < 0$ (the data is stationary and does not need to be differenced).

The test results of the standard Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) statistics for all the time series variables are used in the estimation of the three models. The estimation result can be summarized in the following table:

Table 5.1 – Unit Root tests using DF and ADF

VARIABLE	DF		ADF					
	With drift	With drift and trend	Without drift and trend with lag		With drift and lag		With drift, trend and lag	
			1	2	1	2	1	2
$LNGDPPK_t$	-0.2482	-1.7819	1.0757	1.0384	-0.4791	-0.4907	-1.9219	-1.9620
$LNLAB_t$	0.3437	-0.9113	5.8868	4.0958	1.9448	1.8870	-0.8755	-0.8573
$LNINV_t$	-1.5549	-3.1740	-0.9940	-1.0187	-1.6582	-1.3811	-3.0040	-2.6945
$LNEXP_t$	0.9559	-1.7227	2.1926	1.5058	-0.2264	-0.5729	-1.7774	-2.5571
LNINSt	-2.4948	-4.5371	0.2913	0.4917	-1.8074	-1.9473	-3.3439	-3.3368
LNGNXPKt	-0.3488	-1.8028	0.9936	1.0019	-0.5456	-0.4880	-1.9544	-1.9302
Δ $LNGDPPK_t$	-6.0391	-6.1539	-4.0139	-4.0139	-4.1738	-3.7930	-4.2263	-3.8906
$\Delta LNLAB_t$	-5.8550	-6.5948	-0.6430	-0.3692	-3.9137	-3.0480	-4.5200	-3.7113
$\Delta LNINV_t$	-6.8882	-6.9522	-5.3060	-5.3729	-5.3262	-5.4708	-5.2520	-5.3900
$\Delta LNEXP_t$	-3.7023	-4.0217	-2.0869	-3.7000	-2.4500	-4.13	-2.7200	-4.2600
ΔLNINSt	-8.9092	-8.9040	-5.1617	-5.5399	-5.2164	-5.7649	-5.1333	-5.7736
ΔGNXPPKt	-0.4369	-1.8684	-4.2011	-3.7117	-4.3425	-3.9167	-4.3981	-4.0251
Critical 1%	-2.6241	-3.7700	-2.6256	-2.6272	-3.6105	-3.6156	-4.2119	-4.2191
Values 5%	-1.9493	-3.1900	-1.9496	-1.9499	-2.9390	-2.9411	-3.5298	-3.5331

From the test result we see that the variables are non-stationary at levels but are stationary at first difference hence the variables are considered as I (1) processes. According to Mizon and Hylleberg (1989) an integrated series of order d is a series that requires differencing d times before it becomes stationary. Thus our series requires differencing once to become stationary. If the time-series variables under consideration were non-stationary, this taken alone implies that the variables do not have the tendency to revert to their long run levels. Having found that these variables are non-

stationary, the next step is to check whether any linear combination of the variables is stationary (cointegrated) or not.

5.4.2 Cointegration Analysis

A principal characteristic of cointegrated variables is that their time paths are influenced by the extent of any deviation from the long run equilibrium. After all, if the system is to return to the long run equilibrium the movements of at least some of the variables must respond to the magnitude of the disequilibrium. The short run dynamics is influenced by the deviation from the long run relationship. The dynamic model implied here is an error correction. In an error correction model, the short run dynamics of the variables in the system is influenced by the deviation from the equilibrium (Enders: 1995).

The coefficient of the lagged residuals in the error correction models has the interpretation of a speed of adjustment parameters. The larger it is, the greater the response of the variable to the previous period's deviation from the long run equilibrium. Very small values imply that the short term rate is unresponsive to the last period's equilibrium error (Ibid).

There are two most commonly used methods of testing cointegration i.e. The Engel-Granger (EG) methodology and the Johansen procedure. The Engel-Granger methodology tries to determine whether the residuals of the equilibrium relationship are

stationary. Dickey-Fuller test is in this case, applied to test the order of integration. However, if the residuals from the equation do not appear to be white noise, an augmented Dickey-Fuller (ADF) test can be used for its assumption on the residuals is looser than that of DF.

The EG methodology can be easily implemented but has several side effects. The method assumes only one cointegrating vector and is thus unable to trace more than one cointegrating relationship. Enders (1995) criticized this approach that the estimation of the long run equilibrium regression using EG requires that the researcher places one variable on the left hand side and use others as regressors. Another serious defect is that it relies on a two step estimator. The first step is to estimate the error series and the second steep is to use these generated error terms to estimate a regression. Thus we will be using the Johansen methodology which comes as reply to counter the assumption of a single cointegrating vector of the EG methodology.

5.4.2.1 The Johansen Procedure

The Johansen methodology assumes that there may be more than one cointegrating relations in the model. This procedure relies on the use of rank of a matrix and its characteristic roots. The rank of a matrix is the number of non-zero characteristic roots. To test the number of ranks or simply the number of characteristic roots that are insignificantly different from zero, the procedure uses two statistics: λ_{trace} and

λ_{max} statistics. λ_{trace} tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to some number r against a general alternative. While λ_{max} tests the null hypothesis that the number of cointegrating vectors is r against the alternative that the number of cointegrating vectors is r+1. If the estimated value of the characteristic root is close to zero, λ_{max} will be small.

The first step in the Johansen procedure is the test of VAR. The procedure puts the variables of the model by defining a vector, say Y_t, where Y_t is the vector of explanatory variables, which can be modeled as unrestricted vector of auto-regression (VAR) involving up to k-lags and is given as

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_k Y_{t-k} + U_t \quad \ldots\ldots (5.1)$$

Where, Y_t is an (nx1) matrix of variables and each A_i (A_1 through A_k) is an (nxn) matrix of parameters. U_t is an independently and normally distributed n-dimensional vector with zero mean and a variance matrix of $\sum_u$

Accordingly the vector of error correction (VECM) can be formulated from equation 5.1 as follows:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \ldots + \Gamma_k \Delta Y_{t-k+1} + \Pi Y_{t-k} + U_t \quad \ldots\ldots (5.2)$$

Γ_i contains information of the short run adjustment to changes in Y_t

Π contains information on the long run adjustments to changes in Y_t

$\Pi = \alpha\beta'$ where α represents the speed of adjustment parameters and β is the matrix of long run coefficients.

