AN ABSTRACT OF THE THESIS OF

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                (Name)   (Degree)

in AGRICULTURAL AND RESOURCE ECONOMICS presented on 11/18/88
            (Major)   (Date)

Title: AN ANALYSIS OF COSTA RICAN EXPORT EARNINGS UNDER THE

        CARIBBEAN BASIN ECONOMIC RECOVERY ACT (CBERA)

Abstract approved_____
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        This Thesis explores the possibility of increased export and

export earnings stability for Costa Rica after the implementation of

the Caribbean Basin Economic Recovery Act (CBERA) or Caribbean Basin

Initiative (CBI). It was expected that this policy would not only

increase trade and exports for some developing nations in the

Caribbean but also promote development and economic stability.

        An export earnings model was calculated using the deflated

export earnings to the U.S. and fitting a time trend equation by OLS

to calculate the residuals. These residuals were then transformed to

develop a risk or instability equation which included independent

variables such as the export concentration index to reflect

diversification of exports, the ratios of food, manufactures and raw

materials in exports and the share of total Costa Rican exports

deriving from the U.S. market.

        A reduced risk equation was estimated using OLS. The relative

effect of the policy, measured by a dummy variable for the period

1983-1987 was estimated for each of the independent variables.

The results indicate that there has been a distinct effect of the policy variable upon the diversification, manufactures, raw materials and food products exported by Costa Rica to the U.S. The increase in manufactured exports is significant, at the same time, there have been decreases in the value of traditional agricultural exports such as coffee, sugar, bananas and beef. Vegetables' and fruits' share of Costa Rican exports to the U.S. has increased noticeably.

Although total export earnings for Costa Rica show negative growth during the period 1981-1983, U.S. export earnings have been consistently increasing.

Export earnings from the U.S. show a significant increase as detected by the share of Costa Rican total exports earnings originating in the U.S. In 1980 less than 40% of Costa Rican export earnings came from the U.S. while in 1987 the figure is just over 60%, indicating increased dependency on this market as a source of export earnings.

Export earnings instability, as measured in this research, shows statistically significant reductions after 1983 leading the author to conclude that this policy is possibly increasing trade and reducing the long term instability of Costa Rican exports to the U.S., therefore having some effect on the stability of long term development, and possibly, causing changes in the country's capability to deal with its debt and development efforts.

The components of instability or risk of export earnings from the U.S. market yielded interesting insight into possible causes of these variations. Statistically significant negative signs were

detected for the ratio of foods in exports and the dummy variable, indicating that reducing the share of foods in exports in this market would cause increases in risk and that the policy variable has had the consequence of reducing risk. The ratio of raw materials in exports was, as expected, of limited statistical significance although it consistency exhibited a negative sign indicating similar effects as the food exports. The manufacture ratio in exports was detected to be in general statistically significant during the trial estimations however, lacking consistency. The export concentration index was not determined to be statistically significant in causing export earnings instability in this particular case, however as with all independent variables tested, it was significantly changed after 1983.

These results tend to support the original intention of the CBERA for the case of Costa Rica. Increases in exports and export earnings stability appear to have ocurred. However, the research suggest some caution in relying heavily in the U.S. market as a source of export earnings and supports the view that traditional exports bring about more stability than manufactures and raw material exports.

An Analysis of Costa Rican Export Earnings
Under the Caribbean Basin
Economic Recovery Act (CBERA).

By

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A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirement for the
degree of

Master of Science

Completed November 18th, 1988
Commencement June 1989

APPROVED:

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Date Thesis is presented: <u>November 18, 1988.</u>
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I. INTRODUCTION

BACKGROUND

Economic development and growth in the Caribbean Region has been
a concern of United States policy makers, development economists and
various national government officials for some time. This interest is
due both to the strategic location and to the importance that the
region has in the political stability of Latin America.

Throughout the years, many policies aimed at promoting economic
growth and development have been advanced. Their effects have been
mixed, and to a certain extent analysis of their long term
implications incomplete or unpublished.

Recently, a feeling of urgency has arisen due to the continuing
political unrest in the region and to the worsening debt and liquidity
problems of various participants. Inflation and unemployment are
running high and there has been a decrease in the growth rates in many
of these countries.

As an effort to promote economic growth and to complement ongoing
U.S. economic assistance in the region, legislation was presented to
the U.S. Congress in March 1982 with the purpose of obtaining
preferential treatment for imports coming from some Caribbean
countries. The original Caribbean Basin Initiative (CBI, H.R.7397)

legislation was proposed, under which the participating countries[1] would be permitted to export to the U.S. certain commodities exempted from duties or levies. Also, certain tax incentives would be provided to U.S. firms investing and operating in the region for a period of 12 years. Originally, investment tax credit and accelerated depreciation privileges were to be extended to U.S. firms doing business in the participant countries.

This legislation passed, after various modifications, as H.R. 2769 in September 1983 with a different name: the Caribbean Basin Economic Recovery Act (CBERA). This bill differs from the originally proposed CBI in that petroleum, tuna and footwear, as well as the investment tax credit provisions are not included in the program.

In spite of these changes, hope that growth and development in the region would be possible appeared as a realistic outcome for many defenders of the Bill.

The effects of this policy upon the participants' growth and stability has yet to be measured in detail. Many critics have voiced their concerns about its good, neutral or bad effects. There seems, however, to exist a lack of documented measurement of the economic effects of CBERA.

