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Export fluctuation Earnings in Sudan: Causes and Consequences) *(1970-1987)*

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ABSTRACT*:*

This study analyses the causes of export instability and its possible consequences on Sudan's export sector and the economy as a whole, for period 1970-1987. A single country approach is used, and time series analysis is applied. The instability of export quantity and unit value with their effect on total export value was considered. Sudan's export is mainly agricultural raw materials. The conventional factors of exporting primary goods, commodity and geographical concentration are thought to be the main factors contributing to export instability. The statistical measures used in this study were: regression analysis to examine the relationship between the two forms of concentration and export instability, and domestic consequences of instability in Sudan. Instability indices, to determine the relationship between total export proceeds and quantity and unit value. Variance/ co-variance, to determine the relationship between export earnings instability and supply and/or demand shifts. Producer prices index and border prices index ratio, to test the efficiency of marketing boards to stabilize the producer prices in Sudan. Gini- coefficient index to determine the concentration of the commodity and geographical, throughout the period under investigation. The findings of the study show that primary commodity exporting, commodity concentration, and supply shifts induced instability in Sudan's export and that marketing boards have not succeeded to stabilize producer prices for most of the export commodities. Domestic consequences of instability in Sudan have clear negative impact on agricultural share in the GDP and government revenue. From the results obtained above the study suggested that primary products should be processed before export, more diversification of the commodities exported and gradual change of marketing boards into private companies.

Keywords: *Instability, Time series Analysis, Regression Analysis, Variance/Covariance, Gini-oefficient,GDP,and Supply and/or Demand Shifts.*

I. INTRODUCTION

The study of export earnings instability, its causes and possible impact on economic growth of developing countries have received much discussion in last decades, and the concern for it revived in recent years. The export sector in most developing countries is of high importance to their development; since export receipts provide most of the foreign exchange needed for imports such as skills, strategic goods and services. Early studies of export fluctuation, for instance, Coppock (1962), Michaely (1962), and Macbean (1966), have related the level of fluctuation to characteristics of the developing countries such as commodity concentration and

geographical concentration of exports. Erb and Schiavo and Campo (1969) argued that export fluctuation constitutes an obstacle to developing countries' economic planning and growth. Whereas Macbean (1969) argued that there is little or no empirical support to this contention.However, the topic of export instability in developing countries is still very much alive and relevant since it is concerned with the trends and fluctuations in prices and proceeds of commodities they export. Studies on the sources of export instability have generally taken two main approaches.In the first approach, Massell (1970), tried to draw inferences about the relative importance of domestic and foreign factors in generating export instability by regression analysis, using explanatory variables such as food ratio, raw materials ratio, commodity and geographical concentration, value of export share and per capita income. Also Naya (1973) and Soutar (1977) adopted a similar approach to that of Massell. Massell, however, did not present a formal model showing explicitly export instability is generated.In the second approach, Murray (1978), examined the correlation between aggregate export price and quantity indices. A positive correlation is obtained if export instability is generated by foreign disturbances while a negative correlation is obtained if export instability is caused by supply disturbances. The objective of this study is to analyze the causes and consequences of export instability in Sudan. The study uses time series analysis for period from 1970 to 1987, to investigate this problem from empirical point of view using the two approaches described above.

(i) Vulnerability of the Sudanese Economy to Export Instability: Sudan is a low income developing country with nearly 80% of its population engaged in agricultural activities. Over 90% of Sudan's exports are agricultural raw products. But dependency of Sudan's economy on foreign trade is not as great as might be expected. The export sector accounts for only small share of the total gross domestic product (GDP), (9.3%) Hag Elamin (1987. In spite of this, foreign trade sector remains crucial as taxes on foreign trade constitute about 45% of the central government revenue in the period from 1970 to 1987. Empirical evidence, with a few exceptions, supports the above statement (Massell, 1970). In an attempt to contribute to the debate on this issue, this study investigates causes and consequences of export instability in developing countries with special reference to Sudan. Export instability and its causes and/or consequences have been an issue of long and continuous debate in the field of foreign trade, for both developed and developing countries, but the economics of developing countries are believed to be much vulnerable to export instability. Thus, in the case of Sudan, the expectation is that the fluctuations in export earnings will create negative impact on export sector, because over 90% of Sudan's exports are agricultural raw materials with declining terms of trade over period 1970 - 1987. This study explores the level, causes and effect of export instability in Sudan.

(ii) Objectives of the Study: The general objective of this study is to investigate the level, causes and consequences of export instability in Sudan for the period 1970 – 1987. The specific objectives include:(1)Measuring the degree of export instability in Sudan over the period 1970-1987. (2)Investigating the causes of fluctuations in Sudan's export proceeds with special reference to the major export commodities.(3) Assessing the impact of export instability on economic growth of the Sudanese's economy

(iii) Hypothesis: There are two main hypotheses to be tested in this study, these are:(1) Fluctuations in Sudan's export earnings result mainly from:(a)Exporting primary commodities. (b) Commodity and geographical concentrations .(2) Fluctuations in total export earnings of merchandise commodities have an adverse effect on Sudanese's export sector.

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II. METHODOLOGY AND DATA COLLECTION

To accomplish the objectives listed above, data on Sudan's export for the period from 1970 – 1987 was collected from various sources: locally and internationally. The following statistical measures were used in the analysis: (1)Instability indices: to measure the extent of export instability in Sudan's export. (2)Regression analysis: was used to measure the impact of export earnings fluctuations on the export sector and the rest of the economy. (3) Variance and co-variance: to determine the major causes of fluctuations in export earnings in terms of supply and / or demand shifts. (4) The ratio of the instability index for producer prices to the instability index of border price; to determine the efficiency of Sudan's marketing boards in stabilizing producer prices. Sudan's export fall mainly under primary products category, namely; cotton, gum Arabic, sesame, groundnut, Dura, sheep/lams, and cattle. The main sources of data include: Bank of Sudan, Department of Statistics, Ministry of Finance, Department of Agricultural Economic and Statistics Division, Ministry of Agriculture, the International Monetary Fund (IMF), International Financial Statistics (IFS), and United Nations Conference on Trade and Development (UNCTAD). Export data used included only merchandised export and I did not include services.

