INSTABILITY OF ETHIOPIA'S EXPORT EARNINGS, PRICES AND QUANTITIES

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Abstract

This article examines Ethiopia's instability in export earnings, prices and quantities of the major export commodities over the period 1964-2002. Analysis of the composition of exports through time reveals that Ethiopia has not diversified the commodity structure of its exports in that its export earnings depend on only a few agricultural products. In fact, the results of this study show that six agricultural commodities (chat, coffee, fruits and vegetables, hides and skins, oilseeds, and pulses) accounted for about 86% of the total export earnings of the country. The results indicate that the amplitude of instability varied from one commodity to another. Moreover, the results show that for the major export commodities, except for coffee, domestic supply factors were more important in explaining instability in earnings than demand related factors. The findings of this study suggest that the country needs to break away from its heavy dependence on traditional export commodities for which it is a marginal exporter, thus a price taker.

I.   INTRODUCTION

There has been a considerable discussion during the past five decades on the problem of instability of export earnings and the effects of such instability on the economic growth of developing countries which are heavily dependent on the export of primary commodities. Since the early 1950s, many economists and policy makers have argued that instability in export earnings has been an impediment to development, especially for countries, which derive the bulk of their export earnings from few primary commodities[1]. There are two types of empirical studies on instability of export earnings: cross-country (transversal) studies; and country specific studies. The former ones analyze export earnings instability (its causes and/or consequences) among several countries and the latter focus on individual country studies. The great majority of previous studies on export earnings instability have been transversal in nature, whereas specific country studies on export earnings instability are few and far between.

In most of the transversal studies on export earnings instability of developing countries, Ethiopia was one of the countries frequently included in the samples[2]. However, these studies did not help either to draw tangible conclusions about the impacts of export earnings instability on the Ethiopian economy or to gauge the contributions of major export commodities to the instability in total export proceeds. A survey of relevant literature reveals that the only country specific studies on Ethiopia's export earnings instability are those made by Love (1975), Teressa (1987) and Yohannes (1992). The first of these studies covered the period 1963-1970 and fluctuations were computed as the year-to-year changes in export earnings without eliminating the trend component from the time-series. The second and the third studies covered the 1962-1981 and 1978/79-1988/89 periods, respectively. These two studies employed trend corrected instability indices. However, they did not measure the contribution of major export commodities to the instability of total export earnings. Nor did they decompose instability of export earnings into its constituents. The present study departs from the previous studies in two ways. First, it covers a longer sample period (1964-2002). Second, and perhaps more importantly, **it** measures the contributions of the major export commodities to the instability of total export earnings and decomposes the instability of export earnings into its constituents.

The specific objectives of this study are:

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(i) to analyze the degree of instability in export proceeds, prices and quantities of the major export commodities;

(ii) to compare levels of fluctuations among major export commodities and **to** measure the share of instability attributable to each commodity; and

(iii) to decompose the instability in export earnings of major export commodities into quantity effect, price effect, combined effect of prices and quantities, compensations between fluctuations of quantities and prices from their respective trends, and a residual factor.

The rest of this paper is organized in three sections. Section II discusses the source of data and the analytical procedures of the study. Statistical results are discussed in section III. Conclusions are presented in the fourth section.

II.   METHODOLOGY

A closer look at the time-series estimates of the country's major macro-economic variables shows that different sources report different values for the same variables. In fact, many empirical studies on the Ethiopian economy are based on data gleaned from different sources. It is obvious that the quality and reliability of the data vary from one source to another. Therefore, piecing together data from various sources may lead to erroneous conclusions. In order to avert this problem and ensure the consistency as well as comparability of results, we opted for using data published by the National Bank of Ethiopia (NBE). In view of the objectives of this study, time-series data on values of exports and imports were extracted from various issues of the Quarterly Bulletin published by the NBE. Moreover, statistics pertaining to exported quantities and export earnings from the major export commodities (coffee, hides and skins, oilseeds, pulses, chat and fruits and vegetables) were extracted from the same source.

2.1   Data Coverage

This study covers 39 years, from 1964 to 2002. Review of the different publications of the NBE (Annual Reports and Quarterly Bulletins) reveals that data are available on export earnings, prices (unit values) and quantities of the major export commodities since 1964[3]. Therefore, the absence of data on earnings, unit values and exported quantities of some of the major export commodities for the years before this period, rules out the possibility of extending the study period beyond 1964. As the latest

available data on external trade of the country are that of 2002, the last year of the study period is 2002.

2.2   Definition and Measure of Instability

The meaning of the word instability, in the literal sense, does not pose any problem for it is incontrovertible and signifies the absence or lack of stability. When it comes to economics, this word has been defined in many ways and no unifying principle has underlain its quantification. The absence of a universally accepted definition for the word instability has three serious consequences. Firstly, measurements of instability proliferate. At least 16 distinct indices may be found in the development literature alone. This destroys cross study comparability. Secondly, existing indices fail to indicate clearly the type of fluctuations being measured; no rigorous classification of fluctuations is employed. Third, the relative emphasis on different fluctuations currently arises out of the ad-hoc characteristics of index and data, rather than from any underlying theory about why the fluctuations are presumed to matter. This is especially serious as inappropriate measurements may lead to faulty policy orientations (Gelb, 1979).

In spite of the absence of a universal definition for the term, it is accepted now that instability must be defined relative to a 'normal' value. This approach involves equating trend values with the 'normal' or anticipated path of earnings and regarding deviations from trends as comprising instability (Love, 1990). At present, there is a consensus among researchers to eliminate any trend element from a time series in estimating instability. The removal of the trend is required to avoid interpreting consistent annual increase or decrease as indicating instability. Otherwise, instability, and therefore instability index, of a series with a rapid or even a constant growth rate would tend to be biased upward (Aggarwal, 1982; Cuddy and Della Valle, 1978).