Our models can thus be represented in the form given by equation 5.2, which simply represents the model to be estimated and in a contracted form as:

$$\Delta Y_t = \Gamma_i \sum \Delta Y_{t-1} + \alpha\beta' Y_{t-k} + U_t$$

Accordingly, the matrix tabulated forms of the three models (equations 4.9, 4.10 and 4.11) under analysis takes the following forms, respectively.

$$\begin{bmatrix} \Delta \ln GDPPK_t \\ \Delta \ln LAB_t \\ \Delta \ln INV_t \\ \Delta \ln EXP_t \end{bmatrix} = \Gamma_i \begin{bmatrix} \Delta \ln GDPPK_{t-i} \\ \Delta \ln LAB_{t-i} \\ \Delta \ln INV_{t-i} \\ \Delta \ln EXP_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} & \beta_{41} \\ \beta_{12} & \beta_{22} & \beta_{32} & \beta_{42} \\ \beta_{13} & \beta_{23} & \beta_{33} & \beta_{43} \end{bmatrix} \begin{bmatrix} \ln GDPPK_{t-1} \\ \ln LAB_{t-1} \\ \ln INV_{t-1} \\ \ln EXP_{t-1} \end{bmatrix}$$

$$\begin{bmatrix} \Delta \ln GDPPK_t \\ \Delta \ln LAB_t \\ \Delta \ln INV_t \\ \Delta \ln TEXP_t \\ \Delta \ln INS_t \end{bmatrix} = \Gamma_i \begin{bmatrix} \Delta \ln GDP_{t-i} \\ \Delta \ln LAB_{t-i} \\ \Delta \ln INV_{t-i} \\ \Delta \ln EXP_{t-i} \\ \Delta \ln INS_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha 24 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} \\ \alpha_{51} & \alpha_{52} & \alpha_{23} & \alpha_{54} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ \beta_{12} & \beta_{22} & \beta_{32} & \beta_{42} & \beta_{52} \\ \beta_{13} & \beta_{23} & \beta_{33} & \beta_{43} & \beta_{53} \\ \beta_{14} & \beta_{24} & \beta_{34} & \beta_{44} & \beta_{54} \end{bmatrix} \begin{bmatrix} \ln GDPPK_{t-1} \\ \ln LAB_{t-1} \\ \ln INV_{t-1} \\ \ln EXP_{t-1} \\ \ln INS_{t-1} \end{bmatrix}$$

$$\begin{bmatrix} \Delta \ln GNXPK_t \\ \Delta \ln LAB_t \\ \Delta \ln INV_t \\ \Delta \ln TEXP_t \\ \Delta \ln INS_t \end{bmatrix} = \Gamma_i \begin{bmatrix} \Delta \ln GNX_{t-i} \\ \Delta \ln LAB_{t-i} \\ \Delta \ln INV_{t-i} \\ \Delta \ln EXP_{t-i} \\ \Delta \ln INS_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha 24 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} \\ \alpha_{51} & \alpha_{52} & \alpha_{23} & \alpha_{54} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ \beta_{12} & \beta_{22} & \beta_{32} & \beta_{42} & \beta_{52} \\ \beta_{13} & \beta_{23} & \beta_{33} & \beta_{43} & \beta_{53} \\ \beta_{14} & \beta_{24} & \beta_{34} & \beta_{44} & \beta_{54} \end{bmatrix} \begin{bmatrix} \ln GNXPK_{t-1} \\ \ln LAB_{t-1} \\ \ln INV_{t-1} \\ \ln EXP_{t-1} \\ \ln INS_{t-1} \end{bmatrix}$$

Where GDPPK, LAB, INV, EXP, TEXP, INS and GNXPK refer to the variables described before corresponding to the three models. Before attempting to determine the number of cointegrating vectors, under the restricted and the unrestricted cointegrated system, we need to determine the maximum lag length that will be used in the estimation. The use of inappropriate lag length may lead to unexpected results in the estimation procedure, thus we need to determine the appropriate lag length to be used before any further step is taken.

There are different methods of determining the lag length to be used for the estimation. The PC Fiml 9.10 output equips us with three kinds of information criteria to determine the lag length (like the AIC, the HQ and the SC information criterion). Hendry et al (2005) remarked that model selection criteria in the form of information criteria are utilized in three aspects of general-to-specific modeling: model selection after multiple path searches, the reduction of lag length and the choice of maximal lag length.

The one that will be used in this paper is based on the minimum Akaike Information Criteria (AIC). According to (Wintan, 2000) AIC is an operational way of trading off the complexity of an estimated model against how well the model fits the data. AIC defines

the predictive log-likelihood as the sum of the prior predictive log-likelihood and the incremental predictive loglikelihood. Aside from a constant term, the AIC is simply minus twice the log of the predictive log-likelihood:

$$AIC = 2k - 2\ln L$$

where L is the log-likelihood for the model, and k is the number of parameters in the model. Minimizing the AIC as a model selection procedure is equivalent to maximizing the predictive log-likelihood and minimizing the residual sum of squares. Large values of an information criterion may suggest invalid exclusion of higher-order lags, so a consistent procedure using an information criterion can function as part of a progressive research strategy (Hendry et al, 2005).

Increasing the number of free parameters to be estimated improves the goodness of fit, regardless of the number of free parameters in the data generating process. Hence AIC not only rewards goodness of fit, but also includes a penalty that is an increasing function of the number of estimated parameters. This penalty discourages over fitting. The preferred model is the one with the lowest AIC value. The AIC methodology attempts to find the model that best explains the data with a minimum of free parameters. By contrast, more traditional approaches to modeling start from a null hypothesis (Hurvich and Tsai).

Respective lags selected for equations 4.9, 4.10 and 4.11 are thus determined using the minimum AIC information criterion using the test of system reduction of lag

determination. From the results we find that lag 3 for the first model, lag 2 for the remaining two equations are appropriate. These respective lags are used for the VAR and cointegration test in the remaining parts of the Johansen procedure.

Following the determination of an appropriate lag length we can determine the number of cointegrating relationships and then obtain the estimates of α and β'. If we find a rank equal to zero, it implies that there are no cointegrating relationships and that Π (nxn) is a null matrix and no long run relationships among the variables could be observed.

Once we have checked that the variables are integrated of the same order one or I(1) and the lags properly determined, we can then proceed to test the number of cointegrating vectors. Determination of the number of cointegrating vectors is a central element in the Johansen procedure because this method basically assumes the existence of more than one cointegrating relationships (unlike the EG methodology). Accordingly the result obtained for the three models is presented below.

Table 5.2 – Tests of cointegration and rank for model 1

Ho: rank=r	$n-r$	$\hat{\lambda}$	$-T\ln(1-\hat{\lambda})$	λ_{max} (95%)	-T $\sum_{i=r+1}^{n}$ ln (1- $\hat{\lambda}$.)	λ_{trace} (95%)
r == 0	4	0.6691	42.03**	28.1	70.33**	53.1
r <= 1	3	0.3634	17.16	22.0	28.31	34.9
r <= 2	2	0.1690	7.039	15.7	11.14	20.0
r <= 3	1	0.1023	4.103	9.2	4.103	9.2

** denote the rejection of the null at 1%

* denote the rejection of the null at 5%

Table 5.3– Tests of cointegration and rank for model 2

Ho: rank=r	$n-r$	$\hat{\lambda}$	$-T\ln(1-\hat{\lambda})$	λ_{max} (95%)	-T $\sum_{i=r+1}^{n}$ ln (1- $\hat{\lambda}$.)	λ_{trace} (95%)
r == 0	5	0.636032	39.42**	33.5	85.54**	68.5
r <= 1	4	0.419457	21.21	27.1	46.13	47.2
r <= 2	3	0.331397	15.70	21.0	24.92	29.7
r <= 3	2	0.151368	6.40	14.1	9.21	15.4
r <= 4	1	0.069674	2.81	3.8	2.81	3.8