The Major Sudan's Export Commodities (1970- 1987): Sudan's major export commodities are; long and medium staple cotton, gum Arabic, sesame, and groundnuts. Furthermore, almost all Sudan's exports are annual agricultural commodities. Therefore, it is important that, the supply and/or demand conditions and share in total export value for each of these major commodities should be considered.

Cotton: The long staple cotton constitutes the bulk of Sudan's cotton followed by medium-staple-cotton. For the period under investigation, long-staple cotton constituted about 47% of total Sudan's exports and accounted for 30-35% of the world total exports of long-staple cotton (Table 1). For other types of cotton, Sudan is very minor producer in the world market.Table (1) shows the value of cotton exports relative to total export for the period 1970-1987. It is clear that cotton exports receipts constituted the bulk of the total export proceeds with an average contribution of 41.5% for the period under investigation. It can be seen that cotton proceeds and share were simultaneously declining and fluctuating over time.Long-staple cotton in Gezira Scheme (including the Managil Extension) is grown mainly under irrigation. The Gezira Scheme experience increasing difficulties of labor shortages. Cotton picking needs 50 man-days per feddan while 20-30 man-days are needed for post-harvest operations (Beshi,1967). Previous estimates of cotton supply have shown that cotton supply, like other agricultural crops, is inelastic (Medani, 1970; Hag Elamin, 1990). The short term supply elasticity of Sudan's cotton export has been shown to be less than unity (Hussein and Thirlwall, 1984; Hag Elamin, 1993)

Table 1

Cotton export value, volume and share in total
Export value of the long-staple cotton (1970-1987)
(Values in Millions Sudanese pounds and volume in thousand bales)

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Year	Value	Volume	Share %
1970	55.1	1090.2	70.6
1971	63.2	1240.1	69.2
1972	68.0	1138.8	68.0
1973	68.0	1017.1	68.0
1974	36.8	305.5	36.8
1975	51.6	632.7	51.6
1976	60.2	811.4	60.2
1977	59.2	730.0	59.2
1978	52.5	473.5	52.5
1979	63.1	531.3	63.1
1980	41.9	354.7	41.9
1981	17.9	199.2	17.9
1982	22.0	278.0	22.0
1983	43.8	620.9	43.8
1984	50.5	483.5	50.5
1985	44.1	274.1	44.1
1986	38.5	249.1	38.5
1987	25.1	377.4	25.1

Source: Bank of Sudan Annual Report (1970-1989)

Gum-Arabic: Sudan is the largest supplier of gum-Arabic, exporting more than 80% of the world export (Beshi, 1984). Gum- Arabic is produced under rain fed conditions. The important tree that supplies gum is Hashab (AcaciaSenegal). The weather conditions and local purchase prices are the main factors which influence its level of production (Beshi, 1984; Hag Elamin, 1993). The deterioration in gum-Arabic production was due to the unfavorable weather conditions, infestation of locusts, shortage of labor combined with haphazard cutting of trees for purpose of firewood and charcoal making during theperiod 1970-1987. Gum-Arabic is marketed by gum-Arabic company(GAC) which was established in 1969 as a public entity. The (GAC) guaranteed a floor price to the producers with the objective of encourage gum collections. Gum production is expected to highly responsive to price changes. However, the failure of (GAC) to fulfill its main role resulted in the reduction of gum-Arabic supply.The share of gum-Arabic in total exports earnings was relatively constant as compared with the cotton pattern throughout the period 1970-1987, though, it had slightly declined in volume seeTable2.Although the export quantities were declining, due to the reduction in production resulted from unfavorable weather conditions; the export value of gum-Arabic was increasing steadily since 1970. It ranked second to cotton and contributed about 12% of total export earnings for the period 1970-1987.

Table 2.

Export values, volume and share in total export of gum-Arabic (1970-1987)
(values in Million Sudanese pounds, and volume in thousand metric ton)

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Year	Value	Volume	Share %
1970	8.7	56.3	11.1
1971	2.7	37.3	8.4
1972	8.7	35.5	9.1
1973	7.0	30.0	6.5
1974	14.2	20.0	15.6
1975	7.4	14.8	6.3
1976	11.0	24.8	7.9
1977	13.0	29.8	7.7
1978	14.0	33.2	10.3
1979	18.2	42.5	12.3
1980	17.6	30.2	9.5
1981	33.9	27.6	13.0
1982	38.3	27.6	10.7
1983	73.1	38.4	13.44
1984	64.1	35.7	10.83
1985	47.6	14.2	8.14
1986	122.3	17.1	28.0
1987	254.9	16.7	27.8

Source: Bank of Sudan Annual report (1970-1987)

Sesame: Sesame in Sudan is produced mainly under rain fed farming in Gedaref, Damazin, Kordofan and Darfur areas by both mechanized and traditional sub-sectors. It is worth mentioning that due to iys relatively rising production costs, farmers in traditional rain fed areas shift cultivation from sesame to other crops. Table 3 shows sesame export value, volume, and share in total export for period 1970-1987. Although volume of sesame declined during the period 1970-1987; it came third after cotton and gum-Arabic in terms of its contribution in total export proceeds. On average, sesame accounted for about 11.7% of total export proceeds in the period 1970-1987. The share of sesame increased considerably in the period under study.

