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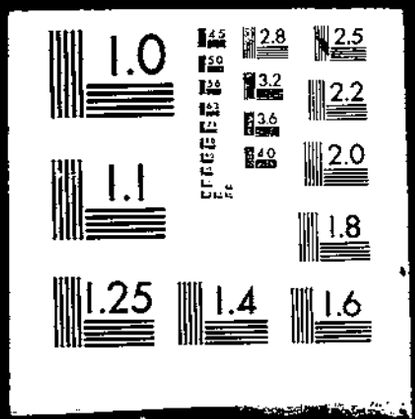

AN ANALYSIS OF THE UNCTAD INTEGRATED PROGRAMME FOR COMMODITIES

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ABSTRACT

The study estimates the capital requirements for operating an Integrated Programme for Commodities as proposed by the developing countries at the fourth session of the United Nations Conference on Trade and Development (UNCTAD) in 1976. The programme is analyzed using ordinary least-squares to establish price and export earnings trends for 1961-75. Capital requirement estimates for compensatory financing and export price and earnings stabilization vary from as low as UNCTAD's estimates of $6 billion to much more, depending on options and years.

Key words: Buffer stocks, commodity agreements, compensatory financing, ordinary least-squares, stabilization

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SUMMARY

The developing countries have proposed an Integrated Programme for Commodities (IPC) through the United Nations Conference on Trade and Development (UNCTAD) Secretariat. This study estimates the capital requirements needed for the programme's operation.

Commodities to be covered under the programme are those produced and exported mainly by the developing rather than the developed countries. Buffer stocking schemes would be used to stabilize prices within a specified range for those commodities that are deemed suitable for stocking. Compensatory financing of their exports has been suggested by the developing countries as a way to support earnings for the nonstockable and in some instances, the stockable commodites.

The cost of compensatory financing is estimated when grants are made to maintain export earnings to at least 2.5 percent below the 1961-75 ordinary least-squares (OLS) regression earnings trend. The capital requirement is also calculated for the stabilization of export earnings $\pm$ 2.5 percent about the 1961-75 OLS earning trend, and for the stabilization of unit values $\pm$ 5 percent about the 1961-75 OLS unit value trend. Buffer stocks are used to stabilize the earnings and unit values.

The UNCTAD Secretariat lists 10 stockable commodities: cocoa, coffee, copper, cotton and cotton yarn, hard fibers and products, jute and products, rubber, sugar, tea, and tin. The nonstockable commodities, or those deemed too expensive to store because of their bulkiness or perishability, include bananas, bauxite, beef, iron ore, manganese ore, phosphate rock, tropical timber, and vegetable oils, including olive oil and oilseeds.

The study determined that the compensatory payments to developing countries needed to support export earnings for the nonstockable commodities reached a peak annual total of $600 million, with an annual average of about half this amount. If stockables are included, peak payments rose to $1.7 billion. Under the simplifying assumptions that include no effect of IPC activities on production, exports, or demand schedules, IPC investment for the 12 commodities were about the same for export earnings, and unit value stabilization reached a peak of $5.1 billion in 1975. Sugar and copper dominate the fund activity in these calculations, mainly because of very high price peaks in 1974 and then the very low price dips in 1975. In 1975, those two commodities accounted for almost 90 percent of the investment, with little over a half billion dollars invested in the other 10 commodities. All calculations are in terms of 1970 prices; to convert to 1975 prices, multiply by 2.18.

International commodity agreements have been or are operational for cocoa, coffee, sugar, tin, and wheat. A paper on the history and problems of international commodity agreements is included as an appendix, briefly describing when these agreements were in operation, who participated, how they functioned, and why they succeeded or failed. The history of these agreements is helpful in understanding some potential shortcomings and attributes of the UNCTAD proposal.

AN ANALYSIS OF THE UNCTAD INTEGRATED PROGRAMME FOR COMMODITIES

by John W. Murray and L. Jay Atkinson*

INTRODUCTION

This study estimates the capital requirements for operating an Integrated Programme for Commodities as proposed by the developing countries at both sessions of the United Nations Conference on Trade and Development (UNCTAD) in 1976. The programme is analyzed using ordinary least-squares to establish price and export earnings trends for 1961-75.

UNCTAD PROPOSAL FOR AN INTEGRATED COMMODITY PROGRAMME

A great many developing countries depend on a very few export commodities for the majority of their export earnings. Consequently, the greater these countries' trade is as a percentage of their gross national product, the more vulnerable their entire economies and economic development plans are to fluctuations in world prices for their exports. A wide variety of remedies have been offered for price instability in the past. They include commodity agreements which establish buffer stocks, export quotas, and domestically, the monopoly of support prices, acreage allotments, marketing quotas, and the like.

Recently, the developing countries have been pressing for a collection of commodity price earnings programs. Three reasons for this renewed interest are most prominent: (1) The success of the Organization of Petroleum Exporting Countries is raising and maintaining high oil prices since 1974, (2) the mounting debt servicing problems the developing countries are facing for oil and other needed imports for their development efforts, and (3) their relatively low and/or widely fluctuating export earnings.

Another remedy set forth by these countries at UNCTAD is the proposed Integrated Programme for Commodities (IPC). This programme has several objectives. First, it aims to establish and maintain commodity prices at levels which would be remunerative and just to producers and equitable to consumers, take into account world inflation and changes in the world economic and monetary situations, and promote equilibrium between supply and demand within expanding world commodity trade. It would seek to improve and sustain the real income through increased export earnings, improved market access, diversified production, and expanded processing of primary commodities. The programme

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further aims to improve the competitiveness of natural products vis-a-vis synthetics and substitutes. Lastly, the programme seeks to improve the developing countries' marketing, distribution, and transport of their commodities, including an increase in their participation in these activities and their earnings from them.

The above goals will be achieved primarily by establishing several international commodity arrangements which would stabilize commodity prices and export earnings of the developing countries. Elements in the programme include buffer stock schemes, multilateral purchase and supply commitments, compensatory financing, and trade measures to expand the processing and diversification of primary products. These arrangements would be financed from a Common Fund. This study will focus on estimating the required size of the Common Fund needed to operate the IPC, given some simplifying assumptions.

International Buffer Stocks

The developing countries have requested that international arrangements for 18 commodities be established which would be negotiated within the framework of the Integrated Programme; that is, within an agreed time period and with common principles and procedures. It is understood that other commodities may eventually be added to this list. Ten of the 18 commodities are considered suitable for storage or international stocking: cocoa, coffee, copper, cotton and cotton yarns, hard fibers and products, jute and products, rubber, sugar, tea, and tin. The commodities not considered suitable for stocking in the Integrated Programme include bananas, bauxite, beef, iron ore, manganese ore, phosphate rock, tropical timber, and vegetable oils, including olive oil and oilseeds. Four of the 18 commodities are presently covered by international agreements: cocoa, coffee, sugar, and tin.

Although the primary tool would be buffer stocks, export quotas and production regulations may also be used to prevent adverse price fluctuations. Either international or internationally coordinated national stocks would be used, and prices would be stabilized in real terms within a range based on a historical trend. The price range would be established high enough to provide incentives for adequate investment in commodity production, but low enough to keep the prices of the raw products competitive with those of their synthetic substitutes. Although indexation is not explicitly mentioned, price stabilization would be aimed at linking the prices of the commodities covered by the arrangements to the prices of commodities exchanged for them in international trade. Price ranges are to be reviewed periodically and adjusted accordingly, to take into account such factors as production costs, changes in barter terms of trade, and modification in relevent exchange rates. Each commodity covered by the stocking arrangement would be purchased by the stocking facility when the commodity's price fell below an agreed floor level and sold from the buffer stock when its price exceeded an agreed ceiling.

The imposition of export quotas would require producing countries to reduce exports proportionately to current output (or output in a previous period) in an agreed aggregate amount (13). 1/ Favorable treatment is suggested by the developing countries in the allocation of export quotas to least developed and most seriously affected developing countries who are members of the international commodity arrangement covering the commodity in question.

Common Fund

The financial requirements of the commodity arrangements are to be covered by a Common Fund, supported by exporting and importing member countries with the possible

1/ Underscored numbers in parentheses refer to literature listed in the reference section at the end of this report.

exception of the most seriously affected developing countries. Resources for the Fund would be provided by subscriptions and long term capital loans from participating exporting and importing countries, possible third countries such as the net oil exporting countries, and international financial institutions.

The primary function of the Fund would be to lend to individual commodity organizations within the Integrated Programme. 2/ Proceeds from subscriptions and borrowings would be lent to the organizations as they needed financing for the acquisition of stocks, and would be repaid as the organizations acquired funds from stock sales.

An exception to the primary function of the Common Fund is to allow the Fund to trade in individual commodities for which commodity arrangements do not exist, for the purpose of providing temporary emergency price supports. The conditions required for this operation would be (1) a request by producing countries which account for more than one-half of total exports of the commodity under consideration, (2) their agreement to initiate the establishment of a commodity organization, and (3) approval by a qualified majority of the Board of Directors of the Common Fund.

Compensatory Financing

A system for compensatory financing has been proposed for those developing countries with a significant dependence on commodities for which stocking arrangements or multilateral commitments still left serious fluctuations in their prices or export earnings.

The proposal calls for the expansion and liberalization of compensatory financing facilities, primarily that of the International Monetary Fund (IMF). Revisions proposed in the IMF facility include: (1) more flexibility in applying the balance-of-payments need criterion when determining the eligibility for assistance; (2) relaxation of the limitation on purchases in relation to members' quotas; (3) more flexibility in the requirements for providing statistical data to support a claim for compensation; (4) extension of the repayment period, including linking repayment to export earnings recovery; (5) modifications of the calculation of export shortfalls to take into account the purchasing power of exports; and (6) elimination of charges on outstanding purchases under the facility after a specific period. A new provision proposed for the facility would allow countries to base export shortfalls on either their commodity exports or total merchandise exports. 3/

Expansion of the European Community stabilization of export earnings scheme (STABEX), has also been suggested. The STABEX scheme was established in February 1975 within the Lome Convention (4). Under the scheme, 45 African, Caribbean, and Pacific (ACP) countries are currently eligible for compensation. The Common Market countries contributed 375 million units of account (about $465 million in U.S. currency for a 5-year fund.

The STABEX system becomes operative for an ACP country if the export earnings from a product sold to the Common Market (and in some cases to all destinations) accounts for 7.5 percent (5 percent in the case of raw sisal; 2.5 percent for the developing countries) of a country's total export earnings in the previous year (9). An ACP country is eligible for a loan (or grant to the least developed countries) if its export

2/ It is hoped that present international commodity organizations will join the Integrated Programme when it becomes operational.

3/ Under an expanded IMF scheme, which became operative in 1976, compensations are based on merchandise exports and paid in respect to shortfalls of the actual export value calculated as a 5-year moving average. Final payments to the Fund are due within 3 to 5 years.

earnings to the Common Market (or in some cases to all destinations) for any of the above products drop below 7.5 percent of the previous 4 years' average (or 2.5 percent for the developing countries). Repayments are due in part or full within 5 years, providing the export price of the commodity recovers. However, the door is left open for all the loans to be converted to grants if the borrowing country cannot repay the loan within 5 years. About 30 developing countries are not required to make repayment. It should be noted that grants and loans are not authorized if the shortfall stems from restrictive export policies.

It is suggested that commodity compensatory financing sc[illegible]n the Integrated Programme be established as residual measures to stabilize e[illegible]in developing countries' export earnings from commodities not covered by oth[illegible]rangements, or for those where other arrangements prove to be inadequate. Automati[illegible]compensation would be made in the form of loans. Repayments would be made from export earnings in excess of the levels at which shortfalls were calculated, with the possibility of converting unpaid balances into grants.

Expansion of Processing and Diversification

The final element called for in the IPC is the implementation of measures to diversify developing countries' economies by expanding the processing of primary commodities and by increasing the volume of exports, including manufactured goods, to developed countries. Emphasis is placed on relaxation of tariff and nontariff measures, including the expansion of Generalized System of Preferences (GSP) schemes and the elimination or further reduction of tariff escalation. 4/

Expansion of GSP schemes would include extension of product coverage to all agricultural, semiprocessed, and processed goods of export interest to developing countries and the lowering or removal of tariff and ceiling quotas. Where this preferential treatment is not feasible, tariff reduction or elimination on a "most favored nation" basis is urged during multilateral trade negotiations. Measures proposed in the nontariff field are the elimination or lowering of quotas and discretionary licensing, reduction of variable levies, abolishment of prohibitions and embargoes, and the relaxation of health and sanitary regulations on developing countries' products.

Also sought is increased producer participation in marketing and distribution arrangements and encouragement of transfer of technology and research from developed to developing countries. Measures will also be undertaken to encourage research and development on problems of synthetics competing with natural products.

CAPITAL REQUIREMENT ESTIMATES OF THE IPC

Other Estimates

Despite the lack of specific figures in the UNCTAD-IPC proposal, it was felt that it would be beneficial first, to make some reasonable assumptions about how a common fund could have operated to stabilize real export earnings or real prices around trends for the 15-year period 1961-75 within a chosen band, and second, to measure the capital requirements and costs of such a fund's operation. Hopefully, this kind of study will help establish some realistic parameters on the degree of stabilization sought and on corresponding costs.

Other studies have been made with a similar purpose. No study will yield the same results, however, not only because of different methodologies and data sources, but also because of the different degress of stabilization sought. The UNCTAD Secre-

4/ Tariff escalation refers to a rate of duty on a product which increases with each level of processing.

tariat has made two such studies. The first assumed that buffer stocks from 1-1/2 to 3 months' export for each of the commodities would be needed (14). If the required 10 commodities were purchased at the average of prices during 1970-74, the investment would have been $5.12 billion. An estimated maximum of $6 billion would have been needed to finance the buffer stocking and compensatory financing schemes, and other activities. Only an initial $3 billion would be needed, however, because some commodity stocks would be purchased initially; others, later.