** denote the rejection of the null at 1%

*denote the rejection of the null at 5%

Table 5.4 – Tests of cointegration and rank for model 3

Ho: rank=r	$n-r$	$\hat{\lambda}$	$-T\ln(1-\hat{\lambda})$	λ_{max} (95%)	-T $\sum_{i=r+1}^{n}$ ln (1- $\hat{\lambda}$.)	λ_{trace} (95%)
r == 0	5	0.642945	40.16**	33.5	85.81**	68.5
r <= 1	4	0.407445	20.41	27.1	45.65	47.2
r <= 2	3	0.331657	15.72	21.0	25.24	29.7
r <= 3	2	0.151563	6.41	14.1	9.52	15.4
r <= 4	1	0.076768	3.11	3.8	3.11	3.8

** denote the rejection of the null at 1%

*denote the rejection of the null at 5%

In the three tables both the λ_{max} and the λ_{trace} statistics clearly show that there is only one cointegrating vector. The null hypothesis of no cointegrating vector in a VAR model is thus rejected while the alternative that the number of cointegrating vectors is at most equal to one is retained (at 1% in the three models). The conclusion is that there is exactly one cointegrating vector in the three models or the other way that the rank of the matrix Π is exactly one. Therefore, we can proceed to determine those uniquely cointegrating vectors, which is the next step of our analysis while using the Johansen methodology.

Table 5.5- Results of cointegration analysis for model 1

standardized β' eigenvectors				
LNGDPPK	LNLAB	LNINV	LNEX	Constant
1.0000	10.7550	-2.2151	-2.8397	-59.2460
0.0808	1.0000	-0.3965	-0.2893	-6.0733
1.2505	-3.6070	1.0000	-0.2165	37.4850
-0.2760	-0.8994	-1.0848	1.0000	-11.2560
standardized α - coefficients				
LNGDPPK	-0.0057	-0.5333	-0.0954	-0.1063
LNLAB	0.0035	-0.0246	0.0002	0.0017
LNINV	0.0132	0.7123	-0.0892	0.1152
LNEX	0.1369	0.4197	-0.1589	-0.1241

Diagnostic Tests for model 1

Number of lags used in the analysis: 3

Variables entered restricted: Constant

Vector AR 1-2 F (32, 53) = 1.2636 [0.2215]

Vector normality Chi^2(8) = 51.797 [0.1271]

Table 5.6- Results of cointegration analysis for model 2

standardized β' eigenvectors				
LNGDPPK	LNLAB	LNINV	LNEXP	LNINS
1.0000	2.8808	-2.5923	-1.2687	0.6167
0.1774	1.0000	0.4671	-0.6800	0.1991
0.8562	-5.2119	1.0000	0.1906	0.4195
-1.1072	0.7203	-0.9483	1.0000	0.0429
-14.8380	43.5160	-11.2550	-8.5251	1.0000

standardized α - coefficients					
LNGDPPK	-0.0919	0.3680	-0.0449	-0.0853	0.0039
LNLAB	0.0023	0.0121	0.0017	0.0006	-0.0002
LNINV	0.1052	-0.2036	0.0136	0.2349	-0.0009
LNEXP	0.0641	0.1399	-0.0855	-0.0377	0.0015
LNINS	-0.1274	0.0682	-1.5661	-0.1229	0.0009

Diagnostic Tests for model 2

Number of lags used in the analysis: 2

Variables entered restricted: Constant

Vector AR 1-2 F (50, 67) = 1.6356 [0.0301] *

Vector normality Chi^2(10) = 106.49 [0.5065]

Table 5.7- Results of cointegration analysis for model 3

standardized β' eigenvectors				
LNGNXPK	LNLAB	LNINV	LNEXP	LNINS
1.0000	3.8730	-2.9246	-1.4447	0.6368
4.1871	1.0000	9.3663	-9.4959	4.8305
1.0664	-8.3364	1.0000	0.7868	0.5576
-1.0671	0.9787	-1.0394	1.0000	-0.0033
-17.5520	54.6820	-15.5860	-9.6123	1.0000

standardized α -coefficients					
LNGNXPK	-0.10615	0.01801	-0.06109	-0.10166	0.00327
LNLAB	0.00221	0.00073	-0.00010	0.00045	-0.00016
LNINV	0.09502	-0.00836	0.05401	0.22759	-0.00028
LNEXP	0.05865	0.00544	-0.06529	-0.03422	0.00140
LNINS	-0.05295	-0.03409	-0.98236	0.01468	0.00159

Diagnostic Tests for model 3

Number of lags used in the analysis: 2

Variables entered restricted: Constant, dummy for policy

Vector AR 1-2 F (50, 67) = 1.5057 [0.0588]

Vector normality Chi^2(10) = 102.38 [0.0352] *

The diagnostic tests for auto correlation and normality do not imply the problems implied by their respective null hypothesis at 1% for all of the three models. The second model shows the existence autocorrelation at 5% which is not a bit of worry at this level of significance.

In all of the three models the existence of a unique cointegrating vector is statistically supported. We now need to determine those uniquely cointegrating vectors corresponding to the three models. The uniquely cointegrating vectors for the three models under consideration should now be determined with rank 1. We now impose a cointegration rank of 1 and obtain the β'-coefficients which can be taken as a counterpart of the long run coefficients in our static long run equation. Thus our estimated long run equations can be simply obtained from the first rows of β' eigen vectors for the three models, which take the following form:

Model 1 (equation 4.9)

LNGDPPK	LNLAB	LNINV	LNEX	Constant
1.0000	10.755	-2.2151	-2.8397	-59.246

Model 2 (equation 4.10)

LNGDPPK	LNLAB	LNINV	LNEXP	LNINS
1.0000	2.8808	-2.5923	-1.2687	0.61666

Model 3 (equation 4.11)

LNGNXPK	LNLAB	LNINV	LNEXP	LNINS
1.0000	3.8730	-2.9246	-1.4447	0.63679

This will then be followed by test of weak exogeneity for the explanatory variables. This is done by imposing zero restrictions on the α-coefficients. This process is very important to determine the form that our static long run equation will take. The fact that the explanatory variables are required to be weakly exogenous to fulfill the neoclassical regression assumption forces us to test for weak exogeneity of the α- coefficients of the explanatory variables. This test is done using the log likelihood ratio or the LR-test. The following results were obtained from the test.