As to the instability indices used in the previous studies, they differ from one study to another[4]. The most frequently used instability indices are: Coppock's log-variance measure, normalised standard error measure, semi-log standard error measure, autoregressive moving average measure, five year moving average measure and average absolute deviation from the trend. For the purpose of this paper, the average absolute deviation instability index is used because, unlike most of the indices, this index does not impose *a priori* the same trend form for the export series of all the countries in the sample (Demeocq and Guillaumont, 1983)[5]. While using this index, export series, which is a function of time is adjusted according to a model that is

assumed to be either linear or exponential (with the better fit of the two being retained)[6].

2.3   Method of Measuring Percentage Contributions

Instability in total export earnings does not give a clear picture of the nature and degrees of fluctuations in earnings from different commodities exported by the country. Export proceeds from all commodities don't fluctuate at the same time and in the same direction. It is, therefore, worth analyzing the amplitude of instability in export earnings from the major export commodities and the contribution of the latter to the instability in total export earnings. Towards this end, the methodology used in some empirical studies (Coppock, 1977; Demeocq and Guillaumont, 1984; Kingston, 1973; Stein, 1979) is adopted with slight modifications[7].

The percentage contribution of each commodity to the instability in total export earnings is a function of its relative share in the total exports of the country. Thus, weighing the instability index of export earnings from each commodity by its average relative share gives a measure, which indicates the relative contribution of each commodity to the instability in total export earnings.

Consider a country exporting m commodities, where,
X_t: total export earnings in year t
X_{it}: export proceeds from commodity i in year t
I_X: instability index of total export earnings
I_{Xi}: instability index of export earnings from commodity i

for $i = 1, \ldots , m$ and $t = 1, \ldots , n$

Thus, the average relative share of commodity i in the total export earnings of the country (p_i) is given by :

$$P_i = \sum_{t=1}^{n} \frac{\left(\dfrac{X_{it}}{X_t} \right)}{n} \qquad \qquad \textbf{(1)}$$

The weighted instability index of commodity i (I'_{xi}) is then equal to : $I_{xi} \cdot p_i$; and the total weighted instability index for the m commodities exported by the country ($\hat{I}_X$) can be written as:

$$\hat{I}_X = \sum_{i=1}^{m} I'_{Xi} = \sum_{i=1}^{m} I_{Xi} P_i \tag{2}$$

Thus, it is possible to compute the percentage contribution of commodity i to the instability in total export earnings (α_i) as follows:

$$\alpha_i = \frac{I'_{Xi}}{\hat{I}_X} \tag{3}$$

$$\text{with } \sum_{i=1}^{m} \alpha_i = 1$$

Empirical studies have shown that the total weighted instability is greater than the instability in total export proceeds of a country (Demeocq and Guillaumont, 1984). This is possibly because of the fact that by definition the total of the export earnings (X_t) is the sum of export proceeds from the m commodities, that is $X_t = \sum_{i=1}^{m} X_{it}$,

and instability in earnings from some commodities can possibly be offset by the relative stability of proceeds from other commodities. The level of this compensation (C') can, therefore, be measured by the difference between the instability in total export earnings and the total weighted instability index for the different commodities :

$$C' = I_X - \sum_{i=1}^{m} I_{Xi} P_i \tag{4}$$

2.4   Method for Decomposing Export Instability: Instability of Export Earnings, Prices and Quantities

The degree of fluctuations of export earnings depends not only on the fluctuations of prices and quantities from their respective trends but also on whether fluctuations of prices and quantities are offsetting each other or move in the same direction. In what

follows, the method used to decompose instability of export earnings into its constituents is presented[8].

Let us consider the case of a country over a period of n years. The relative annual variation in earnings is given by :

$$\frac{\Delta X}{X} \approx \frac{\Delta Q_X}{Q_X} + \frac{\Delta P_X}{P_X} \qquad \textbf{(5)}$$

Where : X is the export earnings ;
Q_X is the volume (quantity) of exports ; and
P_X is the price of exports.

The annual variation in earnings results, on one hand, from quantity variation, $a = \dfrac{\Delta Q_X / Q_X}{\Delta X / X}$

and, on the other hand, from price variation, $b = \dfrac{\Delta P_X / P_X}{\Delta X / X}$ (provided that $\dfrac{\Delta X}{X} \neq 0$).

However, a and b may not move in the same direction, and price and quantity variations may partially offset each other. Therefore, three factors, measured in absolute terms, should be distinguished in the relative variation of export earnings of each year :

- the absolute value of the quantity variation $\left| \Delta Q_X / Q_X \right|$ its contribution being $\left| a \right|$

- the absolute value of price variation $\left| \Delta P_X / P_X \right|$ its contribution being $\left| b \right|$

- the compensation taking place possibly between price and quantity variations when the two move in opposite directions, i.e. :

$$C \approx \left| \frac{\Delta X}{X} \right| - \left| \frac{\Delta Q_X}{Q_X} \right| - \left| \frac{\Delta P_X}{P_X} \right| \qquad \textbf{(6)}$$

its contributi on to the relative variation in earnings being if $\dfrac{\Delta X}{X} \neq 0$

$$c = \left| \frac{C}{\Delta X / X} \right| \approx 1 - \left| a \right| - \left| b \right|$$

It is thus possible to determine what proportion of the variation in the annual export earnings is due to quantity and price variations and the possible compensation between the variations in prices and quantities[9].