The second UNCTAD study estimated the cost of stabilizing prices for the 10 stockable commodities (15). Prices were stabilized ± 10 percent around a target price defined as either the 1971-75 average (1976 dollars) or the projected 1974-78 average (1976 dollars). This study attempted to take into account the impact of both supply and demand fluctuations on the eventual market price of a given commodity. The model in this analysis was simulated for 1957-73. It was estimated that $4.5 to $5 billion would be needed for the buffer stocking schemes covering the 10 commodities, and an additional $1.5 to $1 billion would be needed for other stocking and nonstocking activities. Again, only $3.3 billion would be needed initially.

Jere Behrman has made estimates of the capital requirements for the Common Fund through an econometric analysis. A nonstochastic simulation was conducted for 1963-72, with the deflated commodity prices stabilized ± 15 percent about the 1950-75 trend. The investment requirement was discounted to 1975 at a 5-percent and a 2-percent rate. The investment requirement for 8 of UNCTAD's 10 stockable commodities--cotton and sugar excluded--with prices stabilized ± 15 percent and at a 5-percent discount rate was $2 billion (1975 dollars). This requirement rose to $4 billion when prices were stabilized ± 5 percent. Behrman estimated that if sugar and cotton had been added, the $4 billion figure would have been increased to between $5.6 and $6.8 billion (1).

The $6 billion estimate in Behrman's study is likely insufficient for the stockable commodities. If the maximum stock required for the stabilization of prices at ± 15 percent is valued at the average of the 1970-74 nominal prices, the estimate is $5 billion for the 8 commodities (1). This is too low because transactions and storage costs of those commodities already being held in the world at the time the fund went into operation are excluded. If the average 1970-74 nominal prices are converted to 1975 dollars, the value rises to $6.5 billion. If cotton and sugar are added, the value increases to $10.4 billion.

Two problems with Behrman's study could not be reconciled. One was that although there was very little market intervention by the buffer stocking agency, when it did intervene, it made some unrealistically large purchases and sales during a given year. The second problem is also a shortcoming of the UNCTAD simulation study: that of ignoring actual world stock carryovers. To assume that Brazil's and Colombia's large coffee stocks or the large U.S. cotton stocks during the sixties were not used to stabilize prices is to assume the absurd. By ignoring actual world carryovers, the investment and cost requirements of international buffer stocking facilities would be greatly underestimated.

Procedure for Stabilization

The Common Fund has many proposed objectives: (1) To stabilize export earnings of developing countries, export prices, and quantity traded; (2) to raise prices and earnings of commodities traded by developing countries; and (3) other less specific objectives. The first two objectives can be contradictory, however. For example, for any given crop with the usual inelastic demand in the short run, variations in world production and exports would cause opposite variations in prices and export earnings. If one should stabilize prices, earnings would fluctuate directly, with about equal percentage range with the volume of exports. In other words, since export earnings, prices, and volume do not move together, one has to choose which of the three to stabilize.

Three calculations of the costs of stabilization were made as if the IPC had been in effect during 1961-75: (1) The costs of compensatory financing for all commodities to stabilize export earnings, (2) the capital requirements of stabilizing export earnings for the stockable commodities, and (3) the capital requirements of stabilizing unit values 5/ for the stockable commodities. 6/

For the compensatory financing schemes, the developing countries were reimbursed with grants for any shortfall in export earnings of more than 2-1/2 percent below the trend line for all commodities in the IPC. Only those shortfalls that occurred as a result of circumstances beyond the control of the exporting country would be reimbursed. Those shortfalls resulting from governmental policies that encourage decreased acreage, yield, exports, and the like, would not be reimbursed if the governing body of the commodity organization had not previously approved the policy changes.

For the buffer stocking schemes, calculations are based upon a two-region world trade model, with the fund buying from exporters when prices (or export earnings) are below the stabilization range and selling to importers when they are above the top of the range. Stabilization was set at $\pm$ 2.5 percent around the 1961-75 trend for the export earnings stabilization scheme. This range required intervention in the market approximately 50 to 90 percent of the years, except for copper, which required market intervention in all years.

For the unit value stabilization scheme, unit values were stabilized $\pm$ 5 percent about the trend. Market intervention appeared to be slightly less for this scheme than in the export earnings scheme. Export earnings stabilization takes account of yield variations on the supply side, as well as changes on the demand side. Such stabilization is an announced goal of the developing countries and seems somewhat preferable for all exporters as a group, since the price stabilization would not usually stabilize income. In practice, however, the problem with an export earnings stabilization scheme is the determination of when the central authority should buy or sell stocks in the market. One possible solution could be an operation which periodically during each marketing year (such as every 3 months), estimates world production, thereby allowing a determination of the necessary buffer stocking activity. Although later yield estimates may cause some readjustments, these should be minor unless some major catastrophe such as drought occurs. Another alternative is to make partial payments early in the season, with a full settlement at the end of the year.

Price stabilization schemes are similar in operation to earnings stabilization schemes. Some multinational central authority is required to buy and withdraw sufficient quantities of a commodity from the market in order to maintain at least a certain minimum price level. Sufficient quantities of these stocks, to the extent that

5/ In this study, export unit value data were used instead of price data. These data were chosen as more representative than spot (market) price data which are generally given for one grade, one quality, and/or one location, whereas export earnings and quantity traded are for all grades, all qualities, and all locations. The correlation between spots prices and their respective unit values was tested and found to be fairly high. For about half the commodities, the two yield similar results; for the others, the results are somewhat different, with the added complications of fluctuations about twice as large for spots as for unit values. Some unit values lag spots by a year.

6/ The stockable commodities in this study are: cocoa, coffee, copper, cotton, hemp, jute, manila (abaca fiber), rubber, sisal, sugar, tea, and tin. The nonstockable commodities (those that are deemed to be too expensive to store due to their bulkiness or perishability) are alumina, bananas, bauxite, beef, iron ore, manganese ore, phosphate rock, timber, copra, coconut oil, groundnuts, groundnut oil, and palm oil. These last five commodities comprise the UNCTAD definition of oilseeds. Unlike the UNCTAD-IPC list, this study includes hemp and manila because they are very close substitutes for sisal, and alumina, which is a close substitute for bauxite.

they are available in the buffer stockpile, would be sold in the market to restrict prices to a maximum level.

The earnings and price data were adjusted by the International Monetary Fund (IMF) index of export prices of all commodities in an effort to negate the effects of inflation. The IMF index was used since it includes the export prices of all commodities; that is, both manufactured and raw commodities. Real values and prices are given in terms of 1970 dollars; however, they can be converted to 1976 dollars by multiplying by 2.2 (table 1).

Table 1--Index of world export prices, 1961-76

(1970=100)

Year	Index	Year	Index
1961	88	1969	94
1962	86	1970	100
1963	87	1971	104
1964	90	1972	114
1965	91	1973	141
1966	92	1974	201
1967	93	1975	218
1968	91	1976	1/ 220

1/ Estimate.

Source: IMF, International Financial Statistics, Vol. XXIX, No. 5, May 1976 (for 1961-71) and Vol. XXIX, No. 12, December 1976 (for 1972-75).

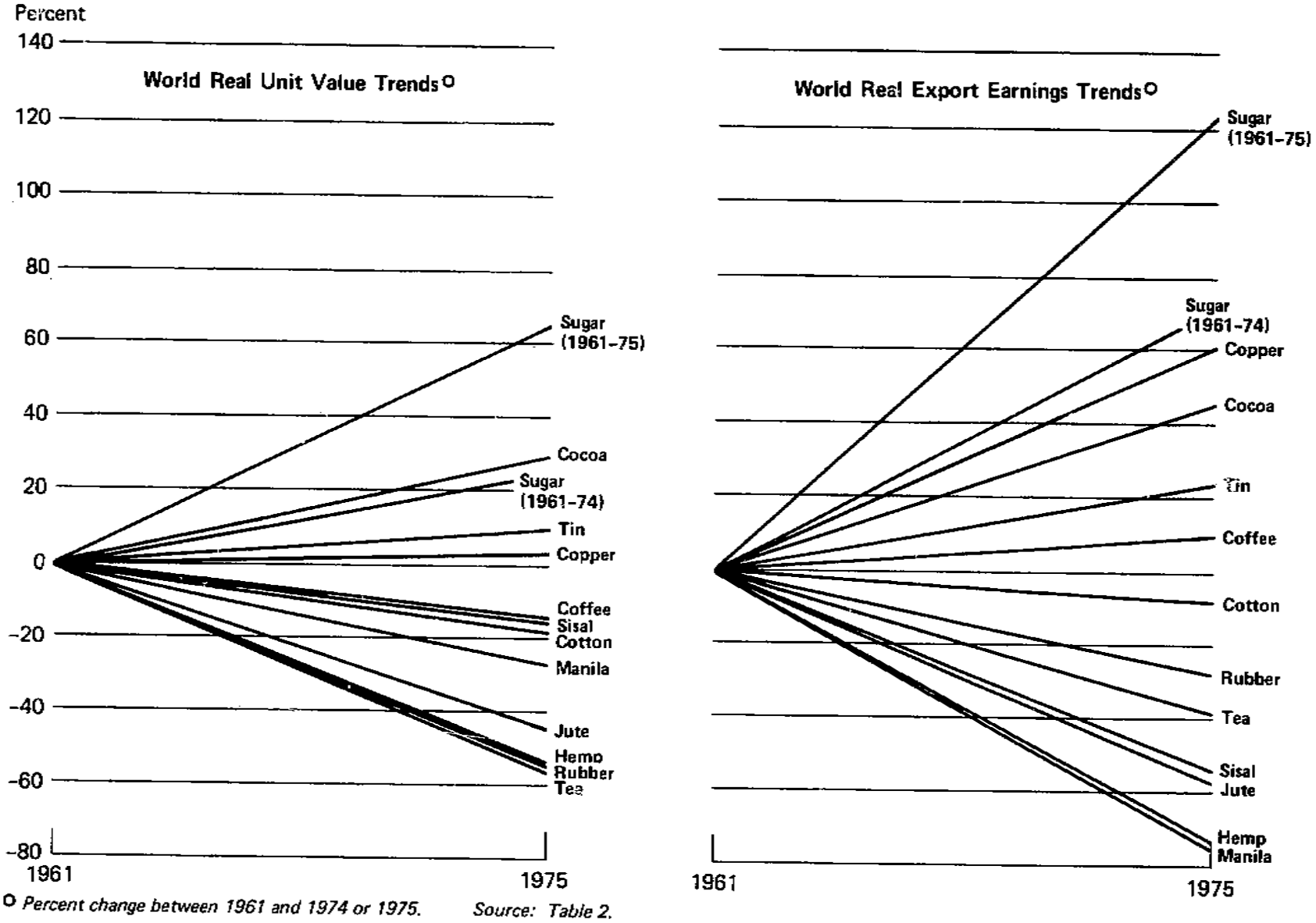
Ordinary least squares was used to establish a trend line for world export earnings and unit values data during 1961-75. This was the longest period available for which there were consistent data that included 1975. However, the analysis of developing countries compensatory financing of minerals covered only 1961-74, since 1975 developing country export earnings data were not available. In either case, this time period should be sufficient to cover at least two price cycles of any of the core commodities. A study conducted by the UNCTAD Secretariat found that the longest price cycle for any of the core commodities was for coffee, which existed 79 months (14). There was no attempt made in these analyses to artificially raise or lower the trend lines.

Trends and Instability of Export Unit Values and Earnings

The real unit value trend declined for all but four--cocoa, sugar, copper, and tin--of the stockable IPC commodities during 1961-75 (fig. 1 and table 2). The commodities' real export earnings trends had the same slope (negative vs. positive) as did their respective real unit value trends, except for coffee, which had an uptrend in real export earnings despite a downtrend in prices.

Table 3 shows the percentage change (slope) in the developing countries' real export earnings trends for 25 commodities during 1961-74 or 1961-75. All the metals except manganese ore in the IPC had uptrends in developing countries' real export earnings. The biggest uptrend of 148 percent; this far exceeded the 60 percent uptrend on real world earnings. Palm oil and timber also had very strong developing country real export earnings uptrends of 351 and 234 percent, respectively.

Figure 1 - World real unit value and export earnings trend



° *Percent change between 1961 and 1974 or 1975.* *Source: Table 2.*

Table 2--Average annual change in world real export unit value and earnings regression trend, 1961-75

Commodity	Unit value	Earnings
	Percent	
Cocoa	29	45
Coffee	-15	10
Cotton	-18	-8
Hemp	-54	-73
Jute	-45	-57
Manila	-27	-75
Rubber	-55	-28
Sisal	-16	-54
Sugar 1/	65	123
Tea	-57	-39
Copper	3	60
Tin	10	24

1/ For the time trend 1961-74, the change was 22 and 65 percent for unit value and earnings, respectively.

It should be noted here that a downtrend in real prices does not necessarily mean a deteriorating economic situation for the exporter. Profits could be holding steady or increasing due to declining per unit cost of production. However, this does not seem to be true for exporters of the above commodities.

With respect to the developing countries' complaints about price and earnings instabilities of their exported commodities, it appears that this is not necessarily true for all the stockable commodities (table 4). Cotton and tea have coefficients of variations for both world export unit value and earnings during 1961-75 that are less than 10 percent, a level at which price stabilization is sometimes suggested. 7/ Four other commodities have coefficients of variations for both unit value and earnings that are 16 percent or less.