Table 5.8 - Test of zero restrictions on α-coefficients for model 1

	LNGPPPK	LNLAB	LNINV	LNEX
α-coefficients	1.0000	10.755	-2.2151	-2.8397
LR - Test: Chi^2(1)	16.244	0.09144	0.36324	2.8073
p-value	[0.0001] **	[0.7623]	[0.5467]	[0.0938]

**denotes rejection at 1%

*denotes rejection at 5%

Table 5.9 - Test of zero restrictions on α-coefficients for model 2

	LGDPPK	LNLAB	LNINV	LNEXP	LNINS
α-Coefficients	1.0000	2.8808	-2.5923	-1.2687	0.6167
LR - Test: Chi^2(1)	11.613	1.6074	3.5461	3.4358	0.23193
p-value	[0.0007] **	[0.2049]	[0.0597]	[0.0638]	[0.6301]

**denotes rejection at 1%

*denotes rejection at 5%

Table 5.10 - Test of zero restrictions on α -coefficients for model 3

	LNGNXPK	LNLAB	LNINV	LNEXP	LNINS
α -coefficients	1.0000	3.8730	-2.9246	-1.4447	0.6368
LR - Test: Chi^2(1)	17.392	3.3831	3.8120	2.2670	0.27278
p-value	[0.0000] **	[0.0659]	[0.0597]	[0.1322]	[0.6015]

**denotes rejection at 1%

*denotes rejection at 5%

The test of weak exogeneity (zero restrictions on the α -coefficients) shows that all the explanatory variables are weakly exogenous, and the dependent variables in the three models (LNGDPPK and LNGNX) are found to be endogenous. It is clearly presented in the PC Fiml 9.10 output with two stars showing rejection at 1%. Now, we can use reduced β' coefficients to formulate our long run equations.

Once we establish the weak exogeneity conditions that the explanatory variables are weakly exogenous, we can write the cointegrating vector in equation format by classifying the variables in to endogenous and exogenous. The reduced β' can now be directly used as coefficients of the long run equation. Hence, we can have our respective long run equations as follows:

The Long run equation for model 1 (equation 4.9)

$$\mathbf{LNGDPPK_t = 59.246 - 10.755LNLAB_t + 2.2151LNINV_t + 2.8397LNEX_t}$$

The long run equation for model 2 (equation *4.10*)

$$\mathbf{LNGDPPK_t = -2.8808LNLAB_t + 2.5923LNINV_t + 1.2687LNEXP_t - 0.61666LNINS_t}$$

The long run equation for model 3 (equation *4.11*)

$$\mathbf{LNGNXPK_t = -3.8730LNLAB_t + 2.9246LNINV_t + 1.4447LNEXP_t - 0.63679LNINS_t}$$

Now since the long run equations are already determined, we need to test the significance of the long run coefficients. This is done by imposing a zero restriction on each of the coefficients, which are simply the β' coefficients. This test is done to make sure whether all the independent variables significantly explain the dependent variable. The results obtained are represented in table 5.11 below:

Table 5.11 - Tests of zero restrictions on the long run parameters

Model 1					
	LNGDPPK	LNLAB	LNINV	LNEX	
Coefficients	1.0000	9.2595	-1.8942	-2.5651	
LR - Test: Chi^2(1)	6.5694	2.3277	7.1876	3.1503	
p-value	[0.0004] **	[0.0152] *	[0.0073] **	[0.0059] **	
Model 2					
	LNGDPPK	LNLAB	LNINV	LNEXP	LNINS
Coefficients	1.0000	2.8808	-2.5923	-1.2687	0.6167
LR - Test: Chi^2(1)	3.4547	1.9214	11.2730	7.1199	4.6229
p-value	[0.0000] **	[0.1657]	[0.0008] **	[0.0076] **	[0.0315] *
Model 3					
	LNGNXPK	LNLAB	LNINV	LNEXP	LNINS
Coefficients	1.0000	3.8730	-2.9246	-1.4447	0.6368
LR - Test: Chi^2(1)	3.3272	2.8367	12.368	3.5461	5.6736
p-value	[0.0018] **	[0.0921]	[0.0004] **	[0.0007] **	[0.0172] *

**denotes rejection at 1%

*denotes rejection at 5%

The results in table 5.11 for equation 4.9 show that all the explanatory variables significantly explain long run relationships at the conventional levels of significance (1% and 5%). All the variables are significant at 1% except labor which is significant at 5% for the first model and the instability index which is significant only at 5% (in the last two models).

The negative sign on labor is due to excessive population growth that resulted in labor surplus and negative marginal productivity of labor. Ethiopia is the second most populous country in the continent and with a very short population doubling time. This has resulted in a huge labor force that can not be absorbed by the economic capacity. The other main reason on the negative sign of labor may be the use total population as

a proxy for the labor force and tells us the fact that the labor force is not growing as a constant proportion of the total population, as opposed to what we assumed in the model. Thus the country's growth of the total population is not accompanied by growth in the total labor force. The estimation result for model 1 weakly suggests that the high population growth of the country may be catastrophic to the growth performance of the country in long run.

The export instability index which is introduced in the last two models is found to have negatively affected the growth of the economy in the long run at 5%. In addition, the growth of trend exports has got the expected signs and significance. The result also shows that trend exports positively and significantly affect the growth of the economy. These two things combined together tell us that if exports were not to fluctuate, they would much better contribute to the growth of the economy in the long run. The long run equation for model 3 (equation 4.11) also tells us one important fact i.e. the growth of exports not only stimulates economic growth in the export sector but also stimulates growth in the non-export sector, in the long run. The same is true of the fact that the instability in the export sector is also detrimental to the growth performance of the economy in the non-exports sector in the long run.

Finally, the growth of investment to GDP ratio is found to have positive and significant effect on economic growth in all of the models used. So investment has a vital and

important effect on economic growth in the long run. LNINV was found significant in all the three models at 1% level of significance and with the expected sign.

5.4.2.2 Vector Error Correction Model (VECM)

Now we have checked the long run relationships, and the next step will be the short run dynamics. Although cointegration implies the presence of Granger causality it does not necessarily identify the direction of causality between the variables. This temporal Granger causality can be captured through the vector-error-correction model (VECM) derived from the long-run cointegrating vectors. The vector-error correction representation therefore takes the following relationship

$$\Delta Y_t = a + \sum_{i=1}^{p} A_i \Delta Y_{t-i} - d\,(\beta' Y_{t-1}) + U_t \quad \text{..... (5.3)}$$

Where Y_t is an n x 1 column vector of macroeconomic variables, Δ is a difference operator, a is an n x 1 column vector of constant terms, p is the lag length, d is an n x r matrix of coefficients, U_t is an n x 1 column vector of disturbances.

The k-order VAR is constructed in terms of their first differences, the I(0) variable, with the addition of an error-correction term ($\beta' Y_{t-1}$). Incorporating the error-correction term (ECT) in to the equation reintroduces the information lost in the first-difference process, thereby allowing for long-run as well as short-run dynamics. Through the error

correction term, the VECM establishes an additional channel for Granger causality to emerge, a channel that is ignored by the standard Granger and Sims tests employed in the earlier works (Enders, 1995). The Wald test applied to the joint significance of the sum of the lags of each explanatory variable and the t-test of the lagged error-correction term(s) will imply statistically the Granger exogeneity (or endogeneity) of the dependent variable. The non-significance of the ECT is referred to as long-run non-causality, which is equivalent to saying that the variable is weakly exogenous with respect to long-run parameters. The absence of short-run causality is established from the non-significance of the sum of the lags of each explanatory variable. Including the ECT term in the VECM indicates the econometric strong-exogeneity of the dependent variables that is the absence of Granger causality.