It would then be possible to average the results obtained for each year. But in doing so one would determine the factors of annual variation in export earnings but not the factors of their instability, which are in fact measured in relation to their trend.

How should the role of the three identified factors in determining the instability index of export earnings be detected? Given that we measure the instability of export earnings using the absolute average deviation in relation to the trend, or:

$$I_X = \frac{1}{n} \sum_{t=1}^{n} \left| \frac{X - \hat{X}_t}{\hat{X}_t} \right|$$

(7)

where $X_t = Q_{Xt} \cdot P_{Xt}$ and $\hat{X}_t$ the value of exports estimated over the trend.

The deviation observed in each year t is equal to $\left(Q_{Xt} \cdot P_{Xt} - \hat{X}_t \right)$ and it can result from five factors :

- the absolute value of deviations in export earnings resulting from deviations of exported quantities from their trend values, prices being assumed to be equal to their trend values, i.e.

$$\left| A_t \right| = \left| \left(Q_{Xt} - \hat{Q}_{Xt} \right) \cdot \hat{P}_{Xt} \right|$$

(8)

Where $\hat{Q}_{Xt}$ is the quantity (volume) of exports estimated over the trend.

- the absolute value of deviations in export earnings resulting from deviations of export prices from their trend values, exported quantities being assumed to be equal to their trend values, i.e.

$$\left| B_t \right| = \left| \hat{Q}_{Xt} \cdot \left(P_{Xt} - \hat{P}_{Xt} \right) \right|$$

(9)

where $\hat{P}_{Xt}$ is the export price trend value in year t.

- the absolute value of deviations in export earnings resulting from the combined action of deviations of exported quantities and prices, from their respective trends, i.e.

$$\left| \hat{Y}_t \right| = \left| \left(Q_{Xt} - \hat{Q}_{Xt} \right) . \left(P_{Xt} - \hat{P}_{Xt} \right) \right| \tag{10}$$

- a residual factor, other than the possible compensation of price and quantity deviations, resulting from the fact that, as price and quantity trends are not the same, the sum of the algebraic values of the three previous deviations is not necessarily equal to the observed deviation ; let Z be this residual factor :

$$
\begin{aligned}
Z_t &= \left| X_t - \hat{X}_t \right| - \left| A_t + B_t + Y_t \right| \\
&= \left| X_t - \hat{X}_t \right| - \left| Q_{Xt} . P_{Xt} - \hat{Q}_{Xt} . \hat{P}_{Xt} \right| \\
&= \left| X_t - \hat{X}_t \right| - \left| X_t - \hat{Q}_{Xt} . \hat{P}_{Xt} \right|
\end{aligned}
\tag{11}
$$

The residual factor corresponds to the fact that the trend values of export earnings are not necessarily equal to the products of price and quantity trend values.

- the possible compensation between price and quantity variations when they work in opposite directions, i.e. :

$$
\begin{aligned}
C_t &= \left| X_t - \hat{X}_t \right| - \left| A_t \right| - \left| B_t \right| - \gamma \left| Y_t \right| - Z_t \\
&= \left| A_t + B_t + Y_t \right| - \left| A_t \right| - \left| B_t \right| - \gamma \left| Y_t \right|
\end{aligned}
\tag{12}
$$

with $\quad \gamma = +1$ if A+B > 0
$\gamma = -1$ if A+B < 0

It should be verified that $C_t = 0$ when Y > 0 and $C_t < 0$ when Y < 0. Actually, the combined element Y_t , included above as an absolute value and which is negative when A and B move in opposite directions becomes a positive compensating element only if the value of the positive element (A or B) is higher than the absolute value of the negative element, i.e. if A+B > 0, in other words only when the deviations in export earnings, relative to their trend, resulting from inverse price and quantity movements, is positive[10].

Thus, each annual deviation observed in relation to the trend can be broken down into five factors:

$$
\begin{aligned}
\left| X_t - \hat{X}_t \right| &= \left| A_t \right| + \left| B_t \right| + \gamma \left| Y_t \right| + Z + C_t \\
& \text{with } C_t \leq 0
\end{aligned}
\tag{13}
$$

The instability index (I) computed over a period of n years can itself be broken down into these five factors:

$$I_X = \frac{1}{n}\sum\frac{|A_t|}{|\hat{X}_t|} + \frac{1}{n}\sum\frac{|B_t|}{|\hat{X}_t|} + \frac{1}{n}\sum\frac{\gamma|Y_t|}{|\hat{X}_t|} + \frac{1}{n}\sum\frac{C_t}{|\hat{X}_t|} + \frac{1}{n}\sum\frac{Z_t}{|\hat{X}_t|}$$ **(14)**

Or, in percentage

$100 = A + B + Y + C + Z$

with

$$A = \frac{100}{nI}\sum\frac{|A_t|}{|\hat{X}_t|} = \%\ \text{of instability due to quantity variations}$$

$$B = \frac{100}{nI}\sum\frac{|B_t|}{|\hat{X}_t|} = \%\ \text{of instability due to price variations}$$

$$Y = \frac{100}{nI}\sum\frac{\gamma|Y_t|}{|\hat{X}_t|} = \%\ \text{of instability due to combined action of quantity and price variations}$$

$$C = \frac{100}{nI}\sum\frac{C_t}{|\hat{X}_t|} = \%\ \text{of instability due to compensation between quantity and price variations}$$

$$Z = \frac{100}{nI}\sum\frac{Z_t}{|\hat{X}_t|} = \%\ \text{of instability due to residual factor}$$

III.   RESULTS AND DISCUSSIONS

In this section the descriptive results and the analytical findings are presented and discussed.