The variability in developing countries' export earnings for the stockable commodities is very similar to the results shown for variability in world export earnings, except for hemp (table 5). The coefficient of variation for developing countries' hemp export earnings is 65 percent, compared to the world's 11 percent. But developing countries account for only one-tenth of the world's hemp export earnings, which are small. Developing countries' export earnings for several metals and minerals appear to be relatively stable. Phosphate rock is an exception, with a 30-percent coefficient of variation.

However, it appears that the developing countries do have a valid complaint about the instability of export prices and earnings as well as downtrends in those areas for many of the commodities for which they are the principal exporters. An attempt to estimate the investment requirement and costs of their IPC proposal appears in order if the plight of the developing countries is not to be ignored.

Theoretical Assumptions and Considerations

Since actual export data are used, this implies that there is no producer supply response to the commodity price adjustment made by the central authority. This procedure and resulting assumptions were made for simplicity, even though if prices per

7/ Cotton prices were stabilized during much of 1961-75 by the Commodity Credit Corporation, U.S. Department of Agriculture.

Table 3--Average annual change in developing countries' real export earnings regression trend, 1961-75

Commodity	Between 1961 and 1975	Between 1961 and 1974 1/
	Percent	
Bananas	11	
Beef	85	
Cocoa	45	
Coffee	6	
Cotton	-11	
Hemp	2/ -114	
Jute	-58	
Manila	-75	
Rubber	-24	
Sisal	-51	
Sugar	144	
Tea	-49	
Coconut oil	89	
Copra	-59	
Groundnuts	-58	
Groundnut oil	9	
Palm oil	351	
Alumina		355
Bauxite		49
Copper		148
Iron ore		61
Manganese ore		-34
Phosphate rock		105
Timber		234
Tin		27

1/ Data was unavailable for 1975.
2/ According to the trend, earnings became negative in 1974 and 1975.

unit that producers receive are stabilized, other things being equal, then producers will undoubtedly increase production since risk will have been reduced. However, one could assume that sufficient production or export control was exerted just to offset any potential increases in producer supply response.

Several other assumptions were made. The import demand curves were assumed to have constant price elasticities. Another assumption is that the quantity exported each year is known far enough in advance of decisionmaking to avoid surprises. This allows the central authority to operate the buffer stocking facility with perfect knowledge of the current year's export supply.

Export Earnings Stabilization

Given the above assumptions, the desired new price level for export earnings and unit value stabilization can easily be determined. With the change in price known, the required buffer stock change can also be determined.

For illustrative purposes, assume two cases for the export earnings stabilization schemes. For case 1, export earnings are raised through buffer stock activity; for case 2, they are lowered through the same means.

Table 4--Variability of world export unit values and earnings of selected commodities during 1961-75 1/

Commodity	Unit value			Export earnings		
	Standard error of regression	Regression mean	Coefficient of variation	Standard error	Regression mean	Coefficient of variation
	---Dollars per metric ton---		---Percent---	-------1,000 dollars-------		---Percent---
Cocoa	103.82	592.20	18	87,718	661,593	13
Coffee	96.57	788.99	12	353,945	2,535,086	14
Cotton	32.45	664.13	5	207,708	2,584,486	8
Hemp	25.50	291.07	9	1,254	11,239	11
Jute	40.24	231.90	19	40,531	209,571	19
Manila	47.22	285.61	17	6,425	22,649	28
Rubber	47.97	428.02	11	179,836	1,122,470	16
Sisal	79.71	208.73	38	40,378	114,474	35
Sugar:						
1961-75	37.53	135.45	28	768,565	2,776,000	28
1961-74	27.89	128.20	22	594,959	2,634,000	23
Tea	62.51	1,008.00	6	62,264	693,400	9
Copper	327.03	1,047.50	31	1,119,150	3,634,534	31
Tin	439.53	3,299.50	13	91,000	672,000	14

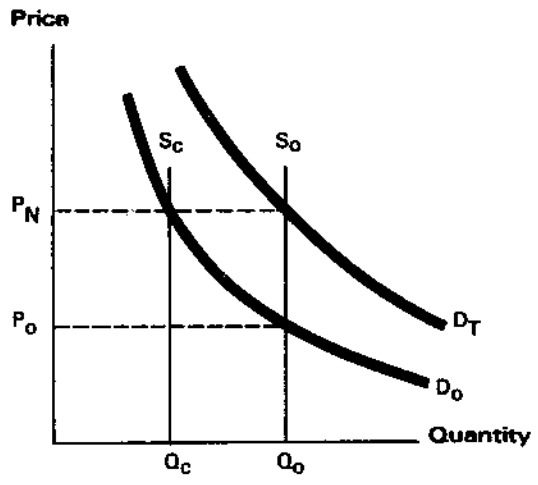
1/ Data adjusted by IMF world export price index, 1970 = 100.

Table 5--Variability of developing countries' export earnings of selected commodities during 1961-74 or 1961-75 1/

Commodity	1961-74			1961-75		
	Standard error	Regression mean	Coefficient of variation	Standard error	Regression mean	Coefficient of variation
	1,000 dollars		Percent	1,000 dollars		Percent
Bananas				62,085	395,312	16
Beef				186,210	432,368	43
Cocoa				86,228	652,212	13
Coffee				354,262	2,453,455	14
Cotton				172,444	1,438,196	12
Hemp				809	1,254	65
Jute				38,237	200,947	19
Manila				6,322	22,329	28
Rubber				176,489	1,076,700	16
Sisal				38,346	108,786	35
Sugar				574,544	1,954,180	29
Tea				50,371	580,486	9
Coconut oil				33,485	142,586	23
Copra				21,610	259,892	8
Groundnuts				23,857	206,824	12
Groundnut oil				13,074	114,298	11
Palm oil				66,071	195,053	34
Alumina	27,075	179,620	15			
Bauxite	29,918	186,630	16			
Copper	368,283	2,076,900	18			
Iron ore	95,104	820,180	12			
Manganese ore	10,213	112,200	9			
Phosphate rock	72,689	244,090	30			
Timber	148,157	1,019,200	15			
Tin	51,431	558,560	9			

1/ Data adjusted by IMF world export price index, 1970=100.

CASE 1:



P_o = Original equilibrium price before buffer stocking activity

P_N = New equilibrium price after buffer stocking activity

Q_o = Quantity exported by producers and available for consumers and buffer stocking

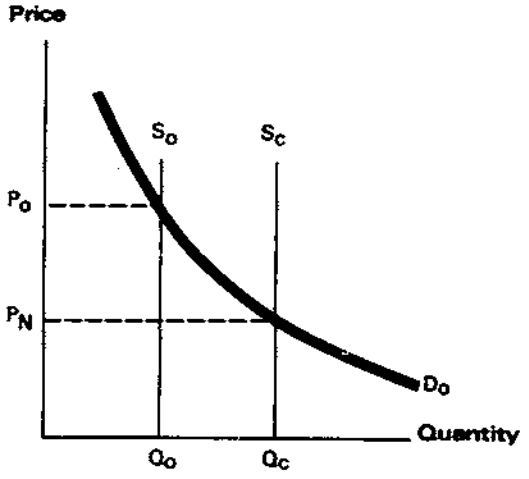
Q_c = Quantity available to consumers after quantity Q_o-Q_c withdrawn from market for buffer stocks

D_o = Consumers' demand for various quantities supplied

D_T = Consumers' plus buffer stock demand for various quantities supplied

Whenever export earnings are below or above the minimum or maximum export earnings trend, respectively, let the minimum or maximum export earnings trend be the target value (TV). In this case, the target value is the minimum export earnings trend for some given year. Therefore, if TV and Q_o are known, P_N can be determined, that is, $P_N = TV/Q_o$. This equality assumes the central buffer stocking authority will bid for the quantity it desires in the open market as if the authority was just another consumer. Then P_N-P_o=ΔP. Assuming the elasticity of import demand (η) is known, then $\Delta Q = Q_o - Q_c$ can be determined where the change in quantity is the amount of the commodity withdrawn from the market by the central authority and placed in a buffer stockpile. If $\eta = \Delta Q/\Delta P \cdot P_o/Q_o$ then $\Delta Q = \eta \cdot \Delta P \cdot Q_o/P_o$. Thus, producers' export earnings equaled $(P_o \cdot Q_o)$ before the buffer stock operations, and $(P_N \cdot Q_o)$ after the buffer stock operation.

CASE 2:



P_o = Original equilibrium price before buffer stocking activity

P_N = New equilibrium price after buffer stocking activity

Q_o = Quantity exported by producers and available for consumers and buffer stocking

Q_c = Quantity available to consumers after quantity $Q_c - Q_o$ is placed on the market from the buffer stock

D_o = Consumers' demand for quantities supplied

In this case, the target value is the maximum export earnings trend for any given year. The variables P_N, ΔP, and ΔQ are determined by following the same procedure as described in case 1. In case 2, ΔQ is the amount of the commodity withdrawn from the buffer stockpile and sold in the market by the central authority. Thus, producers' export earnings equaled $P_o \cdot Q_o$ before the buffer stock operations and $P_N \cdot Q_o$ after the buffer stock operations.

Unit Value Stabilization

With unit value stabilization, P_N is known a priori, since P_N is either the minimum or maximum target price. Thus, ΔQ is the only unknown variable and can be determined from the equation $\Delta Q = \eta \cdot \Delta P \cdot Q_o / P_o$.

Import Demand Elasticities

As demand elasticities approach -1, a buffer stock plan will become an increasingly cumbersome mechanism for stabilizing prices, and will be unnecessary in stabilizing earnings due to changes in supply. With a demand elasticity equal to 1,

increases in supply that would cause a 10-percent drop in prices would increase the quantity sold about 10 percent, and leave total revenue or export earnings unchanged. With a demand price elasticity that approaches one, such as -.75, increasing export earnings by 1 percent would require a purchase of 3 percent of exports and a price increase of 4 percent. Such large purchases for so little price change seems to be a very undesirable consequence for the small increase in export earnings achieved. For the generalized supply and demand situation, price instability is increased (a) as supply and demand schedules become more inelastic, and (b) the more such schedules shift.

As stated earlier, the import demand curves were assumed to have constant price elasticity (table 6). These elasticities are estimates of world demand price elasticities. Since import demand prices are usually more elastic, then, they may be underestimated here. If true, this will result in an underestimation of the investment requirements in buffer stocks. The simple method used in this study allows quick determination of the change in stocks investment when the elasticity is changed. If the elasticity is reduced by one-half, such as -.5 to -.25, then the stocks investment for that commodity is reduced by one-half.

Table 6--World import demand-price elasticities

Commodity	Elasticity
Cocoa	-0.40
Coffee	-0.25
Cotton	-0.35
Hemp	-0.30
Jute	-0.50
Manila	-0.30
Rubber	-0.40
Sisal	-0.30
Sugar	-0.70
Tea	-0.30
Copper	-0.45
Tin	-0.10

Methodology Used to Compute Values

Estimates of the storage costs and the cost of transferring commodities into and out of storage were obtained from the UNCTAD Secretariat's calculation (13). An approximate average of the Secretariat's high and low estimates of costs for each commodity was used.

It was assumed in each of the buffer stock operations that there were no beginning stocks. This assumption was then relaxed to determine the beginning investment needed to stabilize prices and export earnings within the predetermined minimum and maximum ranges. It should be noted that if fluctuations in earnings or prices are stabilized about the linear trend line, the plus and minus deviations will balance out.

The cumulative investment in stocks plus cost of holding those stocks were calculated for each commodity annually during 1961-75. In other calculations, actual world

stocks of any consequences, such as coffee, copper, cotton, rubber, sugar, and tin that were held each year during 1961-75, were added to the buffer stock investments to determine what size investment would have been needed to initiate and maintain the IPC. The actual world stocks were added in since it appears reasonable to assume that if an international buffer stock operation is to work successfully, it must have control of world stocks. This addition of actual world stocks held in calculating capital requirements is noticeably absent in the UNCTAD study as well as in Behrman's.

The control of the world stocks may either be in the form of direct ownership by the central authority or through the use of special agreements with the national governments which control the stocks. In an effort to determine what the maximum investment requirement to the central authority would be, however, complete ownership of existing world stocks was assumed.

The stocks of each of the commodities were valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by the export earnings or price stabilization schemes. This same average price was also applied to the actual world stocks to obtain a comparable value for them. This method of valuing the stocks was chosen for three reasons: (1) An average was used to modify year-to-year fluctuations, (2) the number of years for the average was limited and kept as recent as possible so as to determine what the cost of initiating the IPC today would be, based on recent historical data, and (3) the new generated prices were used to value the stocks, since these would be the relevant prices if the IPC should begin operating.

An advantage of an alternative calculation of buffer stocks (valued at their respective buying and selling price each year whenever stock changes occurred) would be the determination of any profit or loss generated by the IPC's operation. Unless there was a fairly steep uptrend or downtrend, however, profits and losses would not be large. Yet, it does seem appropriate to include in any future analysis the calculation of profits and losses that are generated through buffer stock activity.

Compensatory Financing Costs

Developing countries' compensatory financing costs for the nonstockable commodities reached a yearly maximum cost of $631 million (1970 dollars) in 1974 (table 7). If developing countries receive compensatory financing for all the commodities, both stockable and nonstockable, then the maximum cost in any year would have occurred in 1975, when it was $1.7 billion. However, this figure excludes metals, minerals, and timber.