If variables are cointegrated, then tests involving differenced variables will be misspecified and some important information lost unless a lagged error-correction term is included. Therefore, we estimate the error correction model in which the error correction terms (ECT), derived from long-run cointegrating vectors, and are included as independent explanatory variables in the estimation process of equation (5.3) in order to recover all the long-run information that was lost in the original estimation process. Our equation in such form will be as follows:

$$\Delta gdp_t = \alpha_1 + \lambda\mu_{t-1} + \sum_{i=1}^{k} \beta_i \Delta lab_{t-i} + \sum_{i=1}^{l} \delta_i \Delta inv_{t-i} + \sum_{i=1}^{m} \gamma_i \Delta \exp_{t-i} + \sum_{i=1}^{m} \eta_i \Delta ins_{t-i} + \varepsilon_t \quad \ldots\ldots(5.4)$$

* The variables in small letters represent the natural logarithms of the main variables.

The application of the Johansen method produces two types of relationships: short-run dynamics and long-run causal relationships between the growth of real GDP per capita and the specified set of independent variables. The long-run causal relationship is captured by the coefficients of the lagged value of the error correction term, μ_{t-1}, while the long-run causal effects are implied by the coefficients of the lagged explanatory variables (in first difference). If only the vector error-correction term (ECT) is statistically significant, this implies that the variable is weakly endogenous with respect to the long-run parameters. Similarly, if only the coefficients of the lagged explanatory variables (in first difference) are statistically significant, this implies that the variable is weakly endogenous with respect to the short-run parameters. Finally, if the lagged explanatory variables and error correction terms are not statistically significant, then the dependent variable is econometrically strongly exogenous.

The next procedure after the assurance of the long run relationship is to determine the significant variables that have to enter in to our short run model. The parsimonious short run model is the result of Hendry's general-to-specific modeling. The general model is usually described in an autoregressive distributive lag (ADL). General to specific modeling is the formulation of a fairly unrestricted dynamic model, which is subsequently tested, transformed and reduced in size by performing a number of tests for restrictions. In general-to-specific modeling, empirical analysis starts with a general statistical model that captures the essential characteristics of the underlying dataset, i.e., that general model is congruent. Then, that general model is reduced in complexity

by eliminating statistically insignificant variables, checking the validity of the reductions at every stage to ensure congruence of the finally selected model (Hendry et al, 2005). Therefore, the estimated result of the system of vector error correction model after including the significant variables and using OLS for our models is presented in table 5.12 through 5.14 as follows:

Table 5.12 results of VECM for model 1

Variables	Coefficients	t-value	t-prob	
Constant	0.56559	2.651	0.0125	R^2= 0.78
$\Delta LNLAB_{t-1}$	8.9687	1.775	0.0856	T=37
$\Delta LNEX_t$	0.37080	3.885	0.0005	DW= 1.83
DM_{POL}	0.22552	2.517	0.0172	**DIAGNOSTIC TESTS**
ECT_{t-1}	-0.6570	-3.713	0.0008	AR 1- 2 F(2, 28) = 1.4689 [0.2474]
$\Delta LNGDP_{t-1}$	0.044364	0.308	0.7598	Normality Chi^2(2) = 31.334 [0.3521]
				ARCH 1 F(1, 28) = 0.18682 [0.6689]
				Xi^2 F(11, 18) = 2.1118 [0.0768]

Table 5.13 – Results of VECM for model 2

Variables	Coefficients	t-value	t-prob	
Constant	3.4960	3.084	0.0043	R^2= 0.82
$\Delta LNLAB_{t-1}$	9.6838	2.345	0.0256	T=38
$\Delta LNINS_t$	-0.039299	-1.393	0.0034	DW= 1.97
$\Delta LNEXP_t$	1.4205	4.728	0.0000	**DIAGNOSTIC TESTS**
DM_{POL}	0.031534	0.664	0.0058	AR 1- 2 F(2, 29) = 1.5152 [0.2367]
ECT_{t-1}	-0.5992	-3.327	0.0023	Normality Chi^2(2)= 16.336 [0.7503]
$\Delta LNINV_{t-1}$	0.25577	2.232	0.0330	ARCH 1 F(1, 29) = 0.066856 [0.7978]
				Xi^2 F(11, 19) = 6.4002 [0.7052]

Table 5.14 - Results of VECM for model 3

Variables	Coefficients	t-value	t-prob	
Constant	4.4435	2.991	0.0054	
$\Delta LNLAB_{t-1}$	13.645	2.961	0.0058	
$\Delta LNINS_t$	-0.052708	4.226	0.0002	R^2= 0.77
$\Delta LNEXP_t$	1.4049	-3.234	0.0029	T=38
DM_{POL}	0.027636	0.361	0.0004	DW= 1.72
ECT_{t-1}	-0.6180	1.919	0.0642	**DIAGNOSTIC TESTS** AR 1- 2 F(2, 29) = 1.0227 [0.3722] Normality Chi^2(2)= 7.4941 [0.0236]* ARCH 1 F(1, 29) = 0.096173 [0.7587] Xi^2 F(11, 19) = 17.698 [0.6552]
$\Delta LNINV_{t-2}$	0.24588	-1.713	0.0468	

ECT_{t-1} is the error correction vector and DM_{pol} is the dummy variable included in the model to capture the effect of policy changes and to be able to compare the policy of the current regime with the previous two. Diagnostic tests detected no problem of any sort. The diagnostic tests reported on the right most column of the three tables above refer to tests AR (Autoregressive) which is the test for higher order serial correlation up to two lags, ARCH (Auto regressive conditional hetroscedasticity), normality and hetroscedasticity (XY) and each of which commonly used to validate that the estimated models have no problems of the type stated in their respective null hypothesis. The fact that the stated problems do not exist is usually suggested by the absence of asterisks one or two in the PC Fiml 9.10 output, which usually happens at lower t-probabilities. The DW statistics in addition support the test that there is no autocorrelation which is the most common problem in time series residuals.

The coefficient of the error correction term has got the expected negative sign with a magnitude of 0.657, 0.599 and 0.618 respectively for the three models under analysis. This value depicts a less than complete adjustment. The figures tell us that about 65.7%, 59.9% and 61.8% of the discrepancy between the actual and the long run equilibrium values are corrected every year.