3.1   Structure and Instability of Ethiopia's Exports

The external trade of the country was running at the level of some 3.62 billion birr for exports and 14.3 billion birr for imports in 2002 (NBE)[11]. These figures, when compared with the external trade statistics of the early 1960s, show that Ethiopia's exports have increased significantly in birr values. However, the value of imports has risen at even higher rates exceeding exports in all but one year (1973) since 1960. In fact, during 1960-2002, the annual growth rates of exports and imports were 7.24 percent and 10.37 percent respectively[12]. Merchandise exports accounted for an average of 5.8 percent of the GDP during the period 1990-1999, which was lower than the African average of 21.6 percent (ADB, 2002). The same source reveals that, over the same period, merchandise imports accounted for 16.6 percent of the country's GDP compared to the African average of 21.9 percent.

3.1.1 Export Structure

The country's export structure can be characterized by its heavy dependence on few agricultural commodities. OECD and ADB (2002) reported that the country's diversification index in 1999 was 2.5[13]. This shows that the economy is less diversified compared to some other African countries like Cameroon (6.8), Côte d'Ivoire (4.6), Egypt (9.6), Ghana (7.1), Kenya (10.5), Senegal (9.2) and Zimbabwe (8.9). As indicated in Table 1, six export commodities (Coffee, Hides and Skins, Oilseeds, Pulses, Chat, and Fruits and Vegetables) accounted, on average, for 86 percent of the country's total export earnings during the 1964-2002 period[14]. Coffee alone accounted for more than half of the total export earnings of the country over the period 1964-2002. It was distantly followed by hides and skins and oilseeds.

Table 1: Percentage Shares of Major Export Items in total Value of Exports: 1964-2002

Export items	1964-1973	1974-1983	1984-1993	1994-2002	1964-2002
Coffee	56.52	58.90	61.91	56.31	58.46
Hides and Skins	10.46	10.39	15.31	11.56	11.94
Oilseeds	9.58	5.76	1.14	5.26	5.44
Pulses	7.69	6.69	1.66	3.39	4.90
Chat	1.08	1.86	3.69	8.87	3.75
Fruits &Vegetables	2.32	0.99	1.33	1.16	1.46
Others	12.33	15.39	14.95	13.44	14.04
Total	100	100	100	100	100

Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

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The figures in Table 1 indicate that agricultural commodity trade is an important source of export earnings. Available empirical evidence reveals that such an overwhelming dependence on few agricultural commodities has an adverse effect on the economies of developing countries like Ethiopia[15].

One notable point on the export side is that oilseeds, pulses, and fruits and vegetables, which are the country's traditional export commodities, are losing their relative importance. In fact, a closer look at Table 1 shows that the average shares of oilseeds and pulses have shrunk from 9.58 percent, and 7.69 percent respectively in the 1964-1973 period to 1.14 percent, and 1.66 percent, respectively in the 1984-1993 period. Though the average shares of oilseeds and pulses increased in the 1994-2002 period as compared to that of the period 1984-1993, they were still lower than their levels of the 1964-1973 period. The principal explanation for the decline in the average shares of oilseeds and pulses is the fact that during 1974-1991 the combined effect of recurrent droughts, political instability and military conflicts, in the major producing areas of these commodities, has severely affected the total volume of production and consequently the quantity of exports (Belay, 1998). As to the average share of fruits and vegetables in the total export earnings of the country, it declined from 2.32 percent in the period 1964-1973 to about 1 percent in the 1974-1983 period. It then increased slightly to 1.33 percent in the period 1984-1993 and then dropped to 1.16 percent during the 1994-2002 period. Another important change in the export structure is the rapid increase of relative importance of chat in the total export earnings of the country. In this respect, the relative share of chat in export earnings has been growing at a rate of 7 percent per annum over the 1964-2002 period[16]. It is also interesting to note that Chat was the third important export commodity, in terms of export earnings, over the period 1994-2002. In recent years, Chat was the second largest export after coffee, accounting for 14 percent and 14.2 percent of export earnings in 1999 and 2000, respectively (Computed from data in NBE). Some of the reasons for the increasing importance of Chat include: the persistent decline of coffee price in the world market, since the second half of the 1990s, has led the replacement of the coffee plant by Chat in the major coffee producing areas; the market for chat has been growing over the years (it has been legally exported to Djibouti and the United Kingdom since the early 1980s and in recent years with the liberalization of exports to Somalia its market has grown considerably); and the Chat plant is relatively drought resistant, fetches higher income per unit area as compared to annual crops and in recent years the acreage under this plant has increased significantly especially in the Southern and Eastern parts of the country (Belay, 1994; Belay and Manig, 2004; World Bank, 2002).

3.1.2 Instability of Export Earnings

The first step in computing an instability index is the estimation of a trend equation. Thus, both linear and exponential trend forms were fitted to the export series. Of the two trend forms the one that best fits the actual export proceeds, in terms of the coefficient of determination (R^2) and significance of the regression coefficients, was retained for the computation of the instability index (see Table 2).

Table 2: Summary of Trend Estimates for Export Earnings

Dependent Variable (Export Earnings in thousands of Birr)	Constant	Time trend Coefficient	$R^2_{adjusted}$	D-W
Total	12.252	0.069 (5.03)***	0.381	1.32[a]
Coffee	11.75	0.064 (4.48)***	0.323	1.55[a]
Hides and Skins	9.88	0.078 (9.46)***	0.687	1.62[a]
Oilseeds	-24229.25 (LIN)	5180.55 (2.10)**	0.060	2.07[a]
Pulses	9.44	0.045 (1.41)	0.001	1.63[a]
Chat	7.24	0.132 (7.75)***	0.604	1.91[a]
Fruits & Vegetables	-7299.53 (LIN)	1263.27 (3.30)***	0.190	1.85[a]
Others	10.02	0.080 (5.18)***	0.395	1.31[a]

LIN indicates that the trend equation is linear. In all other cases it is exponential.