Export Earnings Stabilization Capital Requirements

The maximum investment in stocks when export earnings were stabilized, with no beginning stocks, was $5.8 billion in 1975 (table 8). This was a result of a gradual upward trend in the cumulative investment. Sugar and copper required the largest stocks investment--$2.8 and $2.2 billion, respectively. This meant that the remaining 10 commodities required an investment of less than $1 billion. During 1961-75, sugar and copper consistently accounted for at least 80 percent of the total investment in stocks; however, the maximum investment requirements for sugar and copper occur at different times during the 15-year period.

Since there were no beginning stocks, earnings sometimes exceeded the maximum range. If export earnings were to be completely stabilized $\pm$ 2.5 percent about the trend, a beginning stockpile costing $2.1 billion would be needed. Sugar required the biggest beginning inventory of $1.6 billion.

If actual stocks for coffee, copper, cotton, rubber, sugar, and tin were included for each year, then a gradual uptrend during 1961-74 occurred, resulting in a maximum

Table 7--Developing countries' compensatory financing cost for UNCTAD commodities when earnings are stabilized ± 2.5 percent about the trend, 1961-75

(1970 dollars)

Commodity	1961	1962	1963	1964	1965	1966	1967	1968
				Million dollars				
Bananas	23.9	40.0	33.3	34.6	0	-29.6	-34.7	-63.1
Beef	92.0	60.3	0	-33.7	-20.0	-8.8	48.3	62.4
Cocoa	0	0	0	0	42.0	111.1	0	-148.7
Coffee	248.5	183.1	86.5	-129.4	0	-57.5	0	-237.7
Cotton	155.3	78.4	-53.4	1/ 0	-27.4	-54.0	83.9	-7.1
Hemp	1.4	-.2	-1.6	-1.3	0	.4	.1	.4
Jute	0	17.8	30.7	25.4	-2.6	-68.9	-50.5	-16.7
Manila	1/ 0	2.6	-10.0	-9.2	0	2.3	6.4	7.1
Rubber	-42.3	-46.8	0	10.8	2.2	0	173.6	104.7
Sisal	17.7	0	-61.0	-48.9	1.8	10.9	30.5	31.4
Sugar	-596.8	-61.8	-388.1	-228.6	73.9	261.6	267.3	396.9
Tea	63.7	16.6	0	0	-13.5	0	-46.6	-43.0
Coconut oil	18.6	9.4	-5.4	-18.1	-15.0	-5.1	16.3	-29.3
Copra	6.1	28.4	0	0	-25.0	-13.7	6.9	-42.0
Groundnuts	30.2	1.0	0	0	-2.2	-37.2	-4.5	-25.3
Groundnut oil	15.5	-3.8	0	0	-7.0	-8.7	-2.3	-2.1
Palm oil	-74.4	-32.6	-15.9	-8.7	-9.7	3.6	56.7	83.2
Alumina	-27.1	-14.6	25.9	34.8	10.4	10.3	-6.1	0
Bauxite	18.2	14.1	18.8	17.3	.4	-45.6	-36.9	-9.1
Copper	1.5	28.7	198.6	284.9	106.1	-212.7	-71.7	-263.5
Iron ore	64.2	76.2	44.8	-23.5	-48.3	-22.0	0	-11.0
Manganese ore	0	.1	8.5	0	-12.4	-15.2	1.5	0
Phosphate rock	-2.2	0	-3.4	-20.7	-9.3	-12.8	0	0
Timber	-62.9	-1.4	-24.1	0	29.9	54.1	90.7	0
Tin	-22.9	58.0	66.0	4.0	-52.9	-16.4	-15.6	-7.4
Total cost of stockable commodities 4/	528.1	385.2	381.8	325.1	331.8	386.3	561.8	540.5
Total cost of non-stockable commodities	268.7	229.5	131.3	90.7	40.7	68.0	220.4	145.6
Total cost	796.8	614.7	513.1	415.8	372.5	454.3	782.2	686.1

Continued--

See footnotes at end of table

Table 7--Developing countries' compensatory financing cost for UNCTAD commodities when earnings are stabilized ± 2.5 percent about the trend, 1961-75--Continued

(1970 dollars)

Commodity	1969	1970	1971	1972	1973	1974	1975
				Million dollars			
Bananas	-58.7	-16.4	-43.8	-54.5	0	111.9	69.9
Beef	-30.6	-55.8	-57.3	-360.1	-258.4	225.2	364.9
Cocoa	-148.7	-155.0	0	85.5	56.8	-1.4	15.8
Coffee	-49.9	-465.1	-25.9	-194.4	-385.4	449.5	650.4
Cotton	-165.1	-51.6	-47.5	-197.9	-102.3	168.0	325.5
Hemp	.5	.6	.2	.2	1/ 0	2/-.4	2/-.5
Jute	-17.7	0	0	-13.9	3.2	28.1	43.6
Manila	3.8	2.5	2.8	2.0	-2.1	-10.9	-.4
Rubber	-219.9	-44.9	76.3	201.3	-331.0	-146.8	200.7
Sisal	26.7	23.9	29.4	18.4	-22.0	-73.9	0
Sugar	494.1	292.0	425.0	441.7	319.5	-696.9	-1,197.9
Tea	2.1	-34.9	-24.4	-28.7	39.1	80.7	6.5
Coconut oil	29.1	-9.0	-1.6	39.2	19.1	-76.9	31.1
Copra	5.7	12.7	0	13.4	-2.0	0	0
Groundnuts	-30.4	7.6	25.5	18.5	0	9.6	0
Groundnut oil	16.3	-.3	18.7	-21.3	2.3	-3.1	4.9
Palm oil	82.7	33.3	0	48.8	28.9	-111.3	90.8
Alumina	-18.6	-25.1	-17.3	-3.1	47.2	0	--3/
Bauxite	-30.1	-8.5	-14.2	5.9	27.5	35.0	--3/
Copper	-657.6	-488.4	311.0	448.0	7.8	102.7	--3/
Iron ore	-80.8	-153.0	-37.0	26.4	55.2	141.2	--3/
Manganese ore	13.7	3.5	-7.8	2.9	1.9	-3.5	--3/
Phosphate rock	17.2	47.0	64.1	65.9	59.3	-201.1	--3/
Timber	-38.8	0	73.7	99.1	-388.1	108.2	--3/
Tin	-48.9	-23.8	14.8	10.2	58.3	0	--3/
Total cost of stockable commodities 4/	527.2	319.0	859.5	1,247.3	484.7	829.0	1,242.5
Total cost of non-stockable commodities	164.7	104.1	182.0	320.1	241.4	631.1	5/ 470.8
Total cost	691.9	423.1	1,041.5	1,567.4	726.1	1,460.1	5/ 1,713.3

The negative values are earnings accruing to countries above the 2.5 percent maximum range. Grants are made by the Common Fund when export earnings decline by more than 2.5 percent below the trend.

1/ Insignificant negative changes occurred for cotton and hemp and a positive change for manila. 2/ Meaningless since according to the trend line, earnings became negative. 3/ The earnings trend is for only 1961-74. 4/ Cocoa, coffee, cotton, hemp, jute, manila, rubber, sisal, sugar, tea, copper, and tin. 5/ Does not include the metals, minerals, and timber. The export earnings trends for these three groups are for only 1961-74.

Source: Actual earnings obtained from 1975 FAO Trade Tape and Commodity Trade and Price Trends (1976 Edition). Report No. EC-166/76, World Bank, Aug. 1976.

Table 8--Required cumulative capital investment in stocks necessary in a buffer stock operation if earnings are stabilized ± 2.5 percent about the trend, 1961-75 1/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Total
						Million dollars							
1961	0	55.6	0	0.2	9.4	0	0	4.4	0	10.7	517.6	6.3	604.2
1962	0	96.5	41.8	0	17.1	0.4	0	4.4	0	14.7	1,085.8	15.4	1,275.7
1963	0	117.7	41.8	0	31.8	0	0	0	0	14.7	1,808.7	24.2	2,037.9
1964	0	90.6	40.6	0	42.2	0	7.2	0	0	14.7	1,828.9	22.8	2,047.0
1965	26.8	90.6	40.6	.2	31.2	0	9.6	1.4	168.7	13.3	1,587.3	12.3	1,982.0
1966	93.5	78.2	40.6	.4	4.0	.6	9.6	6.0	683.1	13.3	1,171.7	11.2	2,112.2
1967	93.5	80.4	60.6	.7	0	2.6	13.8	19.7	1,298.0	4.7	1,087.8	11.2	2,723.0
1968	83.1	32.2	54.5	.7	6.2	4.7	102.0	34.2	2,016.7	0	779.5	9.8	3,123.6
1969	34.7	24.9	75.1	.7	12.8	5.8	47.3	45.4	2,713.8	0	228.5	4.9	3,193.9
1970	0	0	77.6	.7	12.8	6.5	38.5	57.9	3,172.5	0	0	0	3,366.5
1971	0	0	52.1	.7	12.8	7.1	69.5	73.8	3,655.2	0	148.6	0	4,019.8
1972	48.4	0	0	.5	7.7	7.5	59.2	81.8	3,903.9	0	456.0	1.4	4,666.4
1973	73.2	0	0	.2	9.6	6.9	55.7	75.4	4,083.7	11.3	140.5	4.6	4,461.1
1974	70.6	121.3	0	.5	32.4	4.7	.3	62.5	3,526.2	49.3	77.8	0	3,945.6
1975	75.9	342.1	160.6	.5	65.7	4.1	93.3	62.5	2,770.0	59.9	2,151.4	22.8	5,808.8

1/ Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by export earnings stabilization. Export earnings are not fully stabilized due to insufficient beginning stocks.

investment in 1975 of $12.2 billion (table 9). The world carryover of these six commodities in 1975 was $7.8 billion (table 10). The investment in actual world coffee stocks in 1975 amounted to $2.2 billion, and had been as high as $3.8 billion. Cotton stocks were $3 billion in 1975, and had been as high as $4.1 billion. Copper, rubber, sugar, and tin were also significant.

Unit Value Stabilization Capital Requirements

The results from unit value stabilization are very similar to those obtained from export earnings stabilization. The maximum investment in stocks when unit values were stabilized with no beginning stocks was $5.1 billion (table 11). Again, as under export earnings stabilization, sugar and copper accounted for at least 80 percent of the needed investment every year during 1961-75. An investment in beginning stocks of $1.4 billion was needed to completely stabilize unit values $\pm$ 5 percent about the trend (table 12). A beginning investment in sugar stocks of $1.27 billion was needed. The remaining 11 commodities required a combined beginning investment of only $160 million.

Sugar stocks of $2.4 billion in 1975 were well below the peak of $3.4 billion reached in 1973, yet still constituted nearly half the total stock investment for the 12 commodities in 1975. Copper at $2.2 billion in 1975, or 40 percent of the total fund, was the other dominant stock investment. The two made up almost 90 percent of the total, with only $600 million invested in the other 10 commodities.

With actual world stocks added in, buffer stock investment reached a peak of $11.7 billion in 1975 (table 13). The smallest investment of $7.5 billion occurred in 1961, the first year. Table 14 shows the value of actual world stocks based on the average of 1973-75 unit values (1970 dollars) as established by unit value stabilization. The results for unit value stabilization vary little from those for export earnings stabilization.

The sugar unit value peak in 1975 appeared to reflect a large amount of inflationary speculation. Had a buffer stock operation been in effect, this speculation would probably not have occurred. Thus, inclusion of the 1975 unit value probably presents an upward bias in the trend line. The sugar unit value trend line was therefore recalculated for 1961-74 (table 15 and fig. 2).

The adjusted sugar unit value trend reduced the large accumulation of sugar centering on 1973 by about 50 percent. In 1974, when the copper investment was small, total investment for the 12 commodities was $1.7 billion, of which $1.1 billion was sugar.

The total investment for the 10 commodities other than sugar and copper is surprisingly low if stabilization of year-to-year variations in prices is one's goal. Under these simplified assumptions, there is little buildup of stocks, and the costs are correspondingly light. This results from the simplifying assumption that price could be stabilized with the IPC without affecting the large stock accumulation in other hands.

As stated previously, the maximum investment required for the 12 commodities during 1961-75 was $5.1 billion when using a Common Fund. If there had been no Common Fund and each commodity had its own agreement, then the maximum investment required for unit value stabilization would have been $6.4 billion (table 16). If copper and sugar were excluded, then the maximum investment would have been $788 million, as compared to $605 million with a Common Fund.