Table 3:

Sesame Export Values, Volume and share inTotal export Value (1970 – 1987)
(value in million sudanese pounds , volume in thousand metric ton)

Year	Value	Volume	Share %
1970	6.5	83.7	8.3
1971	8.0	84.4	8.8
1972	9.2	83.1	9.9
1973	10.7	101.9	18.1
1974	16.5	83.5	1.6
1975	11.5	56.6	12.5
1976	17.3	88.8	10.8
1977	18.3	93.0	14.2

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1978	19.2	76.0	4.2
1979	6.3	16.0	13.4
1980	24.9	57.2	13.5
1981	35.3	58.7	13.0
1982	38.2	60.8	10.7
1983	70.2	66.1	12.9
1984	98.2	82.3	16.59
1985	97.8	17.5	16.72
1986	58.9	29.1	13.5
1987	134.8	60.6	14.7

Source: Bank of Sudan Annual Report (1970-1987)

Groundnuts: In sudan it is produced under irrigated agricuitral sub-sector (Gezira and Rahad) as well as traditional rain fed agricultural sub-sector (South Darfur and North Kordofan). Table 4 shows that groundnut export value, volume , and share in total export proceeds during the period 1970-1987. Due to prevalance of unfavourable weather conditions, failure of oil seeds company (OSC) to fulfilits role i.e to stablize oil seeds producers price, shortage of irrigation water, shortage of harvest labor,pests and diseases groundnuts production drastically declined during the period under investigation. In fact the volume dropped from [115.1] in 1971 to [7.3] in 1987.Groundnut came fourth after cotton , gum-Arabic, and sesame in terms of its contribution on total export proceeds. On average, groundnut accounted for about 11.5% of total export proceed in the period 1970-1987. The export proceeds of groundnut have fluctuated considerably during that period.

Table 4:

groundnuts Export Value, Volume, and Share in total Export Value (1970-1987)
(value in Million sudanese pounds, volume in thousands metric ton)

Year	Value	Volume	Share %
1970	5.5	65.9	7.0
1971	9.3	115.1	10.2
1972	9.7	116.8	10.2
1973	13.0	138.4	12.0
1974	18.2	99.1	19.9
1975	34.4	205.0	29.3
1976	39.0	282.0	28.1
1977	28.8	143.8	17.0
1978	20.7	97.2	15.3
1979	10.0	37.4	6.7
1980	5.9	22.1	3.2
1981	66.5	94.3	25.5
1982	33.2	89.0	9.3
1983	16.9	18.0	3.03

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1984	**26.8**	**22.5**	**4.53**
1985	**23.2**	**13.3**	**3.97**
1986	**2.5**	**1.1**	**0.6**
1987	**10.1**	**7.3**	**1.1**

Source: Bank of Sudan Annual Report (1970-1987)

III RESULTS AND DISCUSION

Causes of Export Instability in Sudan: In this section the attempt is to measure the instability in Sudan's export for the period 1970- 1987 and to investigate its main causes. For purposes of comparison the total period is decom[osed into two sub-peiods: 1970- 78 and 1879- 87. The study will estimate the magnitude of instability in export value, quantity and unit value in terms of indices.

Computation of Instability Index: In computing an export instability index, it is important to estimate the trend and averaging thedeviations from it. In measuring export instability as average deviation from a trend, two obstacles arise in computation of the instability idex. These iclude: (1)The selection of a suitable trend.(2)The choice of the appropriate measure of average deviations from that trend. Generally, there are two methods of measuring the average deviations from a trend. These are:(a)The mean absolute deviation (MAD), which takes the average of all percentage deviations from a trend in absolute terms. (b)The root average of the squared percentage deviations.

It was found that instability measured by using the root deviations index method was quite higher than that measured using the mean absolute deviations method (Hag Elamin, 1987). With regard to the trend, there are two methods that are commonly used:(1) The moving average method (MAM). (2)The least square method (LSM).The moving average method (MAM) sometimes gives smaller indices than the least square method (Hag Elamin, 1987). This is due to the inherent characteristics of the moving average trend method; in that it tends to absorb part of the short-run fluctuation causing an underestimation of instability. Moreover, the moving average may not be indicative of the long-run fluctuations. Index of the average absolute values of percentage deviations from trend is defined as:

$$U_{it} = \frac{1}{n}\sum_{i=1}^{n} |x_{it} - \hat{x}_{it}| / \hat{x}_{it}$$

$i = 1, 2, 3, \ldots, n$

square percentage deviations from a trend is defined as:

$$U_{it} = \sqrt{\frac{1}{n}\sum_{i=1}^{n} |x_{it} - \hat{x}_{it}| / \hat{x}_{it}}$$

$i = 1$

where;

U_{it} = The percentage deviation i.e instability index.

x_{it}= price (quantity, value ,etc.) of commodity i at time (t)

$\hat{x}_{it}$= price (quantity, value, etc.) trend of commodity i at time (t)

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Instability in Total export earnings: Using the average absolute values of percentage deviations for trend, instability indices of total export values, quantity (volume) and unit value (price) were estimated for the periods 1970-78 and 1979-87. Besides, the instability indices for the unit value and quantity for Sudan main export commodities are estimated.

For the first period (1970-78) total proceeds fluctuations were lower than either quantum and unit value fluctuations, implying that some offsetting changes in unit value and quantum variables. Fluctuations in quantity and unit value are almost of the same magnitude. In the second period (1979-87) quantum fluctuations is much pronounced than in either total export proceeds or unit value. Unit value is much stable. This implies that fluctuations in total export proceedsare mainly due to the fluctuations in quantity. As shown Table 13, the total instability indices of total export proceeds and quantity are higher in the second period (1979-87) , than in the first period (1970-78), but unit value exports recorded a relatively higher instability index in the first than in the second period. As mention before, the instability index of total proceeds for the period 1970-78 was much smaller than either quantity or unit value instability indices. This implies that instability of total export proceeds was partly stabilized by offsetting movements in unit value and quantity. The results, in Table 13 suggest that instability index of both total proceeds and total quantity increased between 1970/78-79/87, while instability of export unit value decreased.