Figures in parentheses are t- values.

 *** statistically significant at 1 % level or better ; ** statistically significant at 5 % level.

 a - As the trend estimates by the method of Ordinary Least Squares manifested the presence of autocorrelation of the error terms, the Prais-Winsten transformation was applied in order to compute the respective coefficients.

Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

The results in Table 2 show that except for oilseeds and fruits and vegetables where the linear fit produced better results, in all other cases the exponential fit produced higher R^2 s and t values for the regression coefficients. It is important to note that the time path for pulses can be regarded as trendless since the fit of the equation is very

poor. For a more formal verification of the appropriate trend that best fits the actual data, it was found logical to compare, for pulses, the relatively better trend indicated in Table 2 with curves for actual export earnings and the one calculated using five year moving average method. A careful visual inspection of different curves for this commodity indicated that the five year moving average trend form provided by far the 'best fit'. It was noted, however, that in the process of averaging, four terms were lost (two in the beginning and two in the end). Moreover, in using moving averages one should be alert to the fact that the length of the chosen interval influences the degree of smoothing, and where it is small, the moving average tends to absorb some of the short term fluctuations possibly causing an underestimation of instability (Aggarwal, 1982; Love, 1987; Stein, 1977).

Love (1987) points out that the moving average is more strongly influenced by outlying observations than linear and exponential trends. As the moving average method has certain anomalies in measuring instability and as the objective of this study is to compare the degree of instability among different commodities, it was imperative to fit trends of the same form for export series of the different products, albeit, of course, that which best fit the data for most of them. For the computation of the instability indices, it is in practice necessary to keep uniformity in the trend estimation methods hence the trend form shown in Table 2 is used.

As already noted, in this study, export instability is considered to be an 'unpredictable' deviation over an observed time series with respect to its trend. Therefore, the export earnings time series were de-trended using the trend forms which provide the best fit for the time series (see Table 2). The de-trended data were used to compute the instability of export earnings presented in Table 3.

Table 3: Instability of Export Earnings (in percentage): 1964-2002

Instability of earnings from	Instability
Coffee	23.17(6)
Hides and Skins	21.44(7)
Oilseeds	48.66(1)
Pulses	46.60(2)
Chat	46.35(3)
Fruits &Vegetables	43.96(4)
Others	24.57(5)
Total Exports	16.30(8)

Note: Figures in parentheses indicate rankings by degree of instability

Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

As can be seen from Table 3, the instability of total export earnings in the period 1964-2002 was 16.3 percent. Given the fact that the instability index used in this study is constructed in such a way that the lower the instability, the lower will be the value of the index, with the value of zero indicating no instability, the results of this study suggest that the country has been experiencing considerable fluctuations in its export earnings over the study period. A review of the empirical literature on export earnings instability reveals that there is no as such a threshold instability level below which export earnings fluctuations are not harmful to the economy of a given country (Belay, 1997). However, for a country like Ethiopia that derives a substantial proportion of its foreign exchange earnings from the export of few primary products, instability in export earnings, no matter how low this could be, has adverse effects on the performance of the economy (Aiello, 2000; Belay, 1994; Love, 1975, 1987). It is, therefore, important to note that instability of export earnings has been a structural problem that the country has to live with and it calls for measures aimed at stabilizing earnings and/or attenuating the magnitude of instability.

Examination of rankings in Table 3 reveals that during the period 1964-2002, the fluctuations of total export earnings were lower than that of earnings from individual commodities. This can partly be explained by the fact that earnings form these products are affected by different demand and supply conditions. These conditions could engender either increasing or decreasing trends for export proceeds of the different commodities whereby fluctuations in earnings from these products could offset each other. The inter-commodity comparison of instability levels indicates that the commodities that suffered severe fluctuations in earnings, in descending order, were oilseeds, pulses, chat, fruits and vegetables, coffee, and hides and skins. The rankings indicate also that, with the exception of hides and skins, commodities which exhibited enormous volatility in export earnings over the study period were the ones with relatively smaller shares in total export earnings. These results point to the fact that the instability of the country's total export earnings depends on the nature of the exported products, their relative weight in total exports and the correlation among earnings from different products.

3.2   Contribution of the Principal Export Commodities to the Instability of Total Export Proceeds

During the period 1964-2002, the instability index for total export earnings was 16.3 % and the total weighted instability index was 26.86 % (Table 4). These results indicate that the instability in total export earnings is by far less than the weighted instability index. As export earnings from all commodities did not fluctuate at the

same time and in the same direction, the level of compensation between earnings instabilities from different commodities was 10.56 percent. In reality, had it not been for the compensations among fluctuations in export proceeds from different commodities, the total export instability would have increased by 65 %. During the same period, the level of instability in coffee export proceeds was 23.17 %. As this product accounted for 58.46 % of the total export earnings, its contribution to the instability in total exports was 50.41 %. Coffee's contribution to total instability is less than (by 8 points) its share in total export earnings. Hides and skins accounted for 9.53 % of the instability in total export earnings and their contribution was less than (by 2.4 points) their share in the total export earnings. As for oilseeds, pulses, chat, and fruits and vegetables, they have contributed respectively 9.86 %, 8.49 %, 6.48 % and 2.38 % to the total export fluctuations. These products contributed disproportionately to the fluctuations in total export earnings in that their contributions were greater than their respective shares in the total export revenues.