Table 9--Required cumulative capital investment in stocks including world carryover stocks needed in a buffer stock operation if earnings are stabilized ± 2.5 percent about the trend, 1961-75 1/
(1970 dollars)

Year	Cocoa	Coffee			Cotton			Hemp	Jute	Manila	Rubber		
		Buffer requirement	Carryover 2/	Net	Buffer requirement	Carryover	Net				Buffer requirement	Carryover	Net
	Million dollars												
1961	0	55.6	2,916.7	2,972.3	-4.2	2,599.1	2,594.9	0.2	9.4	0	-15.7	3/316.1	3/300.4
1962	0	96.5	3,179.9	3,276.4	37.6	3,047.6	3,085.2	0	17.1	.4	-26.8	316.1	289.3
1963	0	117.7	3,144.8	3,262.5	37.6	3,403.9	3,441.5	0	31.8	0	-26.8	316.1	289.3
1964	0	90.6	3,127.2	3,217.8	36.4	3,773.0	3,809.5	0	42.2	0	-19.6	341.0	321.4
1965	26.8	90.6	3,017.6	3,108.2	36.4	4,129.3	4,165.7	.2	31.2	0	-17.2	350.7	333.5
1966	93.5	78.2	3,785.1	3,863.3	36.4	3,575.4	3,611.8	.4	4.0	.6	-17.2	353.6	336.4
1967	93.5	80.4	3,574.6	3,655.0	46.4	3,008.2	3,054.6	.7	0	2.6	37.0	381.7	418.7
1968	83.1	32.2	3,526.3	3,558.5	40.3	3,034.2	3,074.5	.7	6.2	4.7	75.2	375.6	450.8
1969	34.7	24.9	3,131.6	3,156.5	60.9	2,823.4	2,884.3	.7	12.8	5.8	20.4	413.9	434.3
1970	0	-63.6	2,864.1	2,800.5	63.3	2,625.2	2,688.5	.7	12.8	6.5	11.7	457.5	469.2
1971	0	-65.8	2,394.8	2,329.0	37.8	2,783.4	2,821.2	.7	12.8	7.1	42.7	460.5	503.2
1972	48.4	-108.2	2,407.9	2,299.7	-16.1	3,113.6	3,097.5	.5	7.7	7.5	132.4	443.4	575.8
1973	73.2	-196.1	2,451.8	2,254.9	-134.9	3,285.1	3,150.2	.2	9.6	6.9	28.9	494.5	523.4
1974	70.6	-75.4	1,793.9	1,718.5	-134.9	3,997.2	3,862.3	.5	32.4	4.7	-26.5	495.1	468.6
1975	75.7	145.4	3/2,162.3	2,307.7	25.7	2,968.2	2,993.9	.5	65.7	4.1	66.5	491.2	557.7

Year	Sisal	Sugar			Tea	Copper			Tin			Total
		Buffer requirement	Carryover	Net		Buffer requirement	Carryover 4/	Net	Buffer requirement	Carryover	Net	
	Million dollars											
1961	4.4	-653.6	694.8	41.2	10.7	517.6	378.1	895.7	6.3	257.2	263.5	7,092.7
1962	4.4	-736.3	814.7	78.4	14.7	1,085.8	436.8	1,522.6	15.4	241.1	256.5	8,554.4
1963	0	5/-910.0	910.0	0	14.7	1,807.7	431.7	2,239.4	24.2	169.6	193.8	9,473.0
1964	0	5/-1,008.6	1,008.6	0	14.7	1,828.9	296.2	2,125.1	22.8	175.2	198.0	9,728.7
1965	1.4	-839.9	1,103.9	264.0	13.3	1,587.3	355.9	1,943.2	12.3	191.7	204.0	10,091.5
1966	6.0	-325.5	955.8	630.3	13.3	1,171.7	329.6	1,501.3	11.2	200.6	211.8	10,272.7
1967	19.7	289.4	804.2	1,093.6	4.7	1,087.8	300.3	1,388.1	11.2	219.7	230.9	9,962.1
1968	34.2	1,008.1	811.1	1,819.2	0	779.5	341.7	1,121.2	9.8	282.1	291.9	10,445.0
1969	45.4	1,705.2	754.8	2,460.0	0	228.5	257.8	486.3	4.9	203.2	208.1	9,728.9
1970	57.9	2,163.9	701.8	2,865.7	0	-69.7	439.8	370.1	-1.4	175.9	174.5	9,446.4
1971	73.8	2,646.6	744.1	3,390.7	0	78.9	435.7	514.6	-1.4	197.3	195.9	9,849.0
1972	81.8	2,895.3	832.4	3,727.7	0	386.2	520.7	906.9	0	220.1	220.1	10,973.6
1973	75.4	3,075.1	878.2	3,953.3	11.3	70.8	280.0	350.8	3.2	178.7	181.9	10,591.1
1974	62.5	2,517.6	1,068.6	3,586.2	49.3	8.1	606.6	614.7	-5.6	173.4	167.8	10,638.1
1975	62.5	1,761.4	793.5	2,554.9	59.9	2,081.7	1,118.2	3,199.9	17.2	274.7	291.9	12,174.4

1/ Stocks of each commodity valued at the average of their respective new prices (1970 dollars) that were generated by export earnings stabilization. 2/ These stocks were ending stocks for the crop year ending in the stated calendar year. 3/ Estimate. 4/ These stocks were approximately 90 percent of the free world refined copper stock. 5/ For full stabilization, a buffer requirement of -1,235.6 and -1.617.8 million dollars for 1963 and 1964, respectively, was needed.

Table 10--Actual world carryover stocks using export earnings stabilization valuation, 1961-75 1/

(1970 dollars)

Year	Coffee 2/	Cotton	Rubber	Sugar	Copper 3/	Tin	Total
			Million dollars				
1961	2,916.7	2,599.1	4/ 316.1	694.8	378.1	257.2	7,162.0
1962	3,179.9	3,047.6	316.1	814.7	436.8	241.1	8,036.2
1963	3,144.8	3,403.9	316.1	910.0	431.7	169.6	8,376.1
1964	3,127.2	3,773.0	341.0	1,008.6	296.2	175.2	8,721.2
1965	3,017.6	4,129.3	350.7	1,103.9	355.9	191.7	9,149.1
1966	3,785.1	3,575.4	353.6	955.8	329.6	200.6	9,200.1
1967	3,574.6	3,008.2	381.7	804.2	300.3	219.7	8,288.7
1968	3,526.3	3,034.2	375.6	811.1	341.7	282.1	8,371.0
1969	3,131.6	2,823.4	413.9	754.8	257.8	203.2	7,584.7
1970	2,864.1	2,625.2	457.5	701.8	439.8	175.9	7,264.3
1971	2,394.8	2,783.4	460.5	744.1	435.7	197.3	7,015.8
1972	2,407.9	3,113.6	443.4	832.4	520.7	220.1	7,538.1
1973	2,451.8	3,285.1	494.5	878.2	280.0	178.7	7,568.3
1974	1,793.9	3,997.2	495.1	1,068.6	606.6	173.4	8,134.8
1975	4/2,162.3	2,968.2	491.2	793.5	1,118.2	274.7	7,808.1

1/ Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

2/ These stocks were ending stocks for the crop year ending in the stated calendar year.

3/ These stocks were approximately 90 percent of the free world refined copper stock.

4/ Estimate.

Table 11--Required cumulative capital investments in stocks necessary in a buffer stock operation if unit values are stabilized ± 5 percent about the trend, 1961-75 1/ 2/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Total
						Million dollars							
1961	0	23.5	0	0.2	0	0	0	0	0	2.5	580.3	8.1	614.6
1962	0	52.3	0	.2	3.0	0	0	0	0	2.5	1,115.3	14.9	1,188.2
1963	0	90.9	0	.2	36.9	0	0	0	0	2.5	1,646.6	21.6	1,798.7
1964	0	57.2	0	.2	45.4	0	0	0	0	2.5	1,646.6	17.9	1,769.8
1965	89.6	42.1	0	.1	45.4	0	0	.8	100.7	2.5	1,360.2	7.4	1,648.8
1966	155.5	42.1	0	0	45.4	.6	0	5.5	432.7	2.5	899.5	3.0	1,586.8
1967	155.5	42.1	0	0	45.4	2.0	27.1	16.6	1,010.9	1.1	818.8	3.0	2,122.5
1968	138.9	39.2	0	0	37.8	3.3	64.6	31.7	1,657.8	1.1	561.6	3.0	2,539.0
1969	76.2	39.2	0	0	30.9	3.6	46.3	42.4	2,104.2	1.1	280.1	3.0	2,627.0
1970	30.7	0	0	.1	28.0	3.6	46.3	61.9	2,590.0	1.1	0	3.0	2,764.7
1971	30.7	0	0	.1	23.1	3.6	70.2	81.0	2,994.0	0	55.7	3.0	3,261.4
1972	98.6	0	0	0	13.1	3.9	129.8	92.6	3,213.0	0	345.9	4.7	3,901.6
1973	105.6	0	0	0	13.4	3.9	60.5	89.5	3,449.7	7.0	203.8	5.4	3,938.8
1974	105.6	59.5	0	.3	35.6	2.8	5.9	78.0	3,116.9	33.0	304.4	0	3,742.0
1975	105.6	230.3	75.1	.3	45.9	2.7	25.4	74.7	2,371.4	33.0	2,153.1	12.8	5,130.3

1/ Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

2/ Unit values are not fully stabilized due to insufficient beginning stocks.

Table 12--Required cumulative capital investment in stocks needed to fully stabilize unit values ± 5 percent about the trend, 1961-75 1/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Total
						Million dollars							
Beginning stocks required	0	79.8	31.5	0	8.4	1.8	3.6	22.0	1,274.2	4.6	6.5	1.0	1,433.9
1961	0	103.6	31.5	.2	0	.9	0	22.0	1,021.9	7.1	586.8	9.1	1,783.1
1962	0	132.4	31.5	.2	3.0	.9	0	22.0	1,021.9	7.1	1,121.8	15.9	2,356.7
1963	0	170.6	31.5	.2	36.9	.8	0	10.2	497.7	7.1	1,653.1	22.6	2,430.7
1964	0	136.7	31.5	.2	45.4	0	0	0	0	7.1	1,653.1	18.9	1,892.9
1965	89.6	121.6	31.5	.2	45.4	0	0	.8	100.7	7.1	1,366.7	8.4	1,772.0
1966	155.5	121.6	31.5	.1	45.4	.6	0	5.5	432.7	7.1	906.0	4.0	1,710.0
1967	155.5	121.6	31.5	.1	45.4	2.0	27.1	16.6	1,010.9	5.7	825.3	4.0	2,245.7
1968	138.9	118.7	31.5	.1	37.8	3.3	64.6	31.7	1,657.8	5.7	568.1	4.0	2,662.2
1969	76.2	118.7	31.5	.1	30.9	3.6	46.3	42.4	2,104.2	5.7	286.7	4.0	2,750.3
1970	30.7	35.1	31.5	.2	28.0	3.6	46.3	61.9	2,590.0	5.7	0	4.0	2,837.0
1971	30.7	33.1	31.5	.2	23.1	3.6	70.2	81.0	2,994.0	3.5	55.7	4.0	3,330.6
1972	98.6	25.2	9.4	0	13.1	4.0	129.8	92.6	3,213.0	0	345.9	5.7	3,937.3
1973	105.6	0	9.4	0	13.4	4.0	60.5	89.5	3,449.7	7.0	203.8	6.4	3,949.3
1974	105.6	59.1	0	.3	35.6	2.8	5.9	78.0	3,116.7	33.0	304.4	0	3,741.4
1975	105.6	230.0	75.1	.3	45.9	2.7	25.4	74.7	2,371.4	33.0	2,153.1	12.8	5,130.0

1/ Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

Table 13--Required cumulative capital investment in stocks including world carryover stocks needed in a buffer stock operation if unit values are stabilized ± 2.5 percent about the trend, 1961-74 1/

(1970 dollars)

Year	Cocoa	Coffee			Cotton			Hemp	Jute	Manila	Rubber		
		Buffer requirement	Carryover 2/	Net	Buffer requirement	Carryover	Net				Buffer requirement	Carryover	Net
						Million dollars							
1961	0	24	2,877	2,901	0	2,615	2,615	0.2	0	0	-4	3/310	306
1962	0	53	3,137	3,190	0	3,067	3,067	.2	0	0	-4	310	306
1963	0	91	3,102	3,193	0	3,426	3,426	.2	34	0	-4	310	306
1964	0	57	3,085	3,142	0	3,797	3,797	.2	43	0	-4	334	330
1965	90	42	2,977	3,019	0	4,156	4,156	.2	43	0	-4	344	340
1966	155	42	3,734	3,776	0	3,598	3,598	.1	43	1	-4	347	343
1967	155	42	3,526	3,568	0	3,017	3,017	.1	43	2	24	374	398
1968	139	39	3,479	3,518	0	3,054	3,054	.1	35	3	61	368	429
1969	76	39	3,089	3,128	0	2,842	2,842	.1	28	4	43	406	449
1970	30	-45	2,825	2,780	0	2,642	2,642	.2	25	4	43	449	492
1971	30	-47	2,362	2,315	0	2,801	2,801	.2	20	4	67	452	519
1972	98	-55	2,375	2,320	-22	3,134	3,112	0	10	4	126	435	561
1973	105	-80	2,419	2,339	-22	3,306	3,284	0	10	4	57	485	542
1974	105	-21	1,770	1,749	-32	4,023	3,991	.3	33	3	2	486	488
1975	105	150	4/2,133	2,283	44	2,987	3,031	.3	43	3	22	482	504

Year	Sisal	Sugar			Tea	Copper			Tin			Total
		Buffer requirement	Carryover	Net		Buffer requirement	Carryover	Net	Buffer requirement	Carryover	Net	
						Million dollars						
1961	0	-253	717	464	3	580	391	971	8	248	256	7,516
1962	0	-253	840	587	3	1,115	451	1,566	15	232	247	8,964
1963	0	-777	939	162	3	1,647	446	2,093	22	164	186	9,403
1964	0	5/-1,040	1,040	0	3	1,647	306	1,953	18	169	187	9,455
1965	1	5/-939	1,139	200	3	1,360	368	1,728	7	185	192	9,772
1966	6	-607	986	379	3	900	340	1,240	3	193	196	9,740
1967	17	-29	830	801	1	819	310	1,129	3	212	215	9,346
1968	32	618	837	1,455	1	562	353	915	3	272	275	9,856
1969	43	1,064	779	1,843	1	280	266	546	3	196	199	9,159
1970	62	1,550	724	2,274	1	-7	454	447	3	170	173	8,930
1971	81	1,954	768	2,722	0	49	450	499	3	190	193	9,184
1972	93	2,174	859	3,033	0	340	538	878	5	212	217	10,326
1973	90	2,410	906	3,316	7	198	289	487	5	172	177	10,361
1974	78	2,077	1,102	3,179	33	299	627	926	-1	167	166	10,751
1975	75	1,331	819	2,150	33	2,148	1,155	3,303	12	265	177	11,707

1/ Stocks of each commodity valued at the average of their respective new prices (1970 dollars) that were generated by export earnings stabilization. 2/ These stocks were ending stocks for the crop year ending in the stated calendar year. 3/ These stocks were approximately 90 percent of the free world refined copper stock. 4/ Estimate. 5/ For full stabilization, a buffer requirement of -1,275 and -1,974 million dollars for 1964 and 1965, respectively, was needed.