Table 5:
Total Export Instability Indices for Two periods

	1970-78	1979-87
Total proceeds	**7.79**	**14.54**
Quantity	**14.72**	**18.89**
Unit value	**16.08**	**3.96**

Source: Computations are based on data obtained from Bank of Sudan Annual Report (Various Years)

Instability in Cotton Exports: Cotton is the largest export commodity in Sudan. It accounts for about 50% of total export proceeds (average for 1970-1987). Cotton , therefore, plays a greater role in determining the level of instability in total export proceeds. Cotton in Sudan is grown under three well defined methods: (1) Artificial irrigation.(2) Rain land cultivation.(3)Flood land cultivation.The dominant variety growing in Sudan is the long-staple cotton which is grown primarily under artificial irrigation. It accounts for about 47% of total Sudan exports and accounts for about 30-35% of world total exports of that variety.Findings show that in both periods (1970-78 and 1979-87) units values are less unstable than quantum and export proceeds seem to have been caused mainly fluctuations in quantities. Since cotton constitutes the bulk of export earnings, therefore, it is expected to have a dominant impact in total earnings instability. Paradoxically,total earnings instability as shwon before, is far morestable than cotton export proceeds. This indicates that the high fluctuations in cotton proceeds were offset by opposite movement in other export commodities proceeds. Many reasons could be advance to explain these fluctuations in cotton proceeds. Incidence of pests and diseases, irrigation water shortages, shocks in world demand for cotton, are among the main factors that affect cotton proceeds over the period investigated. This means both supply and demand factors had played a role in the resultant and fluctuations. See Table 6 below:

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Table 6:
Cotton Export Instability, 1970-78 and 1979-87

	1970-78	1979-87
Export proceeds	**16.9**	**35.6**
Quantity	**19.9**	**31.0**
Unit value	**11.3**	**20.5**

Source: Computations are based on data obtained from Bank of Sudan annual reports (Various Years).

Instability in Other Export Commodities: Table 7 shows the instability indices of proceeds, quantity and unit value for two periods for the rest of the major export commodities. From Table 15, it is obvious that, with a few exceptions, fluctuations in export proceeds, quantity and unit value in the period 1979-87 were far higher than those in the period 1970-78. Sorghum, sheep/lambs and cattle seem to be least stable for both periods. Gum-Arabic, groundnuts and sesame recorded the lowest instability index for the period 1970-78 and the highest for the period 1979-87. It is clear that, fluctuations in individual commodity exports are more than those in total export proceeds.

Table 7
Instability Indices of Proceeds, Quantity and Unit Value for Two Periods

	1970-78			1979-87		
commodity	**proceeds**	**quantity**	**Unit value**	**proceeds**	**quantity**	**Unit value**
Gum-arabic	**15.5**	**25.2**	**26.3**	**14.8**	**23.7**	**46.8**
sesame	**16.0**	**9.7**	**15.1**	**19.5**	**39.9**	**96.3**
groundnuts	**23.9**	**27.9**	**15.3**	**107.7**	**57.7**	**90.3**
sorghum	**28.2**	**40.6**	**88.5**	**68.3**	**56.0**	**7.7**
Sheep/lambs	**46.2**	**36.0**	**15.8**	**43.4**	**40.3**	**26.4**
cattle	**41.8**	**46.2**	**8.6**	**37.2**	**26.3**	**34.5**

Source: Computations are based on data obatined from Bank of Sudan Annual Reports (Various Years)

Export Concentration: Conventionally commodity concentration and geographical concentration are thought to be common factors contributing to instability in export earning of developing countries. The concentration of exports on only a few commodities is often thought to be an important cause of export fluctuations. Because concentration on a few products reduces the country's chances of having fluctuations in one direction in some of its exports offset by others (MacBean, 1966). Similar is advanced with respect to geographical concentration. Massell argues that, high geographical concentration is likely to imply greater reliance on economic conditions is one or a few trading parteners. Fluctuations in demand in any recipient country will then have a more pronounced effect on recipts of the exporting country, than if recipts were diversified among recipients (massell, 1970).Empirical analysis by many authors, however, have shown little association between form of concentration and export instability. Coppock (1962), Massell (1964), MacBean (1966), found negative association between geographical concentration and export fluctuations. On the other hand, Massell (1970), Naya (1973). Khalaf (1974), Kingston (1967), have found geographical concentration to be insignificant as an

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explanatory variable of export fluctuations. With regard to the relationship betweencommodity concentration and export fluctuations onlyMassell (1970) found a significant association.The weakness or the absence of any significant association between commodity concentration and the fluctuations of total export earnings has often been attributed to three factors: (1) Export earnings from individual commodities often tend to move in phase.(2) Developing countries with high commodity concentration in their exports often tend to specialize on commodities those whose earnings are relatively stable.(3) The wide dispersion of the degree of fluctuations of the earnings of individual commodities.The association between the degree of fluctuations of country's total export earnings and its commodity concentration is weaker, the greater is the dispersion of the degrees of fluctuations of its individual export earnings (MacBean, 1980).

Measurement of Commodity Concentration Index: We use the Gini-Coefficiet, which defined as:

$Ci = \sum(x_i/x)^2$

Ci = commodity concentration coefficient index;

x_i = the value of export commodity (i) in some specified year; and

x = summation of the values of exports commodities (i_s) in some specified years.

The closer Ci is to one the greater degree of concentration and conversely the closer to zero the greater the degree of diversification.The Gini-Coefficient for Sudan exports for the years from 1970 to 1987 are presented in the Table 8: below. The concentration index shows more or less a decreasing trend over time which implies that Sudan's exports were gradually becoming a bit diversified.

Table 8
Commodity Concentratio Index in Sudan, 1970-1987

Year	*Ci*	Year	*Ci*
1970	**0.640**	**1979**	**0.679**
1971	**0.639**	**1980**	**0.561**
1972	**0.621**	**1981**	**0.489**
1973	**0.600**	**1982**	**0.567**
1974	**0.481**	**1983**	**0.639**
1975	**0.545**	**1984**	**0.615**
1976	**0.569**	**1985**	**0.216**
1977	**0.609**	**1986**	**0.586**
1978	**0.571**	**1987**	**0.515**

Sourc: Calculated from data collected from Bank of Sudan Annual report (Various Years)

Measurement of Geographical Concentration Index: The Gini-Coefficient is also used to measure geographical concentration index, which is defined as:

$G_i = \sqrt{\sum_{i=1}^{n} C_i^2}$

$i = 1$

where;

G_i = Geographical concentration index

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C_i = the share of each country (*i*) in exports in a given year

n = the number of customer countries for each year.