The results in Table 4 indicate that coffee accounted for 50.4 % of the instability in total export earnings over the period 1964-2002. The percentage contribution of coffee is quite significant and largely determines the degree of instability in total export earnings. Consequently, any attempt to stabilize Ethiopia's export proceeds should begin by stabilizing coffee export earnings.

Table 4: Contribution of the Major Export Commodities to the Instability of Total Export Earnings: 1964-2002

Export item	instability in export earnings	average share in total exports	Weighted instability index	percentage contribution
Coffee	23.17	58.46	13.54	50.41
Hides and Skins	21.44	11.94	2.56	9.53
Oilseeds	48.66	5.44	2.65	9.86
Pulses	46.60	4.90	2.28	8.49
Chat	46.35	3.75	1.74	6.48
Fruits & Vegetables	43.96	1.46	0.64	2.38
Others	24.57	14.04	3.45	12.84
Total	**16.3***	**100.00**	**26.86**	**100.00**

* This figure shows magnitude of instability of total export earnings
Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

It is to be noted that during the first four Lomé conventions (1975-1998), Ethiopia was one of the largest recipients of European Union's STABEX transfers, ranking in the

fourth place coming next to Côte d'Ivoire, Cameroon, and Senegal[17]. In the period 1975-1998, Ethiopia received a total of 311.8 million ECU in the form of STABEX transfers (Aiello, 2000). This represents 7.16 % of all the STABEX transfers made during the same period. In fact, the highest proportion of STABEX transfers was made to compensate for losses in export earnings from coffee. A study by Aiello (2000) reveals that the instability of Ethiopia's export earnings which was 21.4 percent over the period 1975-1998 fell to 20.8 percent as a result of STABEX transfers made over the same period. The findings of the study imply that STABEX transfers resulted in a 2.8 percent stabilizing effect on the instability of the country's export earnings over the study period.

In sum, Table 4 shows clearly that, over the 1964-2002 period, the major export items, with the exception of coffee and hides and skins, contributed more to fluctuations in total export earnings than their relative shares in total exports. More precisely, coffee and hides & skins had a stabilizing effect on the instability in total export earnings because their contributions were significantly lower than their respective shares in total export proceeds[18]. However, earnings from oilseeds, pulses, chat, and fruits and vegetables were unstable and amplified fluctuations in total export earnings.

3.3   Instability of Prices and Quantities

As variations in export earnings stem from variations in world market prices and volume of exports, it is necessary to examine whether instability in export proceeds is due principally to the fluctuations in prices or quantities exported. Following the methodology used in computing instability indices for export proceeds, deviations from the appropriate trends (see, appendix Tables A and B) are considered to compute instability in prices (unit values) and quantities of the major export items.

Table 5: Instability of Earnings, Unit Values and Quantities of Major Export Commodities in Percentage: 1964-2002

Export item	Instability in		
	Export earnings	Unit values	Quantities
Coffee	23.17	22.48	15.07
Hides and Skins	21.44	22.30	28.86
Oilseeds	48.66	18.25	85.21
Pulses	46.60	23.51	42.07
Chat	46.35	23.31	45.14
Fruits & Vegetables	43.96	20.35	26.69

Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

Table 5 reveals that, except for coffee, quantity fluctuations were higher than price fluctuations. This implies that much of the explanation for instability in export earnings is to be found on the supply side. More precisely, exported quantity varied significantly from year to year. One obvious reason for this phenomenon is that the country's export earnings are derived form few agricultural commodities and Ethiopian agriculture is highly weather dependent so much so that poor rains mean crop failure and famine. In addition to weather variability, factors such as pest attacks, disease infestations, utilization of poor quality seeds, post-harvest grain losses, etc. affect the total volume of production and quantity of exports. Another important reason for instability in export quantity is the domestic consumption of exportable commodities. Nearly all of Ethiopia's export products have strong domestic demand. For some items, such as oil seeds, vegetables and fruits and animal products the domestic market is the dominant outlet of supply. Given a fixed domestic consumption ratio (domestic consumption as a percentage of production), the exported quantity varies in relation to the volume of production (Belay, 1994). Export quantity variations can also result from the size and importance of illegal exports. Though exact figures about the volume of smuggling are difficult to find, there is an agreement in the literature that illegal exports from Ethiopia represent a considerable proportion of the exportable production (Belay, 1994). For instance, the Ethiopian government estimated the level of smuggling to be up to 25 percent of exports (TGE, 1992).

In the period under consideration, coffee suffered wide fluctuations in earnings due mostly to instability in the world market price, over which the country had no control. In this respect, the World Bank (2002) noted that Ethiopia's share of the world coffee market has been stable at less than two percent since the early 1980s. Available evidence reveals that coffee price volatility has been a common feature since 1989 (year of suspension of the International Coffee Agreement). It is also important to note that fluctuations in export earnings from coffee, pulses, chat, and fruits and vegetables were higher than the variations in their respective unit values and quantities. For oilseeds, the instability in export earnings was higher than that of their respective unit values but lower than that of their respective quantity. Whereas, fluctuations in export earnings from hides and skins were lower than that of their respective unit values and quantity.

3.3   Decomposition of fluctuations in export earnings

In the previous section the magnitudes of instability of unit values, quantities and export earnings were analyzed separately. In this section, fluctuations in export earnings are

decomposed into five components: price effect, quantity effect, combined effect of prices and quantities, compensations between fluctuations of quantities and prices from their respective trends, and a residual factor. The magnitude of export earnings instability depends on whether fluctuations in unit values and quantities from their respective trends are offsetting each other or move in the same direction. More precisely, if fluctuations of unit values and quantities from their respective trends move in opposite directions (offsetting fluctuations), then fluctuations in export earnings will be small and the resulting instability index will be relatively smaller. However, if fluctuations of unit values and quantities from their respective trends move in phases rather than offsetting each other, fluctuations in export earnings will be large and the resulting instability index will be relatively higher.