Table 14--Actual world carryover stocks using unit value stabilization valuation, 1961-75

(1970 dollars)

Year	Coffee 1/	Cotton	Rubber	Sugar	Copper	Tin	Total
				Million dollars			
1961	2,877	2,615	2/310	717	391	248	7,158
1962	3,137	3,067	310	840	451	232	8,037
1963	3,102	3,426	310	939	446	164	8,387
1964	3,085	3,797	334	1,040	306	169	8,731
1965	2,977	4,156	344	1,139	368	185	9,169
1966	3,734	3,598	347	986	340	193	9,198
1967	3,526	3,017	374	830	310	212	8,269
1968	3,479	3,054	368	837	353	272	8,363
1969	3,089	2,842	406	779	266	196	7,579
1970	2,825	2,642	449	724	454	170	7,264
1971	2,362	2,801	452	768	450	190	7,023
1972	2,375	3,134	435	859	538	212	7,553
1973	2,419	3,306	485	906	289	172	7,577
1974	1,770	4,023	486	1,102	626	167	8,174
1975	3/2,133	2,987	482	819	1,155	265	7,841

Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

1/ These stocks were ending stocks for the crop year ending in the stated calendar year. 2/ These stocks were approximately 90 percent of the free world refined copper stock. 3/ Estimate.

Unit Value and Earnings Stabilization Related

With the imposition of export earnings stabilization, unit value fluctuations were reduced for all the stockable commodities except jute and hemp. Unit values were destabilized from a maximum fluctuation of ± 30 to ± 43 percent for jute, and from ± 17 to ± 20 percent for hemp (table 17). The maximum stabilization of unit value occurred for tea. Tea unit values were stabilized from a maximum fluctuation of ± 19 to ± 4 percent about the trend.

With the imposition of unit value stabilization, the maximum fluctuations in export earnings were reduced in all commodities except hemp, where the change was a negligible destabilization. The maximum fluctuation of sisal was reduced the most, from ± 100 to ± 18 percent about the trend. If the fluctuations in 1975 were eliminated for copper, sugar, and tin, the maximum fluctuation in earnings would be reduced appreciably for each.

The full carrying costs (storage, movement into and out of storage, and interest on capital) for each of the commodities varied between 8 and 12 percent, except for sugar, which fluctuated up to about 15 percent. The interest on capital was assumed to be 8 percent. The yearly carrying cost under unit value stabilization increased nearly every year, from $57 million in 1961 to $622 million in 1975 (table 18). This is comparable to the yearly carrying cost under earnings stabilization, which increased from $58 million in 1961 to $722 million in 1975 (table 19).

Table 15--Required cumulative capital investment in stocks needed to fully stabilize unit value ± 5 percent about the trend, 1961-75 1/

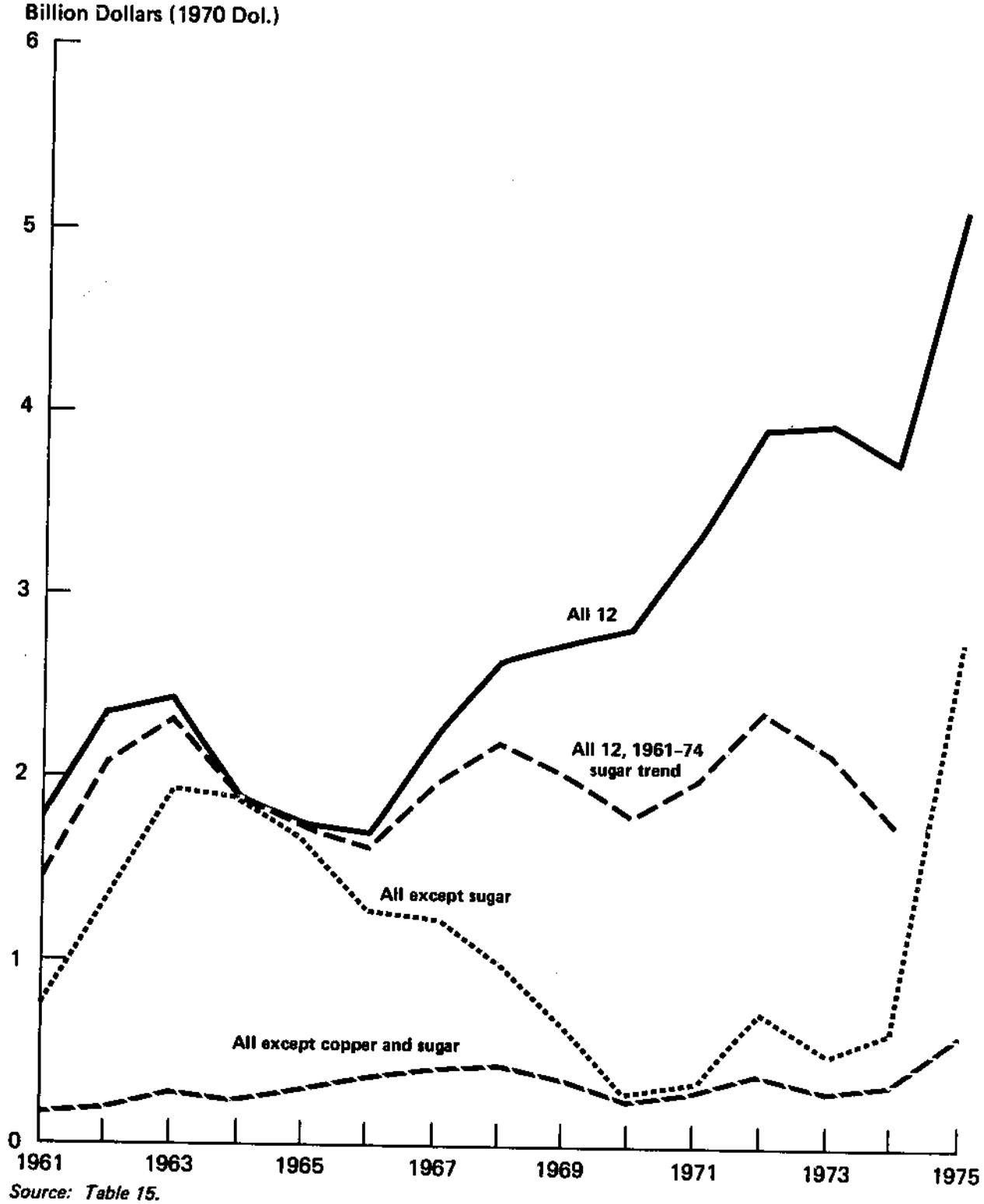
(1970 dollars)

Year	12 commodities using 1961-75 trend	Sugar using 1961-75 trend	Sugar using 1961-74 trend	12 commodities using 1961-74 sugar trend	Copper using 1961-75 trend	11 commodities, excluding sugar	11 commodities, excluding copper	10 commodities, excluding copper and sugar
				Million dollars				
Beginning stocks required	1,434	1,275	686	845	7	159	1,427	152
1961	1,783	1,022	683	1,444	587	761	1,196	174
1962	2,357	1,022	748	2,083	1,122	1,335	1,235	213
1963	2,431	498	380	2,313	1,653	1,933	778	280
1964	1,893	0	0	1,893	1,653	1,893	240	240
1965	1,772	101	100	1,771	1,367	1,671	405	304
1966	1,710	433	349	1,626	906	1,277	804	371
1967	2,246	1,011	751	1,986	825	1,235	1,421	410
1968	2,662	1,658	1,160	2,164	568	1,004	2,094	436
1969	2,750	2,104	1,374	2,020	287	646	2,463	359
1970	2,837	2,590	1,560	1,807	0	247	2,837	247
1971	3,331	2,994	1,649	1,986	56	337	3,275	281
1972	3,937	3,213	1,649	2,373	346	724	3,591	378
1973	3,949	3,450	1,649	2,148	204	499	3,745	295
1974	3,741	3,117	1,079	1,703	304	624	3,437	320
1975	5,130	2,371	---	---	2,153	2,759	2,977	606

-- = Not applicable.

1/ Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

Figure 2 - Investment requirement for unit value stabilization of 12 commodities



Source: Table 15.

Table 16--Maximum investment required for 12 independent commodity agreements, 1961-75

(1970 dollars)

Commodity	Investment
	Million dollars
Cocoa	155.5
Coffee	230.3
Cotton	75.1
Hemp	0.3
Jute	45.9
Manila	3.9
Rubber	129.8
Sisal	92.6
Sugar	3,449.7
Tea	33.0
Copper	2,153.1
Tin	21.6
Total	6,390.8

Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by unit value stabilization.

Table 17--Maximum + export unit value and earnings fluctuations about the trend, 1961-75

Commodity	P_o/price trend	P_N/price trend	Original real earnings/ earnings trend	New real earnings/ earning trend
	Percent			
Cocoa	38	19	25	15
Coffee	25	8	17	13
Cotton	13	11	18	1/ 16 (10)
Hemp	17	20	18	19
Jute	30	43	40	34
Manila	51	31	103	55
Rubber	27	13	37	18
Sisal	84	27	100	18
Sugar	2/ 49 (41)	16	2/ 42 (26)	3/ 28 (12)
Tea	19	4	4/ 21 (12)	12
Copper	54	12	2/ 64 (46)	14
Tin	25	11	2/ 27 (21)	13

P_o = original real unit value; P_N = new unit value generated by export earnings stabilization. New earnings = export earnings generated by unit value stabilization.

The numbers in parentheses are the second largest ± fluctuations. These percentages were included whenever there was a large difference between them and the largest ± fluctuation.

1/ The largest fluctuation occurred in 1973. 2/ The largest fluctuation occurred in 1975. 3/ The largest fluctuation occurred in 1961. 4/ The largest fluctuation occurred in 1974.

Table 18--Carrying and transfer cost of buffer stocks if unit values are stabilized ± 5 percent about the trend, 1961-75 1/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Total
						Million dollars							
1961	0	2.3	0	0	0	0	0	0	0	0.2	54.0	0.6	57.1
1962	0	5.0	0	0	0.6	0	0	0	0	.2	100.7	1.2	107.7
1963	0	8.6	0	0	6.1	0	0	0	0	.2	147.2	1.7	163.8
1964	0	5.2	0	0	6.3	0	0	0	0	.2	144.5	1.4	157.6
1965	9.0	3.8	0	0	6.0	0	0	0	17.7	.2	119.4	.6	156.7
1966	14.8	3.8	0	0	6.0	0	0	0.7	73.5	.2	79.0	.2	178.2
1967	14.3	3.8	0	0	6.0	0.2	3.2	2.3	167.2	.1	71.9	.2	269.2
1968	12.7	3.5	0	0	5.1	.3	7.4	4.3	267.4	.1	49.2	.2	350.2
1969	6.9	3.5	0	0	4.1	.4	4.9	5.4	330.9	.1	24.6	.2	381.0
1970	2.7	0	0	0	3.8	.4	4.9	8.0	405.8	.1	0	.2	425.9
1971	2.7	0	0	0	3.0	.4	7.9	10.3	465.6	0	5.2	.2	495.3
1972	9.6	0	0	0	1.7	.4	14.8	11.4	494.8	0	31.9	.4	565.0
1973	9.7	0	0	0	1.8	.4	6.3	10.7	531.2	.6	17.9	.4	579.0
1974	9.7	5.8	0	0	5.5	.3	.6	9.4	475.1	2.7	27.3	0	536.4
1975	9.7	22.1	7.6	0	6.5	.3	3.0	9.0	361.4	2.7	198.5	1.0	621.8

1/ Costs are for storage, movement into and out of storage, and 8-percent interest on capital requirements.

Table 19--Carrying and transfer cost of buffer stocks if export earnings are stabilized ± 2.5 percent about the trend, 1961-75 1/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Total
						Million dollars							
1961	0	5.4	0	0	1.5	0	0	0.7	0	1.1	48.3	0.5	57.5
1962	0	9.0	4.2	0	2.6	0	0	.6	0	1.4	98.6	1.2	117.6
1963	0	10.7	3.9	0	4.8	0	0	0	0	1.4	163.0	2.0	185.8
1964	0	8.2	3.8	0	5.8	0	0.9	0	0	1.4	161.1	1.9	183.1
1965	2.7	8.2	3.8	0	4.0	0	1.2	.2	30.3	1.2	139.7	1.0	192.3
1966	9.1	7.0	3.8	0	.5	0	1.2	.8	118.8	1.2	103.3	.9	246.6
1967	8.6	7.3	5.9	0.1	0	0.3	7.9	2.7	217.1	.4	103.8	.9	355.0
1968	7.6	2.9	5.1	.1	1.0	.7	13.3	4.6	331.8	0	68.6	.8	436.5
1969	3.2	2.2	7.2	.1	1.9	.7	5.8	5.8	440.1	0	20.1	.4	487.5
1970	0	0	7.3	.1	1.7	.7	4.7	7.3	506.1	0	0	0	527.9
1971	0	0	4.8	.1	1.7	.8	8.6	9.4	582.0	0	13.8	0	621.2
1972	4.8	0	0	0	.9	.9	19.5	10.1	615.3	0	41.8	.1	693.4
1973	6.9	0	0	0	1.3	.8	6.8	9.1	641.6	1.1	12.3	.4	680.3
1974	6.5	10.7	0	0	4.9	.6	0	7.5	550.4	4.7	6.8	0	592.1
1975	6.9	29.3	16.4	0	9.5	.5	11.6	7.5	432.3	5.5	200.5	1.9	721.9

1/ Costs are for storage, movement into and out of storage, and 8-percent interest on capital requirements.