The coefficient of geographical concentration decreased slowly over 1981-86, indicating that there has been some diversification in export markets, see Table 9, below:

Table 9
Geographical Concentration in Index in Sudan, 1970-1987

Year	G_i	Year	G_i
1970	**0.640**	**1979**	**0.679**
1971	**0.639**	**1980**	**0.561**
1972	**0.621**	**1981**	**0.489**
1973	**0.600**	**1982**	**0.567**
1974	**0.481**	**1983**	**0.639**
1975	**0.545**	**1984**	**0.615**
1976	**0.569**	**1985**	**0.216**
1977	**0.609**	**1986**	**0.586**
1978	**0.571**	**1987**	**0.515**

Sourc: Calculated from data collected from Bank of Sudan Annual report (Various Years)

The Relationship Between Deviations of Real Export:

Earnings from Trend and Export Concentration: This section attempts to examine the relationship between export concentration and export instability in Sudan. There are several *a priori* reasons which suggest a positive relationship between export concentration (both commodity and geographical) and export earnings instability.The relationship between export earnings instability and export concentration is examined using the following equation:

$$X_E = a_0 + a_1 C_i + a_2 G_i + T$$

Where;

X_E = Deviation of export earnings from trend

C_i = Commodity concentration index

G_i = Geographical concentration index

T= Time (years)

$a_0, a_1, \& a_2$= Constants

Regression X_E on C_i and G_i and T yield the following results:

$$X_E = 3.63 + 0.0251 C_i - 0.0263 G_i - 0.216\ T$$

(1.37) (1.86) (- 0.83) (- 5.35)

R^2 = 81.3% (value in percentage are *t-ratio* of particular coeficient) C_i and G_i coeficients are not significant at 2% level of significance, but C_i coeficient is positive.

C_i = 0.5498

The equation above yield postive coeficients between X_E and C_i but geographical coeficient is negative. R^2 shows that commodity and geographical concentration together explain about 55%

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of the variation in export earnings over the period 1970-1987. As indicated by R^2, the overall fit the model is good. Geographical concentration does not appear to be an important source of export instability.

Commodity concentration on the other hand, has an important influence on instability of export proceeds. This result could mean that policies that often aimed at increasing the diversity of export may have succeeded in reducing instability of export proceeds.

Supply and Demand Shifts and Export Earning Instability: Among the causes said to give rise to excessive fluctuations in developing countries export earnings are low price elasticities of export commodities and their tendency to experience sharp shifts in supply and/or demand.The reasons for price instability are large shifts in supply and demand; and lowprice elasticities of supply and demand contribute to earnings instability only to the extent that price elasticity departs from unity. This is because supply shifts cause oppsite movements in price and quantity, while demand shifts cause movements both in price and quantity in the same direction.

Causes of Prices Instability in Sudan Export: Sudan is a developing country with its exports dominated by agricultural products. Thus, one can assume its exports to have the following characteristics:(1) Supply and demand for Sudan's exports are relatively inelastic.(2) Large changes in supply of agricultural primary commodity exports is indirect response to the violent changes in production due to changes in prices of inputs, frequent incidence o pests, diseases and sporadic changes in weather conditions. Export supply is the difference between domestic production and domestic consumption plus change in stock, which can be expressed as:

ES = DP- [DC+CS]
Where;
ES = Export supply
DP = Domestic production
DC = Domestic consumption
CS = Change in stock

The short-run supply and demand price elasticities of Sudan's major export commodities, as estimated byHussein (1984) and Hag elamin (1993) are presented in the following table 10.

Table 10
Supply and Demand Elasticity

	Supply Elasticity		Demand Elasticity	
	Hussein	Hag Elamin	Hussein	Hag Elamin
Total export	0.49	-	-0.58	-
cotton	0.51	-	0.58	-
-Long -staple	-	0.12	-	-0.65
-Medium-staple	-	0.57	-	-
Gum-Arabic	0.32	0.07	-0.65	-0.52
Sesame	-0.91	0.28	-0.72	-1.08
Groundnuts	0.38	0.24	-0.38	-

Source: Hussein (1984), Hag Elamin (1993)

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The estimates of both Hussein (1984) and Hag Elamin (1993) show that the price elasticities of supply are positive in all cases except in the case of sesame (-0.91) with no wide variation across other crops. Cotton has the largest positive elasticity (0.51)and total export supply elasticity is much close to that of cotton (0.49) perhaps due to the dominance of cotton exports in total Sudan's exports. The price elasticity of demand is negative for all crops and relatively smaller in magnitude with sesame showing the highest elasticity (-0.72 and -1.08).The price elasticities of sudan's export are low. It is difficult to increase crop production in short-run, especially for cotton and groundnuts, where the area under cultivation is governed by public scheme boards which determine the cropping pattern. In addition, cotton producer prices, over the period of the study, were determine by the state cotton marketing corporation (CMC). Fluctuation in export supply rsult largely from changes in domestic production, as domestic consumption of exportable was fairly negligible for the period under investigation. However, domestic consumption of exportable in Sudan had a negative but minor effect on total export earnings 1970-187 (Hag Elamin, 1990).

Supply Shifts: Changes in the supply of primary commodities, particulaly of agricultural commodities may be random, caused by weather conditions, plant disease etc. These changes in the conditions of supply bring about price changes, which in turn are likely to have an impact on the volume of supply; high prices induce increased output, while low prices reduce output.Fluctuations in supply are more severe for agricultural raw materials, specially in the short-term. In case of annual crops supply fluctuations may arise from CobWeb effect. For both annuals and perennial, pests, plant diseases and weather variability often bring about change in supply. Fluctuations resulting from a given shift in supply will be influenced by demand. The short-run supply elasticity of most primary commodities is low and perhaps even zero for some. The long-run supply elasticities of primary commodities are generally greater than the short-run elasticities (Binwanger, 1989). Shifts in export supply are the resultof fluctuations in output or domestic demand for the export commodity. Shifts in domestic demand result in opposite shifts in export supply curve. The above implies that fluctuations in quantity of exports and earnings should be inversly related to the percentage of total supply exported. Domestic demand will affect export price only to the extent that export demand is elastic.