Table 6: Decomposition of Instability of Export Earnings in percentages (1964-2002)

Export items	Instability due to				
	Quantity variation	Price variation	Combined action of quantity & price variations	Compensation between price & quantity variations	Residual factor
Coffee	67.24	100.1	10.92	-78.08	-0.17
Hides and Skins	138.62	3	20.20	-135.26	-23.41
Oil seeds	76.30	99.91	7.30	-36.29	28.36
Pulses	157.92	24.35	-12.40	-62.88	-59.23
Chat	96.78	76.61	12.64	-64.14	5.50
Fruits & Vegetables	53.46	49.21	-1.11	-18.15	24.93
		40.88			

Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

Table 6 shows that with the exception of coffee, quantity effects dominated price effects. Coffee had larger unit value volatility than quantity volatility. In other words, during the study period, the quantity effect was the most significant determinant of export earnings volatility for all major export commodities except coffee. However, it should be noted that fluctuations of unit values and quantity from their respective trends have quite often moved in opposite directions thereby helping attenuate the amplitude of instability of export earnings. It should be recognized that the combined absolute actions of fluctuations of unit values and quantities (when they moved in the same directions or were not offsetting each other) were smaller than the levels of compensations between price and quantity variations for all the commodities considered. This is a clear indication of the fact that the magnitudes of instability in export earnings would have been higher

than their current levels in the absence of compensations between variations of unit values and quantity.

IV.   CONCLUSION

This paper has evaluated the magnitude of instability of export proceeds, prices and quantities of the major export commodities and has decomposed the instability of export proceeds from these commodities into their constituents. The levels of instability of export proceeds, prices and quantities were estimated using an index based on de-trended values of the time series. The results of the study indicate that for the major export commodities, except for coffee, fluctuations in quantity of exports were the major sources of earnings instability. Given the fact that exports are dominated by few agricultural products and the inherent uncertainties associated with the production of these products, the findings of this study point to the fact that the country must diversify its exports in terms of both products and markets. This is precisely because concentration on a few agricultural products, whose production level depends for the most part on factors beyond the control of producers, reduces the country's chances of having fluctuations in one direction in some of its exports offset by counter fluctuations in others.

The efforts, which have been made since the late 1980s, to diversify exports into the non-traditional products, such as flowers, clothing, leather products are encouraging signs. However, it must be pointed out that the markets for these products are intensely competitive both in price and quantity terms. Moreover, the products are facing trade barriers that limit the nation's ability to export. Be that as it may, in the Ethiopian context, the diversification of exports into non-traditional products would call for, among others, creating an enabling environment for the private sector to invest in the production and processing of non-traditional export products; strengthening domestic supply capability through technological upgrading and infrastructure development; and organising efficient input, output, and financial marketing systems.

It is also important to note that Ethiopia's export structure is characterized by high degree of geographical concentration. In other words, the major export markets are some countries in Europe, USA and Asia where the demand for the country's traditional exports is growing very slowly. This geographical concentration serves as a mechanism for the transmission of recession from the major trading partners to Ethiopia. Given this state of affairs, increasing trade with other countries in the

Eastern and Southern African region might help to stabilize earnings. Available evidence shows that over the period 1990-1999, the country exported, on average, about 11 percent of its total exports to other African countries, which was higher than the African average of about 9 percent (ADB, 2002). The same source shows that, over the same period, imports from African countries accounted for about 5 percent of the total imports, which was lower than the African average of about 10 percent. Ethiopia is currently a member of the Common Market for Eastern and Southern Africa (COMESA) and of the Inter-Governmental Authority on Development (IGAD). However, the performance of these regional organizations is not as expected. Some of the factors which explain their poor performances are: poor regional transport infrastructure, most of the countries in the region export the same products; mistrust of regional partners; lack of information about regional markets; and high cost and low quality of regional goods. Consequently, concerted efforts should be made, by all concerned, to alleviate these problems and make regional trade an engine for development.

NOTES

1. See, for example, Belay (1994), Dawe (1996), Demeocq and Guillaumont (1984), and Lancieri (1978).
2. See, for example, Aiello (2000), Belay (1994, 1997), Coppock (1977), Lancieri (1978), Love (1985, 1992), Massell (1970) and Savvides (1984).
3. Average prices (unit values) of the different commodities were computed by dividing export earnings by quantity of exports.
4. For a detailed discussion of the different instability indices, see Love (1987); Demeocq and Guillaumont (1983).
5. For a description of the inconvenience of *a priori* choice of the form of the trend, see Tan (1983).
6. The Average Absolute Deviation Instability index (AAD) is computed by using the following formula:

$$AAD = \frac{100\!\!\!\big/_{\!\!n} \sum\limits_{i=1}^{n} \left\| X_t - \hat{X}_t \right\|}{\hat{X}_t}$$

Where: X and $\hat{X}$ are the actual and trend values in period t,
n is the number of years considered in the study.