Comparison of Compensatory Financing and Earnings Stabilization Costs

The cost of developing countries' compensatory financing exceeded the cost of unit value stabilization in every year but two (comparisons of table 7 and 18). The total cumulative cost of developing countries' compensatory financing during 1961-75 totaled $9 billion, whereas the total cumulative cost was $5 billion for unit value stabilization, and $6 billion for earnings stabilization. However, it is possible to reduce the cost of compensatory financing by requiring repayments of loans (instead of grants) by the developing countries when export earnings exceed a specified level.

SUGGESTIONS FOR FURTHER STUDY

Much more information needs to be generated about the costs of the IPC under different assumptions about different time periods, different degrees of stabilization desired, and the dynamic effects of buffer stock operations.

Changing the starting and/or ending years for the time trend and the number of years covered will usually change both the level and slope of the trend. Accordingly, the level of stock changes in each year would be altered. Eliminating the year 1975 from the price and earnings trend for sugar changed the level of investment required dramatically. Future studies should vary the starting and ending dates.

The width of the stabilizing band about the price or earnings trend will also greatly influence the level of stock changes and frequency of market intervention activity by the buffer stocking authority. The tighter the band, the more frequent intervention is required. The wider the band, the less frequent intervention is required.

Future studies should also establish confidence intervals on the stabilization of prices and earnings. Confidence intervals would allow capital requirement prediction with some level of confidence, such as 90 percent of the amount of stabilization accomplished with some specified level of capital. These intervals would indicate the tradeoff between capital requirements and degree of stabilization.

It was assumed in this study that the historical quantity exported by the exporting countries during a particular year was not altered by buffer stocking operations. Realistically with a stabilization program, producers would probably increase production and thus exports over time. With the use of production or export controls, it may be possible to prevent this supply increase. Export controls more likely would result in producing countries accumulating stocks of their own. These stocks would contribute more uncertainty to the operations of the buffer stock authority. The amount of stocks released into the market would depend not only on the import demand elasticity and the absolute level of quantities demanded and supplied at each price, but also on the export supply elasticity.

CONCLUSIONS

Both stabilization of prices and export earnings are mentioned as central aims of the IPC. But stabilization of the one does not necessarily stabilize the other. When both were tried for the various commodities, there were some differences in results, but the total requirements for the fund were about the same. For a majority of commodities, stabilization of either unit values or earnings resulted in some reduction in fluctuations for the other, but there was sometimes a destabilizing effect, such as for jute and hemp.

The capital requirements calculation most nearly comparable with the UNCTAD $6-billion estimate for unit value stabilization covers 1961-74, and is around $5 billion (1976 dollars). If 1975 is included in the trend, the estimate more than doubles to $11 billion (1976 dollars) because of the unusually high commodity prices in 1975. The principal investment is in sugar and copper stocks, with the rest of the commodities slightly exceeding $1 billion (1976 dollars) in total.

In our first round of calculations, as well as other studies, actual world carryovers of commodities by other entities are assumed to have no effect on price. Since a principal aim of such holdings was to affect price, the assumption that they did not is unrealistic. If existing world stocks held during the period are included, investment is again doubled to over $25 billion (1976 dollars).

Compensatory payments to developing countries to support export earnings reached a peak annual total of $1.4 billion (1976 dollars) for commodities with an annual average of about half this amount. If the stockables are included, peak payments rise to $3.75 billion (1976 dollars). Such payments have some advantages, such as their limited effect on the present pricing mechanism. They are not in favor with developing countries, since the possibility of obtaining and sustaining such payments seems unlikely, although compensatory loans are used by the IMF for its developing country members.

An analysis of changes in operating rules and in years selected for trend fitting revealed that a principal difference in estimates of capital requirements is in the interpretation of what is to be stabilized: (1) real prices or earnings at some base period, or (2) stabilization of prices about a past or long-term trend to approximate an equilibrium price. Since some commodities have downtrends, some have uptrends, and others vary in both directions, the results are quite different from simple stabilization at a given level.

As a rough approximation of an equilibrium price for the past 15 years, the OLS trend fitting of unit values and export earnings brought stabilization with moderate capital requirements, but had little effect upon the average level of unit values and export earnings. Gross transfers between producers and consumers were about equal (table 20). Behrman's large transfers, and minor price raising brought enormous capital requirements and stock accumulation.

The diversity in trends, cycles, and fluctuations of prices and earnings of the stockable commodities precludes parallel treatment or relatively general rules to improve each situation. For the few commodities with rising price trends, simple rules may often restrain prices and tend to benefit importers. For the majority of the stockable commodities which have declining price trends, buffer stock stabilization leads to difficulties. Stabilization of annual fluctuations about a downtrend is not very helpful in the long run. Stabilization of prices at a given level above the trend brings one-sided accumulation of stocks with little opportunity to sell, except at lower prices. To try to raise earnings by supporting prices of these commodities is a costly endeavor.

There is no agreement on the problem of the most appropriate or logical trend calculation. It is very clear that the years or system used to establish the trend bring about large variations in results obtained. As a consequence, there is no simple or logical trend selection system. A danger of this is that in the absence of a single, logical system for trend establishment, one may be chosen that will give huge benefits either to importers or exporters, depending on who gains control.

In real terms, prices and export earnings show great diversity in timing and amplitude of annual fluctuations. Among the stockable group, there were strong, declining, and irregular trends, short and long cycles, and small and large annual fluc-

Table 20--Export earnings effect from unit value stabilization, 1961-75 1/

(1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sisal	Sugar	Tea	Copper	Tin	Net	Total positive	Total negative
							Million dollars								
1961	0	101	0	1	-38	-4	-19	0	-258	17	844	64	708	1,027	-319
1962	0	121	0	0	10	0	0	0	0	0	796	54	981	981	0
1963	0	159	0	0	81	-1	0	-65	-703	0	783	-35	219	1,023	-804
1964	0	-173	0	0	24	-4	0	-53	-691	0	0	-40	-937	24	-961
1965	147	-74	0	0	0	0	0	3	94	0	-838	-126	-794	244	-1,038
1966	113	0	0	-1	0	2	0	14	295	0	-1,635	-47	-1,259	424	-1,683
1967	0	0	0	0	0	4	90	27	493	-8	-198	0	408	614	-206
1968	-43	-13	0	0	-25	4	115	34	560	0	-712	0	-80	713	-793
1969	-204	0	0	0	-22	1	-69	26	425	0	-799	0	-642	452	-1,094
1970	-136	-437	0	0	-8	0	0	40	481	0	-809	0	-869	521	-1,390
1971	0	-9	0	0	-13	0	65	38	423	-11	115	0	608	641	-33
1972	132	-34	-70	-1	-30	1	137	26	255	-15	536	15	952	1,102	-150
1973	16	-113	0	0	0	0	-233	-11	281	24	-362	8	-390	329	-719
1974	0	209	-29	1	33	-5	-164	-67	-559	73	207	-75	-376	523	-899
1975	0	514	184	0	16	0	40	-13	-1,604	0	1,986	104	1,227	2,844	-1,617
Net	25	251	85	0	28	-2	-38	-1	-508	80	-86	-78	-244	469	-713
Total positive	408	1,104	184	2	164	12	447	208	3,307	114	5,267	245	5,103	11,462	
Total negative	-383	-853	-99	-2	-136	-14	-485	-209	-3,815	-34	-5,353	-323	-5,460		-11,706

1/ Positive numbers are additional export earnings accruing to exporters as a result of unit value stabilization.

tuations. No simple rules will be appropriate for all of these, since the diagnoses of their problems are so varied.

Any established stabilization program should provide for a reevaluation of price levels so as to take into account permanent changes in demand, technology, and the like. In addition, this analysis, like most others, assumed knowledge of future prices in determining equilibrium. Without reliable forecasts, the opportunities for destabilizing prices are greater. Prices and earnings of the various stockable commodities occasionally rise 50 to 200 percent in a year or two, but they also may fall precipitately.

Principal elements, then, affecting capital fund requirements include:

(1) The years chosen for trend stabilization, and the sequence of good and bad harvests;

(2) Elasticity of supply and demand--the more inelastic supply or demand, the more the advantage of stabilization;

(3) The width of the band in which prices are stabilized--the wider the band, the cheaper it is to stabilize;

(4) The variability of prices--annual fluctuations, cycles, and sporadic changes in trends; and

(5) The level at which prices are set--stabilized prices that do not reflect long-term equilibrium conditions will result in no stocks or too large stocks at great costs.

Any study incorporating some or all of these changes will change the results obtained substantially. In analyzing any results, care must be taken to evaluate the desirability and efficacy of the costs involved.

Many considerations including those brought out in this study, suggest that the IPC and particularly the Common Fund buffer stock proposals may not be the most effective way to help developing countries develop. Prospects for their development may be more enhanced by reducing production of commodities and products with weak, declining demand, and increasing production of those with stronger, growing demands.

In addition, research and development efforts should be applied to those products with a growing demand that can be produced by the developing countries and for the developed countries to open their markets to receive them. Although this may be a difficult route requiring many adjustments, it may be a more promising one for the UNCTAD objective of favorable prices for an expanding volume of exports.

APPENDIX: HISTORY AND PROBLEMS OF INTERNATIONAL COMMODITY AGREEMENTS

by Eileen M. Manfredi and John W. Murray*

Commodity agreements in varying degrees of complexity and formality have been tried for many commodities in the twentieth century. However, there are few examples of working commodity agreements which have influenced world prices, production, or consumption for longer than a few years. The most common goal of a commodity agreement is to raise and/or stabilize export prices or total earnings, although increased consumption and productivity are also goals. In those agreements which have little enforcement powers, these latter goals become of paramount importance since technical research in other uses for primary products and in increasing production and reducing costs are not generally controversial. Commodity agreements which successfully stabilize prices may benefit both producers and consumers.

Commodity agreements attempt to affect world prices by influencing supply and demand for the benefit of both consumers and producers. Success is more likely if certain conditions are present: relatively inelastic supply and demand; few or poor commodity substitutes; a majority of producers and exporters being members of the agreement and controlling a majority of world trade; and political and economic cohesion among members.

Commodity agreements are set up by producing and consuming nations to affect a balance between producers' desires for high prices, consumers' desires for low prices, and a mutual desire to end widely fluctuating prices. The agreements depend on the members' compliance with the terms of the agreements. The most important terms have to do with technical aspects of the target price range, including ceiling and floor prices; the buffer stock acquisitions and disposals; and the implementation of export quotas.

Ideally, the agreement would work almost automatically. Excess supply would be bought by a buffer stock manager when world market prices fell to the low point in an intervention range of prices, and sold when world market prices reached the high point of the intervention range. To keep prices higher than they would have been, export quotas could also be set by establishing volume levels, linking volume levels to specific price triggers, or by restricting exports in the next calendar quarter to a percentage of past exports. Acquisitions of the buffer stock for an individual commodity agreement may be financed in a variety of ways--by levying fees on member countries to be paid in hard currency or in the commodity involved as in the case of tin, or by taxing unit exports of the given commodity, as in the first cocoa agreement.

There have been several notable agreements covering five commodities: cocoa, coffee, sugar, tin, and wheat. Although there have been other international commodity agreements, they have been of relatively minor importance in influencing international trade. Of these, only tin has had a series of continuous agreements since its inception.

Cocoa

There have been two International Cocoa Agreements covering the periods from October 1973 to October 1976, and October 1976 to October 1979. The first agreement was adopted following a precipitous price decline in 1970 and 1971. Countries producing about 90 percent and consuming about 70 percent of the world cocoa output are members of the present agreement. However, the United States which consumes about

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one-fourth of the world's cocoa production, did not sign the first agreement, nor has it signed the second because of the high price range set.

The first agreement provided for export quotas, a price range, and buffer stocks. The agreement also provided for increasing quotas and increased buying of buffer stocks as the market price declined toward the minimum price, and vice versa as the market price increased toward the maximum price. Funds to operate the buffer stock were raised through an export levy of one cent per pound. The present agreement is essentially an extension of the first, with a higher nominal price range.

Since the inception of the cocoa agreement, the market price has exceeded the maximum price set by the agreement. Thus, neither the quota nor the buffer stock provisions have been operative.

Coffee

The first international attempt at a coffee agreement was the Inter-American Coffee Agreement in effect during 1940-48. In 1959 an International (producers) Coffee Agreement came into effect, followed in 1962 by the first International Coffee Agreement (ICA), comprising both consumers and producers. The ICA was in effect until 1968 and was followed by the second ICA. The latest ICA, signed in 1976, will be in effect until October 1982.

The coffee market has been characterized by persistent overproduction and depressed prices. The 1940 agreement provided for export quotas for Pan American exporters and import quotas for the United States. However, there were no price provisions. After the United States entered World War II, prices were frozen for the duration of the war at double the initially negotiated level (3). The quotas lost their regulatory effect after 1945. By 1948, the oversupply problem no longer existed and the agreement expired.

The international coffee market faced an increasingly depressed market in the late fifties. The 1959 Inter-American Coffee Agreement was negotiated and implemented in an effort to improve prices for producers. Members of the agreement accounted for about 85 percent of world exports. The 1959 agreement provided for export quotas; however, they were consistently set too high. Prices consequently declined substantially.