The short run estimated equations for the three models can therefore be written to take the following form:

The short run equation for model 1

$$\Delta LNGDPPK_t = 0.56559 + 0.044364\,\Delta GDP_{t-1} + 8.9687\,\Delta LAB_{t-1} + 0.37080\,\Delta LNEX_t - 0.6570ECT_{t-1} + 0.22552\ DM_{POL}$$

The short run equation for model 2

$$\Delta LNGDPPK_t = 3.4960 + 9.6838\,\Delta LNLAB_{t-1} - 0.039299\,\Delta LNINS_t + 1.4205\,\Delta LNEXP_t + 0.25577\,\Delta LNINV_{t-1} - 0.5992\ ECT_{t-1} + 0.031534\ DM_{POL}$$

The short run equation for model 3

$$\Delta LNGNXPK_t = 4.4435 + 13.645\,\Delta LNLAB_{t-1} - 0.052708\,\Delta LNINS_t + 1.4049\,\Delta LNEXP_t + 0.24588\,\Delta LNINV_{t-2} - 0.6180ECT_{t-1} + 0.027636\ DM_{POL}$$

The short run analysis also confirms that instability of exports significantly and negatively affects the growth of GDP per capita. The instability component which is included in the last two models is therefore found to be detrimental to economic growth both in the short run and in the long run. On the other hand trend exports do have a significant positive effect on economic growth in all of the three models considered. But in the degree of significance, instability is more significant in the short run than the long run. This is because economic agents may in the long run try to adjust and look for mechanisms through which they can eliminate instabilities. All other explanatory variables that are entered in the model explain economic growth rate are also significant in the short run.

The positive and significant relationship between dummy for policy and economic growth shows that the current regime's effort to diversify exports and the trade policy contribute positively to the growth of the economy. The third model also implies the fact that growth of the export sector stimulates growth in the non-export sector of the economy, and at the same time the instability that existed in the export sector harms the growth of the economy. This is clearly shown by the negative and significant effect of export instability on GDP net off exports per capita.

6. Conclusions and Recommendations

6.1 Conclusions

Exports do have a significant positive effect in all of the three models considered. Even though the explanatory power of the variables (as measured by R^2) is greater for the second model than the other two, exports also significantly and positively affect GDP net of exports per capita. We can there fore conclude that growth of exports do stimulate growth of non-exports. The regression results for model three support that exports not only affect economic growth directly but also indirectly by enhancing the productivity of other inputs, and this effect is large enough.

Export instability is found to have a significant and negative effect on economic growth both in the long run and in the short run, which reaffirms the findings of many other researchers who found a negative association between export fluctuations and economic growth. Such a negative effect is found to be stronger in the short run than in the long run, showing that economic agents may have some mechanisms to adjust fluctuations in the long run.

Moreover, in all of the models the growth explaining variables included in the model are found to have explained the variation in growth of the economy, both in the long run and the short run. The signs of the parameters are also found as expected.

The fate of the export sector of the country seems to hang on five major commodities, which on the average accounted for 81% of the total export earnings of the country in the period considered. Exports failed to cover import bills, commodity concentration indices revealed very little diversifications made. However, geographic concentration has declined and the country has become more open. Openness measured by the share of external trade in GDP has increased from 11.2% in 1964/65 to 47.9% in 2004/05. Many new export items have also been introduced in the export market (though still most of them are primary products). The dummy for policy variable included in the model shows that the current regime's effort to diversify exports and the drive to openness shows a positive association with the growth of the economy and that the outcomes are being materialized.

In summary, all of the models that are included in this study review the different approaches used by different researchers. The regression results obtained prove that exports should be expanded and its instability, which is detrimental to the growth of the economy, should be mitigated.

6.2 Policy Recommendations

Attempts to diversify exports should be made to tackle the bad effect that instability may have on economic growth. If exports are diversified the total earnings from the export sector may not be easily fluctuating, because a fall in the in the earnings of one

export commodity may be backed by a rise in the other. The measure thus involves diversifying in to a product that the country has a comparative advantage or by increasing the degree of processing of raw materials (trying to process or semi-process those primary exports). Diversification should not necessarily be in manufactured goods as the country may not initially have a comparative advantage.

One major reason for failure to expand the range of export commodities in the country may be lack of incentives to exporters. This may be avoided by liberalizing the export sector through avoiding export controls whose effects are discouraging potential exporters. Giving export tax holidays for new exporters, producer's income stabilization schemes, avoiding licensing restrictions and exchange controls may be some of the measures that should be taken.

The short run model suggests that the country should build foreign exchange reserves to smooth out fluctuations in the export earnings. The lack of capital flows results from excessive governmental controls over the foreign exchange and capital markets. It is therefore essential to liberalize foreign exchange markets to arrest the ill effects of short run export fluctuations.

The various indicators that have been used to evaluate the performance of the export sector in the country show underperformance of the sector in the country. Though the objective of the paper is not to find out the causes of export instability, these indicators

have been claimed by many researchers as having positive contribution to instability. These include commodity concentration, export partner concentration, primary exports composition, the degree of processing of exports etc... Measures have to be taken to combat the undesired effects of them.

Finally, an important task that remains to be done is to calculate the minimum threshold level of instability that should be attained and that allows for positive economic growth. The researcher encourages all future studies related to this work.

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Annex 1-Commodity concentration index for the five major commodities (1970/71 - 2004/05)

	COFFEE	HIDES AND SKINS	OIL SEEDS	PULSES	CHAT	OF THE FIVE COMMODITIES
YEAR	CI	CI	CI	CI	CI	CI
1970/71	0.36	0.06	0.07	0.05	0.01	0.54
1971/72	0.57	0.10	0.12	0.08	0.01	0.89
1972/73	0.42	0.16	0.14	0.10	0.01	0.82
1973/74	0.33	0.11	0.17	0.21	0.01	0.82
1974/75	0.18	0.06	0.14	0.11	0.01	0.50
1975/76	0.57	0.08	0.07	0.10	0.01	0.83
1976/77	0.60	0.08	0.04	0.07	0.01	0.80
1977/78	0.79	0.09	0.02	0.05	0.00	0.95
1978/79	0.88	0.08	0.01	0.01	0.01	0.98
1979/80	0.68	0.15	0.01	0.01	0.00	0.86
1980/81	0.63	0.08	0.02	0.03	0.03	0.78
1981/82	0.71	0.14	0.03	0.03	0.02	0.93
1982/83	0.19	0.03	0.01	0.01	0.01	0.25
1983/84	0.67	0.11	0.03	0.02	0.03	0.87
1984/85	0.62	0.10	0.02	0.02	0.01	0.76
1985/86	0.74	0.11	0.01	0.01	0.01	0.88
1986/87	0.66	0.14	0.01	0.01	0.04	0.85
1987/88	0.57	0.17	0.03	0.02	0.03	0.82
1988/89	0.69	0.14	0.01	0.02	0.01	0.87
1989/90	0.54	0.18	0.01	0.05	0.03	0.81
1990/91	0.49	0.17	0.01	0.03	0.04	0.74
1991/92	0.60	0.21	0.00	0.00	0.02	0.83
1992/93	0.34	0.08	0.00	0.00	0.04	0.46
1993/94	0.58	0.16	0.04	0.02	0.09	0.88
1994/95	0.66	0.14	0.02	0.04	0.06	0.91
1995/96	0.68	0.12	0.02	0.03	0.07	0.92
1996/97	0.66	0.11	0.02	0.03	0.06	0.87
1997/98	0.70	0.08	0.08	0.02	0.07	0.95
1998/99	0.60	0.07	0.08	0.03	0.13	0.90
1999/00	0.57	0.08	0.07	0.02	0.16	0.90
2000/01	0.43	0.19	0.08	0.02	0.15	0.87
2001/02	0.42	0.14	0.08	0.08	0.13	0.85
2002/03	0.40	0.13	0.11	0.05	0.14	0.82
2003/04	0.41	0.08	0.15	0.04	0.16	0.85
2004/05	0.40	0.08	0.12	0.04	0.12	0.76
PERIOD AVERAGE	0.55	0.11	0.05	0.04	0.05	0.81