Demand Shifts: For many products, shifts in foreign demand forms a major source of fluctuations in export receipts. An individual country is faced by a net foreign demand based on aggregate world demand supply. A shift in either the aggregate demand or the aggregate supply curve will change the position of the net demand curve. Short-run shifts in demand may arise from changes in prices of competing goods, changes in tastes and cyclical chanes in income. These factors are more severe for raw materials than for food products and least severe for manufactured products. Thus, instability is held to vary with the shares of thse products in total earnings.The effect on a country's export receipts of a givendegree of supply instability also epends on the elastiity of foreign demand. The greater the departure of foreign demand elasticiy from unity, the more pronounced is the effect on export receipts of shifts insupply. The demand elasticity of a country's export is a function of the price elasticity of world demand and the country's share of the world market. If a country's share in world market declines, its demand price elasticity will increase. It follows for a given shift in supply, the resulting change in price should be smaller while the change in quantity and earnings should be greater, the smaller is the

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country share in world market. In general, the smaller the country's share of the world market, the more elastic the relevant demand curve will tend to be.

The Importance of Supply and Demand Shifts in Earnings Instability in Sudan: To determine the relative importance of supply and demand fluctuations in determining earnings instability in Sudan; Murray's approach was used with respect to decomposing the variance of export earnings (E) into the variance and co-variance (around constant growth rate trend line) of export price (P) and quantity (Q). Murray shows that around trend:

E=P.Q……(1)
Then log E = logP+log Q……..(2)
Var(log E) = Var (log P) + Var (log Q) + 2Cov (log P. log Q) ……(3)
CP = 100 Var (log P)/ [Var(log P) + Var (log Q) + 2Cov (log P. log Q)]……(4)
CQ = 100 Var (log Q)/ [Var (log P) +Var (log Q) +2 Cov (log P . log Q)……(5)

Where;

Var = variance, Cov = covariance, CP = price contribution, CQ = quantity contribution

The relative contribution of fluctuations in (P) or (Q) to fluctuations in (E) can be determined, as Murrayshowed, by taking the appropriate term on the right-hand side of the equation (3) as a perentage of the sum of the right-hand terms as in equation (4) and (5) above. The sign of the covariance term indicates whether upply (-) or demand (+) variations has been the major source of earnings instability. The terms on the right-hand side are calculated from the price and quantity indices. Fluctuations in prices and quantities traded do not arise randomly, but reflect underlying changes in demand and supply. Movement in the demand schedule will result (supply unchanged) in price and quantity variations in the same directions. Shifts in the supply schedule will result (demand unchanged) in price and quantity and variations in opposite directions. An examination of Tables11 and 12; shows that for most of the commodities examined (6 out of 7) for peiod 1970-78, the covariance between price an quantity is negative. This implies that in thse cases it is the supply fluctuations which have been the dominant cause of earnings instability. For the period 1979-87, however, (4 out of 7) commodities had negative covariances; indicating supply variations as the dominant source of earnings instability. The covariance for cotton appears to be equal to zero which could be interpreted as indicating dominance of neither supply or demand shifts.The analysis of the sign of the covariance term of price and quantity suggests that it is supply but not demand fluctuations which is the dominant source of export earnings instability.

Table 11
Components of the Variance of Individual Commodity Export Earnings (1970-78)

commodity	Var (log E)	Var (log P)	Var (log Q)	2cov(log Q.log P)
Cotton	**0.17**	**0.01**	**0.21**	**-0.05**
Gum-Arabic	**0.09**	**0.10**	**0.15**	**-0.16**
Sesame	**0.06**	**0.04**	**0.03**	**-0.01**
Groundnuts	**0.15**	**0.02**	**0.18**	**-0.05**
Sorghum	**0.14**	**0.40**	**1.60**	**-1.86**
Sheep/lambs	**0.61**	**0.25**	**0.40**	**-0.04**
Cattle	**1.08**	**0.03**	**0.89**	**0.16**

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Source: computations are based on data obtained from Bank of Sudan Annual Reports (various years)

Table 12

Components of the Variance of Individual Commodity Export Earnings (1979-87)

commodity	Var (log E)	Var (log P)	Var (log Q)	2cov(log Q.log P)
Cotton	0.25	0.10	0.15	0.0
Gum-Arabic	0.10	0.18	0.16	-0.24
Sesame	0.28	0.18	0.37	-0.27
Groundnuts	2.60	0.83	1.83	-0.06
Sorghum	2.28	0.09	1.80	0.34
Sheep/lambs	0.36	0.05	0.48	-0.17
Cattle	0.29	0.08	0.18	0.03

Source: computations are based on data obtained from Bank of Sudan Annual Reports (various years)

Table 13 below, presents the variance analysis of price and quantity for totalexport earnings, it shows that supply shifts were the dominant source of total earnings instability for the period 1970-78, while for the second period 1979-87 dmand appears to be main source of fluctuations but with little magnitude of variations (0.01).As it appears from Table 14 below, for the priod 1979-87, the effect of price on total earnings outweighed that of quantity. For the period 1970-78, however, the variations in quantity contributes more to earnings instability than the variations in price (44.22).