The 1962 and 1968 ICA's were similar to the 1959 agreement. Members of the agreements accounted for about 95 percent of the world coffee exports and imports. The agreements used export quotas which were adjusted whenever the indicator price fell below or rose above a predetermined level. However, the price provision was deleted in the fifth year of the 1968 ICA, and a theoretical annual export quota was established which was eliminated in January 1973. The price provision was deleted principally because the producers wanted prices raised to reflect the lower value of the U.S. dollar in relation to other currencies.

The U.S. International Trade Commission believed the agreements during 1963-72 achieved a degree of success in stabilizing the wide price fluctuations associated with the coffee cycle (6). The stabilization was reflected in higher prices to the U.S. coffee consumer. However, the agreements became inoperative when world prices rose because of weather-induced production shortfalls.

The extensions of the 1968 ICA contained no price or quota provisions, although the 1976 ICA reinstituted both price provisions and export quotas. The agreement's price and quota mechanisms will not take effect, however, until the market price falls within the negotiated price range. This will depend on how well production recovers from the low levels following the 1975 freeze in Brazil. As of August 1977, over 95

percent of world exports and over 85 percent of world imports are accounted for by the present members of the 1976 ICA.

Sugar

The 1937 International Sugar Agreement (ISA) was the first such agreement to include both exporting and importing countries. This agreement lasted for 3 years, but was not followed by another agreement until 1954, when successive new pacts were implemented lasting through 1973. A new ISA has been negotiated and took effect in January 1978 pending later ratification.

The 1937 ISA provided for the regulation of production within countries to control stocks within a 10 to 25 percent range of production, general price guidelines equal to the cost of production plus a reasonable profit, and export quotas on free world trade. Free world trade was defined as all trade except for U.S. imports within the U.S. sugar quota as set forth by the U.S. Sugar Act, trade within colonial empires, trade within the Belgium-Luxembourg Customs Union, Commonwealth Countries intra-trade within terms of the Sugar Industry Act of 1936, and the trade of the USSR and its associated states.

A major failure of the 1937 ISA was the refusal of members to pare their quotas during times of surpluses, and the refusal of members with excess quotas to relinquish them. Another major problem with this agreement and all subsequent ones has been that only about 10 percent of the world production, or a third of world trade, has been classified as the free world trade. The free world trade has been mostly the residual sugar traded after commitments to preferential markets have been fulfilled (6). As a result, sugar sold in the free market has tended to be sold at distress sale prices.

After World War II, sugar stocks began accumulating again while sugar prices declined. In response to this situation, the 1953 ISA was instituted. Participating countries accounted for about 85 percent of the net free world exports, but only 54 percent of the net free world imports. The largest importing countries were members, however, U.S. imports were excluded from the terms of the agreement. The 1953 ISA was similar to the 1937 ISA, except that it provided for specific price guidelines. Quota triggering prices were established at 3.25 and 4.35 cents per pound. The 1956 protocol and the 1958 ISA essentially only revised the quotas and changed the price range to 3.25 and 4 cents per pound.

The world free price remained generally within the established guidelines of the 1953 ISA and the 1956 protocol, but the free price during 1959-61 was generally lower than the 3.25 cents price established in the 1958 ISA. With the termination of U.S. sugar imports from Cuba in 1960, world sugar prices became severely depressed because of the additional Cuban exports on the free market.

The 1968 ISA was similar to the 1958 ISA, with a new price range of 3.25 to 5.25 cents per pound and specific trading commitments for the members. The free market in the 1968 ISA was defined as all trade except for exports to the United States (the United States did not sign); exports to the United Kingdom within the negotiated price quota under the Commonwealth Sugar Agreement; Cuban exports to centrally planned countries; and exports under the Afro-Malagasy Sugar Agreement. However, the coverage of net free world trade remained about the same as under the 1953 ISA.

A major weakness of the 1968 ISA was the absence of the United States, some countries participating in the U.S. market, and the European Community. The U.S. quota actions under the U.S. Sugar Act and supply manipulations in other protected markets outside the agreements frequently upset the world sugar market (6). The market price of sugar exceeded the agreement's maximum price range in 1972 and 1973. The failure of the importers and exporters to agree on prices for quota operations resulted in the

failure to negotiate another ISA until 1977. Low world prices and the expiration of some of the major preferential arrangements, such as the U.S. Sugar Act, stimulated renewed negotiations. The new ISA will establish a price range of 11 to 21 cents. The agreement also provides for price-triggered export quotas and the establishment of a buffer stock of up to 2.5 million tons.

Tin

Early efforts at tin price stabilization included the Bandoeng Pool, 1921-24 and the Tin Producer's Association (TPA), 1929-31. According to Davis, the Bandoeng Pool was an organized effort between the Netherlands East Indies (now Indonesia) and the Federated Malay States (now Malaysia) to liquidate the war surpluses of tin while maintaining or increasing the price level (2). Together these countries produced about half the world's tin. Prices were maintained while the stocks were being liquidated in the mid-twenties.

In the late twenties and early thirties, the world's tin producers began experiencing declining revenue due to declining prices and production. In an effort to correct this problem, several tin-producing companies established the TPA which accounted for about 60 percent of world production. The TPA provided for voluntary export restrictions and met with wide support, except in the Federated Malay States. As conditions grew worse, an International Tin Control Scheme under the control of an International Tin Committee was established by the major tin producers in 1931, lasting through 1933. Three other schemes, whose objectives were to regulate production through a quota system enforced by governmental action followed through the thirties and forties to 1946. By 1932, about 95 percent of the world tin production was controlled.

The first scheme did not provide for a buffer stock, although a privately financed tin pool was in existence which operated in conjunction with the scheme. Although the latter schemes provided for buffer stocks which were to be financed by the producers, such stocks were accumulated only during 1934-35 and 1938-39 (6). Both times the stocks were accumulated, strong objections were raised by the United States, a proponent of the expansion of free trade, and by the Malayan Chamber of Mines, a low-cost producer. By early 1937, the price of tin had reached its highest level since 1927.

The tin schemes of the thirties and forties were not actual commodity agreements in that consumers were not members, although a nonvoting consumer advisory panel was established. In effect, the tin schemes were monopolistic restrictive schemes which exploited the ultimate consumer. Tin prices were held above levels which prevailing supply and demand conditions dictated. Davis believes that tin supplies were maintained at too low of levels, and were not released fast enough to meet important changes in demand (2). He also states that export restrictions were applied in such ways as to raise total average costs and to hinder normal expansion of low-cost production (2).

The first international tin agreement to include both producers and consumers was established in 1956 and lasted to 1961. Subsequent 5-year agreements were in effect during 1961-66, 1966-71, 1971-76, and the present one, 1976-81. The principle objectives of the agreements have been to eliminate wide fluctuations in stocks and excessive fluctuations in prices of and export earnings from tin. The agreements have provided for export controls and buffer stocks to achieve the objectives. Ceiling and floor prices have been used to trigger buffer stock activity. The first agreement provided for a maximum buffer stock of 25,000 metric tons; the next three, 20,000 metric tons; and the present agreement, 40,000 metric tons.

The members of the first agreement were 6 producing and 10 consuming countries, accounting for about 40 percent of the free world consumption. The fourth agreement had 7 members accounting for about 95 percent of the free world production, and 22

members accounting for about 70 percent of the free world consumption. Members of the present agreement account for about 95 percent of the world trade. The United States, a major world consumer accounting for about 25 percent of world consumption, was not a member of the first four agreements, but does participate in the current agreement.

The International Tin Agreements achieved some limited success. The tin price fell below the floor level only during a short period in 1958. This was a result of sales by the USSR, which was not a member of the first three agreements. But the price has exceeded the price ceiling several times in spite of an occasional raise in price ranges within the agreement period. The small size of the buffer stock relative to export volumes has proven inadequate. It is doubtful the ITA's would have met with any success without the cooperation of the United States, the world's largest consumer and stockpiler. The U.S. stockpile holdings exceed the ITC buffer stocks several times over. The U.S. international tin market operations were generally operated in conjunction with the ITA's buffer stock market operations. In periods of low prices, the ITC has imposed export quotas. However, they are not very effective because of the resulting lags in instituting export controls and in restarting production after the quotas have been suspended. Thus it can be argued that the economic impact of the first four tin agreements has been minimal, both in its effect on the volatility of prices and on the longrun trend of tin prices (11).

Wheat

There have been several International Wheat Agreements (IWA), the first established in 1933 for 2 crop years. The next IWA operated during 1949-52. Similar 3-year agreements were established in 1953, 1956, 1959, and 1962, with the last one extended through 1967. An International Grains Arrangement (IGA) was established in 1968 for a 3-year duration and in 1971, an IWA was established which has been extended through June 30, 1978.

Except for when the United Kingdom (IWA of 1953 and 1956) and Argentina (IWA of 1949 and 1953) did not belong to the IWA's, virtually all the world's wheat trade was accounted for by members of the IWA's. The 1933 IWA attempted to increase prices through the use of export and production controls. The agreement failed in 1934 because Argentina exceeded its quota in both years and world import demand was overestimated by the members.

The 1949, 1953, and 1956 IWA's were similar in operation. They established a maximum and minimum price for one grade of wheat in one place, such as Number 1 Manitoba Northern wheat in store at Ft. William/Port Arthur. The exporting member countries agreed to sell a minimum quantity to the importing member countries at not more than the maximum price. The importing member countries in turn agreed to buy a minimum quantity from the exporting member countries at not less than the minimum price.

The IWA's which operated during 1959-67 were similar to the previous three IWA's, except that the concept of guaranteed quantities was abandoned. In these latter agreements, the IWA exporters agreed to make wheat available to the IWA importers in quantities sufficient to satisfy their commercial requirements and at prices within the IWA price range.

The IWA broke down in 1967 when the United States expressed its unwillingness to carry the major burden of stabilizing world prices by holding stocks and reducing production at the same time that other major exporters were refusing to abide by the IWA maximum price. It appeared Canada had been establishing the price while the United States supported it (10).

In 1968, the IGA changed the commercial trade requirement to include all trade with nonmembers as well as members, and the reference price was changed to include 14 reference prices. These changes did not prevent this arrangement from being suspended. In July 1969, the price minimum was suspended as a result of being severely breached by the major exporters, especially Australia and France (10). Since July 1969, there have not been any operational economic mechanisms in the IWA's. However, since the inception of the 1968 IGA, a Food Aid Convention has operated in which each member contributes to developing countries a specified amount of wheat and coarse grains or the cash equivalent.

With the exception of the 1949 IWA, it is doubtful the IWA's had much effect on the world wheat trade. The price of wheat to the 1949 IWA member importers was held consistently below the average export price. But when world stocks built up, and the average world price fell to within the IWA price range, importing members ceased to participate. This was generally true of all succeeding IWA's. Essentially, the lack of production and enforcement controls has severely limited the success of the IWA's. The apparent success of the IWA's in the fifties and sixties may be attributed more to the pricing, inventory, and export policies of the United States and Canada, which accumulated large stocks, and in effect, administered export sales through the Commodity Credit Corporation and the Canadian Wheat Board.

Conclusions

All of the agreements reviewed here were originally formulated during periods of low market prices. A mutual desire among the exporters to raise the commodity price in the short run and to stabilize longrun fluctuations, along with the belief that joint action was the most effective means of accomplishing it, has stimulated the negotiations of commodity agreements. Past commodity agreements, however, have achieved only limited success in raising or stabilizing prices. Problems have arisen in many agreements in keeping prices above the floor level and below the ceiling level of the negotiated price range. Thus, many functioning agreements have not operated in their price provisions for certain periods. Many of the current agreements are not operating within their price range provisions.

International agreements have used nationally coordinated buffer stocks, export quotas, and sometimes domestic production controls to maintain market prices within set price ranges. However, the effectiveness of the agreements depends on many factors, including the cooperation of the bulk of exporters and importers and the supply and demand characteristics of the commodity.

Even when these conditions have been met, members have generally been unable to enforce the rules of the agreement over time. Countries have failed to abide by the production or export quotas established by the commodity agreement to stabilize falling prices, and buffer stocks have proven to be too small to contain prices rising above the ceiling levels. Among the member countries, the problem of allocation of market shares for quota purposes is intensified with changes in production over time. This problem is accentuated during periods of falling prices due to demand and/or supply changes, and raises the problem of establishing the basis on which decreases or increases in member quotas should be made. A related problem is the entrance of new suppliers outside the agreement's membership. If production and exports are increased by nonmembers, then the viability of the agreement is reduced.

The use of export quotas has been widely critized as an inefficient method of adjusting supply and demand. Their use may adversely affect productive capacity in the long run because of lags in gearing up production again after the expiration of the quotas. For example, tin mines once closed down may not reopen even when business demand increases and prices rise. More efficient producers generally prefer prices to

be supported by buffer stock purchases rather than export controls. Export controls also permit countries to build up domestic stocks which may be dumped on the market at a later date.

The mechanism of buffer stock accumulation and drawdowns has not worked consistently to keep prices within a given range. Especially in times of soaring prices, the failure of commodity agreements to keep market prices below the agreed ceiling price has been due to both a lack of desire to keep prices from rising, and to insufficient stocks to do so.

Similarly, in periods of declining world prices, attempts by buffer stock managers to keep world prices up by accumulating these stocks becomes increasingly expensive. Production controls have generally not been attempted in recent international agreements. They are exceedingly difficult to get agreement on, and perhaps impossible to monitor for agricultural products, especially those with gestation periods longer than a year.

Finally, for some commodities, continued agreements face different price and income elasticities over time. Appropriate price levels to maximize income during one period may be too high in another, particularly when substitute goods have begun to take an increasing share of a commodity's market.

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