Source : National Bank of Ethiopia and Author's calculation using commodity concentration index

Annex 2- The share of External trade in the country's GDP

YEAR	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73
X/GDP	5.73	5.27	4.62	4.68	5.05	5.00	6.67	4.59	6.30
M/GDP	6.09	7.15	7.38	6.30	7.32	6.34	6.73	7.01	6.04
X+M/GDP	11.82	12.42	12.00	10.98	12.36	11.34	13.40	11.60	12.34

continued

YEAR	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
X/GDP	7.893716	9.35	7.40	9.60	9.24	17.92	11.79	10.49	7.20
M/GDP	7.058872	9.65	9.62	10.52	9.61	15.97	17.46	17.54	17.93
X+M/GDP	14.95259	19.00	17.02	20.12	18.86	33.90	29.25	28.03	25.13

continued

YEAR	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
X/GDP	24.85	9.074701	8.60	9.37	7.26	7.06	8.22	6.51	4.96
M/GDP	16.93	21.16044	20.25	23.04	20.43	20.35	21.94	16.02	19.49
X+M/GDP	41.78	30.23514	28.85	32.41	27.69	27.41	30.16	22.52	24.45

continued

YEAR	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
X/GDP	2.65	13.57	10.39852	5.36	4.43	5.86	7.28	5.79	5.87
M/GDP	17.19	31.10	39.50187	12.84	13.45	12.41	16.41	19.29	17.89
X+M/GDP	19.84	44.68	49.90039	18.19	17.88	18.27	23.68	25.08	23.77

continued

YEAR	2000/01	2001/02	2002/03	2003/04	2004/05
X/GDP	4.90	4.84	5.32	6.23	8.98
M/GDP	17.85	20.93	23.84	29.70	38.51
X+M/GDP	22.75	25.76	29.16	35.93	47.49

Source: Author's calculation on data from Customs Authority and National Bank of Ethiopia

continued ...

1996/97	-2.51	33.84	28.95	77.02	-12.44	20.20	-17.13	13.77	-16.68	14.38	37.28
1997/98	5.37	25.23	256.64	323.85	-21.41	-6.60	-1.40	17.19	14.85	36.50	18.85
1998/99	-13.75	-26.88	1.77	-13.73	-17.54	-30.10	16.48	-1.26	92.74	63.39	-15.23
1999/00	-5.56	0.99	-12.04	-5.94	10.22	17.86	-26.38	-21.28	30.04	39.05	6.93
2000/01	-24.31	-31.89	17.34	5.59	145.85	121.24	1.10	-9.02	-8.32	-17.50	-10.01
2001/02	-2.85	-4.09	4.73	3.39	-24.17	-25.14	291.58	286.55	-16.92	-17.99	-1.28
2002/03	-4.57	1.76	33.09	41.91	-11.44	-5.57	-42.93	-39.15	11.52	18.91	6.63
2003/04	3.28	35.84	36.99	80.18	-36.22	-16.11	-13.57	13.69	15.88	52.43	31.53
2004/05	-3.90	50.59	-20.17	25.10	-2.69	52.49	1.07	58.38	-27.23	14.04	56.71
PERIOD AVERAGE	11.24	20.10	24.37	127.32	15.26	17.97	42.33	68.95	37.34	72.25	27.52

Source: Customs Authority and Author's calculation

...rate of the main export commodities

YEAR	GROWTH RATE										
	COFFEE		OIL SEEDS		HIDES AND SKINS		PULSES		CHAT		TOTAL EXPORT
	AS A%AGE OF TOTAL EXPORTS	PROCEEDS	AS A%AGE OF TOTAL EXPORTS	PROCEEDS	AS A%AGE OF TOTAL EXPORTS	PROCEEDS	AS A%AGE OF TOTAL EXPORTS	PROCEEDS	AS A%AGE OF TOTAL EXPORTS	PROCEEDS	PROCEEDS
1970/71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1971/72	58.03	13.72	73.43	24.80	71.80	23.63	77.60	27.81	127.26	63.54	-28.04
1972/73	-25.94	4.21	8.75	53.02	58.61	123.18	19.74	68.49	-32.20	-4.59	40.71
1973/74	-22.02	-0.93	22.69	55.89	-31.13	-12.50	112.21	169.62	8.71	38.12	27.05
1974/75	44.73	34.57	-17.32	-2.12	46.28	36.41	-46.51	36.68	-2.99	14.85	18.38
1975/76	214.54	153.34	-50.43	-60.08	42.59	14.85	-10.81	-28.16	-7.54	-25.53	-19.46
1976/77	4.74	37.34	-42.31	-24.35	-6.25	22.93	-29.97	-8.17	47.29	93.14	31.13
1977/78	32.92	25.85	-52.97	-55.47	16.47	10.27	-33.71	-37.24	-57.38	-59.65	-5.32
1978/79	10.61	128.68	-60.91	-19.18	-13.16	79.54	-71.55	-41.18	12.27	132.10	106.74
1979/80	-22.32	-46.32	103.75	40.82	92.87	33.29	-37.43	-56.76	-17.92	-43.27	-30.89
1980/81	-7.54	-17.00	27.41	14.38	-49.11	-54.32	240.87	205.99	488.14	427.97	-10.23
1981/82	12.78	-8.39	34.59	9.32	83.96	49.43	8.19	-12.12	-31.93	-44.70	-18.77
1982/83	-72.86	3.25	-75.96	-8.55	-78.61	-18.61	-64.19	36.26	-22.28	195.69	280.47
1983/84	247.99	19.06	465.65	93.52	255.26	21.55	108.86	-28.54	131.98	-20.63	-65.79
1984/85	-7.73	-21.02	-55.04	-61.51	-9.35	-22.40	-24.61	-35.47	-65.28	-70.28	-14.40
1985/86	19.18	42.57	-44.47	-33.58	9.00	30.39	-19.27	-3.42	-17.79	-1.66	19.63
1986/87	-10.84	-21.13	44.05	27.41	29.20	14.28	-24.11	-32.88	282.46	238.29	-11.55
1987/88	-13.73	-16.21	131.46	124.80	26.46	22.82	93.82	88.24	-23.44	-25.64	-2.88
1988/89	22.07	42.66	-57.13	-49.90	-20.55	-7.15	-12.55	2.20	-68.27	-62.92	16.87
1989/90	-21.54	-35.36	-7.70	-23.96	31.75	8.54	167.51	120.39	222.78	165.92	-17.61
1990/91	-9.13	-33.72	-40.62	-56.68	-5.70	-31.21	-40.09	-56.30	33.17	-2.86	-27.06
1991/92	21.87	-37.32	-79.50	-89.46	23.66	-36.40	-95.22	-97.54	-51.70	-75.16	-48.57
1992/93	-44.41	219.07	-46.05	209.66	-60.04	129.37	82.79	949.22	125.72	1195.62	474.01
1993/94	71.63	33.71	258.02	3625.72	94.29	51.37	778.05	584.05	110.78	64.21	-22.09
1994/95	14.43	150.56	-48.19	13.45	-16.21	83.46	70.27	272.82	-27.08	59.67	118.96
1995/96	3.12	-4.17	-9.98	-16.34	-10.79	-17.09	-19.55	-25.23	8.92	1.22	-7.06