Table 13

components of the variance of total export earnings for the periods 1970-78 and 1979-87

Periods	Var(log E)	Var(log P)	Var(log Q)	2cov(log Q.log P)
1970-78	0.04	0.19	0.08	-0.23
1979-87	0.07	0.01	0.04	0.01

Source: computations are based on data obtained from Bank of Sudan Annual Reports (various years)

Table 14

the contribution of price and quantity to earnings instability for the periods (197o-78) and (1979-87)

Periods	Var (loP %) [CP]	Var (log Q %) [CQ]
1970-78	-100.00	-42.11
1979-87	-11.11	44.22

Source: computations are based on data obtained from Bank of Sudan Annual Reports (various years)

Efficiency of Marketing Board to Stabilzing the Producer Prices in Sudan: Until 1987 three marketing boards were operating in export marketing in Sudan. These are Cotton Marketing Corporation(CMC), Oil Seeds Marketing Company (OSMC) and Livestock Marketing Corporation (LSMC). These marketing boards were established by the state with the main objective of stabilizing producer prices of those primarycommodities. To examine the question

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of stabilizing the producer prices in Suda we carried out a comparison between instability in real producer prices and instability in real border prices. The rsults obtained are presented in Table 15 below. Table 15 shows the instability index ratio for real producer prices (PI) to real border prices(15) for Sudan major exports, were remarkably different. The instability indices ratio of real producer prices to real border prices, for cotton, groundnuts and sheep/lambs were found to be greater than one, indicating that producer prices fluctuate more than border prices. For gum-Arabic, sesame, sorghum and cattle, however, the instability ratio is less than one, implying that their producer prices are more stable relative to border prices.Paradoxically, as shown by Table 23, real producer prices of commodities controlled by marketing boards, with the exception of gum-Arabic, flucutuate more heavily than their border prices whereas, for other commodities producer prices were relatively more stable.

Table 15

comparison between real producer price instability index(PI) and real border price instability index (BI)

Commodity	PI/BI
Cotton	1.65
Gum-Arabic	0.09
Sesame	0.83
Groundnuts	1.24
Sorghum	0.45
Sheep/lambs	1.37
Cattle	0.69

Source: coputations are based on data obtained from Bank of Sudan Annual Reports (various years) and department of agricultural economic, division o statistics Annual Reports (various years)

Domestic Consequences of Unstability in Sudan: Large swings in export earnings affect the export sector, and less offset by policy action or adequate reserves or external borrowing. In addition, fluctuations in export earnings have an impact on GNP, government revenue as well as agriculture. The magnitude of the effect of export earnings fluctuations on each of these components differs according to the degree of associationbetween the component and the fluctuation in earning, hence, knowledge of such relationship is of importanc. In this tudy simple regression equation procedure was applied to determine the impact of export instability ongovernment revenue, agri-share in gross domestic product (GDP) and gross national product (GNP).

Relationship Between Fluctuations In Export earnings and Govrnement Renenue: The Sudan government rely on traded sector for ita revenue. Fluctuations in export earnings, therefore, will cause the fluctuations in government revenue. In order to asses the extent of the effects of fluctuations in export earnings on government revenue, the relationshipbetween these two variables was computed for the period under investigation. The deviations from trend of real export earnings (X_E) was regressed on the deviations from trend real government revenue (Y_r)and time trend (T) for a period of 18 years, covering 1970 to 1987. The following rsults were obtained:

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X_E = 5.14 - 0.00165Y_r – 0.045 T
(13.20) (-3.26) (-1.08)
R^2 = 68.9 %

(values in parenthesis are the t-ratios for particular coefficients). Y_r coefficient at 2 % level of significance.

In the equation above if $Y_r$and T are both fixed at zero, the average value of the real export earnings X_E (reflecting the influence of all the omitted variables) is estimated at approximately 5.14 millions of Sudanese pounds. Though, in most cases the intercept term has noeconomic meaning. The partial regression coefficient (0.00165) means that, holding other variable constant (T, in the present case), as real governement revenue decreases, say, by L.S 1, the mean real export earnings decrease by about (-0.00165) L.S. Similarly if Y_r is kept constant, the mean real export earnings is estimated to decrease at the rate of -0.045 millions of Sudanese pounds per year. The R^2 value of 0.689 shows that the two variables explain about 68.9 % of the variation in the real export earnings in the Sudan over the period 1970-1987. This implies that export instability had a negativ impact on government revenue during the priod above.

Relationship between Fluctuations in Export Earnings and Agricultural share in GDP: To determine if the share of agriculture in GDP, had a relationship with export earnings instability, the deviation from trend of real export earnings (X_E) was regressed on the deviation from the trend of the share of agricultural in GDP (Y_{as}) and time (T). the following results were obtained:

X_E = - 0.16 + 0.117 Y_{as} +0.05 T
(-0.06) (1.59) (1.8)
R^2 = 53 %

(value between parenthesis are the t-ratios for particular coefficient). Y_{as}coefficience is significant at 2% level of significance.

The above equation shows that if Y_{as} and T are both fixed at zero, the mean value of the real export earnings X_E (reflecting the influence of all omitted variables) is estimated at approximately – 0.16 million of Sudanese pounds. As mention before, in most cases the intercept term has no economic meaning. The prtial coefficient (0.117) means that, keeping T constant, as the share of agriculture in GDP increase, say, by L.S 1, the mean real export earnings increase by about 0.117 L.S. by the same taken, if Y_{as} is kept constant, the mean real export earnings is estimated to increase at a rate of 0.05 million of Sudanese pounds per year. The coefficient of determination value 0.537 indicates that the two variables explain about 53.7% in the Sudan export earnings over the period 1970-1987. This indicates that fluctuation in export earnings had a positive impact on the share of agriculture in the total GDP.

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Relationship Between Fluctuations In Export Earnings And GDP: Regression of the deviation from trend of real export earnings (X_E) against deviation from trend of GDP (Y_{gdp}) and time (T). Yielded the following results:

X_E = 4.21 – 0.0051Y_{gdp} + 0.o561 T

(12.64) (-0.04) (1.61)

R^2 = 48.0%

(value in parenthesis are the t-ratios for particular coefficients). Y_{gdp} coefficient is not significant at 2% level of significance with minus sign.