7. While earlier studies measured the relative share of individual commodities in the total export earnings of a country by dividing the average export value of the individual commodities by the average total export earnings of the country over the entire study period, in this study it is computed with slight modifications. More precisely, it is computed in two steps. In the first step, the annual export earnings of individual commodities are divided by the total

annual export earnings of the country. In the second step, the mean values of the relative share of individual commodities are computed by dividing the sum of the results obtained in step one by the total number of years covered in the study

8. On the method for decomposing instability of export earnings, we have drawn heavily from Guillaumont (1982).

9. To be more exact, it should be written as:

$$\frac{\Delta X}{X} = \frac{\Delta Q_X}{Q_X} + \frac{\Delta P_X}{P_X} + \frac{\Delta Q_X}{Q_X} \cdot \frac{\Delta P_X}{P_X}$$

and four factors (not three) should be distinguished relative to the variation in export earnings X, the additional factor being more or less equal to the absolute value of the combined effect of price and quantity variations :

$$\left| \left(\Delta Q_X / Q_X \right) \cdot \left(\Delta P_X / P_X \right) \right|$$

10. If Y < 0, the following values of C will obtained:
     A + B > 0, A > 0, B < 0 : C = 2B + 2Y
     A + B > 0, A < 0, B > 0 : C = 2A + 2Y
     A + B < 0, A > 0, B < 0 : C = -2A - 2Y
     A + B < 0, A < 0, B > 0 : C = -2B - 2Y

    In all the cases C < 0, but the absolute value of C is increased by Y in the first two cases and is decreased by Y in the last two cases.

    We can also write:
    $$C = -2|A + Y| \ \ \text{if} \ \ |A| < |B|$$
    $$C = -2|B + Y| \ \ \text{if} \ \ |A| > |B|$$

11. Birr is the Ethiopian national currency. Between February 15, 1973 and September 30, 1992, the birr had been pegged to the US dollar at the rate of 1 US = 2.07 birr. The Transitional Government of Ethiopia devalued the birr in September 1992 and fixed the exchange rate at 1 US = 5 birr. Currently, the exchange rate is determined by inter-bank exchange of currencies and it is around 1 US = 8.8 Birr.

12. Computed by fitting exponential trend forms to the time-series in National Bank of Ethiopia, Quarterly Bulletin, various issues. The regression coefficients are significant at less than 1 percent significance level.
13. The diversification index measures the extent to which exports are diversified. It is constructed as the inverse of a Herfindahl index, using the disaggregated exports at 4 digits (following the SITC 3). A higher index indicates more export diversification.
14. Chat (C*atha edulis*) is a natural stimulant plant, which reaches heights from 3 to 7 meters. Fresh chat leaves, which are typically chewed like tobacco, produce a mild cocaine- or amphetamine-like euphoria that is less potent than either substance. Chat is widely used in eastern and southern parts of the country. It is also exported to Djibouti and Somalia.
15. For more information on the effects of commodity concentration, see, among others, Belay (1994), Knudsen and Parnes (1975), Massell (1970), MacBean and Nguyen (1987) and Sheehey (1977).
16. Rate computed by fitting exponential trend form to the yearly percentage shares. The regression coefficient is significant at less than 1 percent significance level. The result is available from the author on request.
17. STABEX is a facility that compensates for lost export earnings caused by fluctuations in world prices for and/or volumes of basic agricultural commodities. Only ACP countries (African, Caribbean and Pacific states signatories of the Lomé convention) are beneficiaries of STABEX.
18. This does not, however, mean that the country should concentrate on the production and export of Coffee and Hides & Skins. Rather, the implication is that, had it not been for these two commodities, the instability of total export earnings would have been higher than its computed value of 16.3 %.

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Appendix Table A: Summary of Trend Estimates for Unit Values of Major Export Commodities

Dependent Variable (unit values in thousands of Birr)	Constant	Time trend Coefficient	$R^2_{adjusted}$	D-W
Coffee	0.606	0.057 (5.19)***	0.397	1.81[a]
Hides and Skins	0.402	0.092 (25.32)***	0.944	1.94
Oilseeds	-1.132	0.072 (9.61)***	0.704	1.90[a]
Pulses	-1.565	0.072 (15.96)***	0.870	1.61
Chat	0.442	0.092 (7.72)***	0.603	1.99[a]
Fruits & Vegetables	-1.599	0.059 (7.40)***	0.581	1.97[a]

LIN indicates that the trend equation is linear. In all other cases it is exponential.
Figures in parentheses are t- values.
*** statistically significant at 1 % level or better.
 a - As the trend estimates by the method of Ordinary Least Squares manifested the presence of autocorrelation of the error terms, the Prais-Winsten transformation was applied in order to compute the respective coefficients.
Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.

Appendix Table B: Summary of Trend Estimates for Quantity of Major Export Commodities

Dependent Variable (Export quantities in metric tons)	Constant	Time trend Coefficient	$R^2_{adjusted}$	D-W
Coffee	67540.32 (LIN)	764.40 (1.99)*	0.05	1.99[a]
Hides and Skins	9.49	-0.014 (2.83)***	0.156	1.82
Oilseeds	10.70	-0.030 (0.71)	0.0001	1.62[a]
Pulses	70040.14 (LIN)	-981.32 (1.14)	0.001	1.73[a]
Chat	6.83	0.039 (2.58)**	0.109	1.77[a]
Fruits & Vegetables	20348.37 (LIN)	-145.28 (0.76)	0.0001	2.12[a]

LIN indicates that the trend equation is linear. In all other cases it is exponential.
Figures in parentheses are t- values.
*** statistically significant at 1 % level or better; ** statistically significant at 5 % level; * statistically significant at 10 % level.
 a - As the trend estimates by the method of Ordinary Least Squares manifested the presence of autocorrelation of the error terms, the Prais-Winsten transformation was applied in order to compute the respective coefficients.
Source: Computed from data in National Bank of Ethiopia, Quarterly Bulletin, various issues.