Annex - 4: The percentage of exports covering import bills and the trade balance

YEAR	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75
Trade balance	-17,856.00	-98,641.00	-151,510.00	-91,722.00	-134,375.00	-82,413.00	-3,965.00	-161,210.00	17,880.00	57,843.00	-21,344.00
% of exports covering import bills	94.20	73.74	62.52	74.36	68.93	78.78	99.08	65.49	104.33	111.83	96.81

YEAR	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86
Trade balance	-156,616.00	-65,738.00	-25,838.00	145,857.00	-445,560.00	-557,267.00	-1,006,203.00	818,029.00	-1,169,391.00	-1,016,825.00	-1,312,079.00
% of exports covering import bills	76.90	91.23	96.16	112.23	67.49	59.84	40.13	146.79	42.89	42.50	40.66

YEAR	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Trade balance	-1,441,662.00	-1,455,625.00	-1,507,630.00	-1,087,752.00	-1,589,465.00	-1,531,872.00	-2,068,135.00	-3,492,212.00	-3,814,228.00	-5,169,192.00	-3,893,673.00
% of exports covering import bills	35.55	34.67	37.45	40.61	25.45	15.41	43.64	26.32	41.73	32.94	47.24

YEAR	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Trade balance	-5,195,932.90	-8,190,452.00	-7,683,809.00	-8,935,032.00	-11,100,065.00	-12,380,047.00	-17,619,309.00	-24,102,916.42	-29,368,174.21
% of exports covering import bills	44.36	30.01	32.83	27.44	23.11	22.32	20.98	23.32	22.82

Source: MoFED, NBE and author's calculation

Annex -3 Geographic concentration index of Ethiopian Exports

EXPORT DESTINATION	1985/86 (1978)	1986/87 (1979)	1987/88 (1980)	1988/89 (1981)	1989/90 (1982)	1990/91 (1983)	1991/92 (1984)	1992/93 (1985)	1993/94 (1986)	1994/95 (1987)	1995/96 (1988)	1996/97 (1989)	1997/98 (1990)	1998/99 (1991)	1999/00 (1992)	2000/01 (1993)	2001/02 (1994)	2002/03 (1995)	2003/04 (1996)	2004/05 (1997)	2005/06 (1998
Djibouti	0.04	0.08	0.07	0.03	0.09	0.11	0.03	0.09	0.10	0.07	0.10	0.07	0.13	0.11	0.10	0.16	0.07	0.07	0.10	0.05	0.06
Kenya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Sudan	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03
U.A.R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.03	0.03
France	0.04	0.04	0.03	0.05	0.03	0.05	0.07	0.04	0.03	0.06	0.04	0.03	0.04	0.04	0.03	0.02	0.03	0.07	0.02	0.02	0.02
Germany	0.31	0.26	0.24	0.23	0.19	0.23	0.18	0.17	0.18	0.32	0.34	0.25	0.22	0.18	0.18	0.10	0.11	0.09	0.11	0.15	0.10
Italy	0.08	0.08	0.07	0.06	0.09	0.06	0.08	0.08	0.08	0.08	0.09	0.07	0.08	0.07	0.06	0.08	0.10	0.04	0.06	0.05	0.05
Netherlands	0.09	0.03	0.03	0.09	0.01	0.04	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.03	0.02	0.04	0.04
U.K.	0.02	0.03	0.02	0.01	0.03	0.12	0.07	0.05	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.03	0.04	0.02	0.04	0.03	0.03
Russia	0.04	0.09	0.06	0.06	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yugoslavia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U.S.A.	0.13	0.18	0.14	0.12	0.12	0.06	0.05	0.10	0.07	0.06	0.06	0.10	0.08	0.04	0.04	0.03	0.04	0.08	0.05	0.05	0.05
China, P.Rep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.05	0.13
Japan	0.09	0.08	0.13	0.10	0.13	0.20	0.28	0.19	0.13	0.13	0.13	0.10	0.08	0.15	0.11	0.10	0.08	0.05	0.11	0.08	0.08
Saudi Arabia	0.05	0.04	0.07	0.06	0.10	0.08	0.14	0.14	0.08	0.01	0.09	0.07	0.07	0.12	0.09	0.08	0.06	0.04	0.06	0.06	0.06
Rest of the World	0.12	0.08	0.13	0.17	0.10	0.05	0.07	0.11	0.27	0.19	0.11	0.24	0.24	0.24	0.32	0.36	0.43	0.44	0.39	0.38	0.32
Total Export	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum value	0.31	0.26	0.24	0.23	0.19	0.23	0.28	0.19	0.27	0.32	0.34	0.25	0.24	0.24	0.32	0.36	0.43	0.44	0.39	0.38	0.32

Source: National Bank of Ethiopia and author's calculation using geographic concentration index

Annex 6 – Beta and Reduced beta form long run parameters for the three models

\beta'

GDP	LAB	INV	LNEX	Constant
1.0000	10.7550	2.2151	-2.8397	-59.2460

Reduced form \beta'

	LAB	INV	LNEX	Constant
GDP	-10.755	2.2151	2.8397	59.246

\beta'

LGDPPK	LNLAB	LNINV	LNEXP	LNINS
1.0000	2.8808	-2.5923	-1.2687	0.6167

Reduced form \beta'

	LNLAB	LNINV	LNEXP	LNINS
LGDPPK	-2.8808	2.5923	1.2687	-0.61666

\beta'

GNX	LAB	INV	EXP	INS
1.0000	3.8730	-2.9246	-1.4447	0.6368

Reduced form \beta'

	LAB	INV	EXP	INS
GNX	-3.8730	2.9246	1.4447	-0.63679

Beta and reduced form beta outputs

DECLARATION

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

Declared by

Mulugeta Andualem

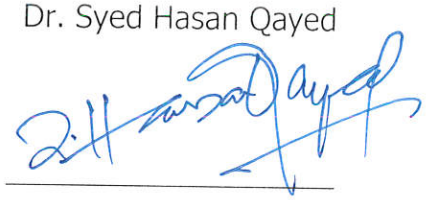
Candidate

February, 2007

Addis Ababa

Confirmed by

Dr. Syed Hasan Qayed



Advisor

February, 2007

Addis Ababa