In the above results: if Y_{gdp} and T are both fixed at zero, the average value of the real export earnings (X_E) is estimated at approximately 4.21 millions of Sudanese pounds. If Y_{gdp} is kep constant, the mean real export earnings is estimated to increase at rate of 0.0561 million of Sudanese pounds per year. The coefficient of determination value 0.48 indicates that two variables explain about 48% in the Sudan export earnings over period 1970-1987. This indicates that fluctuation in export earnings had postive impact on the GDP.

Relationship Between Fluctuations in Export Earnings And Gross national Product (GNP):

The same model used above was applied to test the relationship between fluctuations in export earnings with GNP. The results obtained are as follows:

X_E = 4.43 – 0.000094 Y_{gnp} + 0.0218 T

(13.39) (- 1.55) (0.59)

R^2 = 0.478

(values in parenthesis are t-ratios for particular coefficient). Y_{gnp}coefficient is not significant at 2% level of significance with minus sign.

The above results show the following: if Y_{gnp} and T are both fixed at zero, the average value of the real export earnings (X_E) is estimated at approximately 4.43 millions of Sudanese pounds. But the intercept term has no economic meaning. The partial regression coefficient 0.000094 indicates that, keeping other variables constant (T), as gross national product (GNP) decreases, say, by L.S 1, the mean real export earnings decrease by about 0.000094L.S. Similarly, if Y_{gnp} is kept constant, the mean real export earnings is estimated to increase at a rate of 0.0218 millions pounds per year. The R^2 value of 0.478 shows that the two variables explain about 47.8 % of the variation in the real export earnings in the Sudan over the period 1970-1987. This indicates that export instability had little impact on GNP.

The foregoing analysis shows that there is relationship between export earnings instability and government revenue, and agricultural share in GDP, but the relationship between export earnings and GDP and GNP are moderate for the period under study (1970-1987). Generally, these results suggest that fluctuations in export earnings have clear negative consequences on the agricultural share in GDP and government renenue, and no clear negative effect on GDP and GNP. Two reasons could be advanced to explain the absence of negative effect on GDP and GNP:(1) Inflow

of foreign capital during the period 1970-1987 in form of loans and grants have granted a protective cushion for certain sectors against adverse effects of fluctuations in export earnings. Over the period 1970-1987, Sudan had received a total sumof U.S $ 1114 millions. This, however, has lrd to a chronic debt problem for the country over the 1990s.(2) In the 1985 Sudan debt service ratio as a percentage of GNP and export of goods and service stood respectively at 1.8 and 15.6. Total debt stood at U.S $ 15 miliards in 1993.Thus, the adverse effects of fluctuations in export earnings may have been largely offset by these factors. The expectation, therefore, is that once these cushioning facilities are tampered off fluctuations in export earnings may create more harmful effects than would have been thought of before.

IV.CONCULOSIONSAND RECOMMENDATIONS

The issue of export instability, its causes and consequences have been considered of great importance by this study. Most of the theoretical literture tend to the argue that export instability could have adverse effect on the rate of economic growth. The empirical evidence, however, have not settle this issue. Our study adopted the one country approach to study the problem and looked at causes and consequences of instability in Sudan for 1970-1987 period. The methods used in this study are various statistical measures, mainly: (1) Instability indices; to measure the extent of export instability in Sudan.(2) Regression; to estimate the impact of export earnings fluctuations on export sector and the rest of the economy.(3) Variance/ co-variance; to measure the major cause of fluctuation in export earnings in terms of supply and/or demand.(4) Prodicer prices/ border prices index ratio; to determine the efficiency of marketing boards in stablizing producer prices. Primary commodity exports remain the chief source of foreign exchange for Sudan. Sudan still earns bulk of its foreign exchange from a few commodities. The trend and fluctuations in the prices and proceeds of the export commodities determined the country's ability to pay for imports of capital goods and/or fuel. Sudan's share in world export of primary products declined during the period 1970-1987. The decline in Sudan's share in world primary product exports was partly due to its concentration on coomodities which on average lower growth rates than those exported by the rest of the world. Price instability has cuased concern, because it is believed to raise risks to traders, producers and consumers and contributes to the instability of export earnings, imports, investment and government expenditure. However, not all price changes are harmful. In a market system more price changes are necessary to provide a signal to producers and consumers to take actions to prevent or reduce shortages or surpluses. Sudan export unit value shows that there was considerable variation in the degree of instability of export unit value for all commodities expoted. The degree of earnings instability for individual commodities appeared to very widely; and volume instability showed even greater instability than earnings instability. Price and earnings instability are interrelated and may share common causes , although large shifts in supply and/or demand and low price elasticities of supply and demand are resposible for earnings instability. With regard to other causes of export instability the evidence shows a very weak association between commodity concentration and instability. This is mainly because:(1) Sudan tends to specialize in commodities which are relatively stable or whose fluctuations tend to be mutually offsetting.(2) Sudan tends to have relatively high degree of commodity diversification. Diversification means shifting out of unstable commodities into more stable ones which would generally reduce export earnings

instability. There is no clear evidence that geogrphial concentration causes instability in Sudan. The evidence from time series analysis an country approach takes along with *a priori* reasoning suggest that a large swings in exports above or below trend would affect strongly the export sector. The main proposals for raising the foreign exchange earnings from commodities in Sudan are related to facilitating marketing of Sudan's primary products and the processing of primary products in Sudan before export. It is found that the random movement in various commodities receipts were offsetting which leaad to a relatively higher stability in total export earnings. The study also showed that the instability of individual commodities increases over time, and the fluctuations in the proceeds during the period 1970-1987, were due to movement in both quantity and price. From the study it appears that domestic factors play a greater role in determining fluctuations in export earnings than extenal factors. For Sudan, this is seen in quantity variation which is largely determined by domestic factors. The producer prices to border prices of commodities controlled by marketing board fluctuate more heavily than others, this implies the failure of these marketing boards to stabilze the producer prices of those commodities. The study recommended the following:(1)Processing the primary products before export.(2)More diversification of the commodities exported.(3)Gradual change of marketing boards into private companies

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