One of the procedures that has been reported for evaluating the impact of the program is by determining trade creation and trade diversion caused by development initiative.(Sawyer and Sprinkle, 1984)

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[1] Includes Anguilla, Antigua, Barbuda, Bahamas, Barbados, Belize, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Panama, St. Lucia, St.Christopher-Nevis, Turks and Caicos, St. Vincent, Surinam, Trinidad and Tobago, Cayman Is., Montserrat, Netherland Antilles and the British Virgin Islands. Cuba and Nicaragua do not participate in CBERA.

As Sawyer and Sprinkle state, the benefits of this policy on trade increase for the participating countries might be questionable because of the small increases in trade creation and trade diversion caused by the program. It is also important to examine the effects this policy may be having on the stability of export earnings of participant countries.

Export earnings and export earnings stability can be important indicators of the effects of an export/import policy. The benefits of stability in developing economies in certain cases becomes a central issue in deciding economic strategies and development planning.

However, as with other policy measures, much more detailed analysis will be necessary and more time might have to pass before any structural change becomes evident as a result of this policy. Even given these limitations, it is important to determine the effects of the policy at this early stage so that adjustments can take place where deemed necessary by the participants.

GENERAL PROBLEM

Producers and government officials in some of the CBERA countries have manifested through the media and by their comments on U.S. trade policies, an increasing concern for the impact these policies have on their short and long term investment and planning.

A significant factor in this complex problem of export earnings is the problem of instability. Planning and long term programs can be seriously affected when shortfalls occur in the export earnings. They affect government expenditures, welfare programs, debt service and other internal activities of vital importance for these economies.

Therefore, a goal in certain cases is not only increased export earnings but also increased stability in export earnings which would permit certain level of domestic stability and external debt servicing.

The effects of the CBERA on export earnings stability, diversification of exports and economic growth are of significant interest to economists in the U.S. and the Caribbean.

Also, there is concern among policy analysts and planners regarding how this trade program is affecting export growth in the different economic sectors of participant countries.

It is not clear whether the policy is causing any stabilizing change and there are doubts about whether this program is any different from previous trade agreements such as the GATT. (Benedek, 1986).

Furthermore, the effects on specific countries have not been analyzed in detail and data is still scattered among different agencies and participants.

This study will specifically focus on the effects of the CBERA on the Costa Rican economy. Nonetheless, the methodology developed here could be applied to other countries in the region.

The purpose of this research is to examine the effects of CBERA on the Costa Rican economy by means of analyzing the export earnings and export earnings instability of its exports to the U.S. before and after the implementation of the policy.

The Costa Rican case represents many challenging characteristics which are common to other countries in the region. They include the relatively reduced number of export commodities, limited raw product

trade, good agricultural base and a certain degree of openness to international markets. Specific characteristics of the country which include a relatively educated labor force and relatively advanced social-labor benefit system and a high degree of political stability, would make this country an interesting case study.

THESIS OUTLINE

The next Chapter of this paper will review the basic literature about export earnings and export earnings instability, their causes and linkages to economic development and policy.

Chapter III will review the methodology to be utilized, the variables and model used, estimation problems, data, time, and correction decisions and procedures.

The results of the research are presented in Chapter IV along with some interpretations of the statistical results, their implications within the model and some of the limitations resulting from the analysis.

Chapter V provides conclusions and recommendations drawn from the results and also suggests further research directions in this area of policy analysis.

Appendix A contains the compiled data base for this research in machine readable form.

II. LITERATURE REVIEW

TRADE EARNINGS AND DEVELOPMENT

The importance of trade and export earnings for the development process has been widely discussed in the literature. There exist direct and indirect benefits of trade to an economy which are no longer questioned. The impacts of increased trade in terms of resource use, division of labor, innovation, capital flows and stimulation of domestic demand and supply are of primary importance to any trade oriented policy analysis.

The repayment of the external debt and the financing of development projects are very important incentives for less developed countries to increase trade and hopefully, export earnings. In certain cases, the only source for repaying foreign debts and interests on such debt is export earnings. Although special loan arrangements have been used in the past to pay the interest portion of this debt, the long term sustainability of this practice is questionable.

After the implementation of CBERA, Costa Rica as well as other Caribbean countries involved have taken an active role in promoting exports to the U.S. CBERA has enhanced the relative competitive advantage in certain products for Caribbean countries with respect to other Latin American, Asian, African and European exporters.

An increase in Costa Rican export earnings is expected as a result of this policy and the significance of this increase will reflect the significance of CBERA and CBERA induced changes in the Costa Rican and U.S. economic environment. A degree of trade

diversion and creation is expected from this policy and in this regard, Sawyer and Sprinkle (1984) tend to support the argument that these effects are minuscule. However, trade creation and diversion from the standpoint of the exporting countries have not been addressed, and to a certain extent, these effects might be considerable and significant for an individual economy.

The efforts to produce for a given market can and very likely will create some production which can be redirected to markets other than the U.S., therefore creating and diverting trade to other countries.

An indicator of these effects could be the percentage of total Costa Rican trade carried out with the U.S. and the changes in total export earnings.

An issue which will also to be addressed when doing policy analysis is the stability or riskiness of those export earnings. The changing riskiness of depending on a given source of export earnings might be undesirable or desirable for a particular country. The issue of export earnings instability changes between the pre and post CBERA time periods will be discussed next.

DEFINING INSTABILITY

The most common measure of export earnings instability used in previous studies has been the percentage deviation of export earnings with respect to a trend.[2] This measure indicates the fluctuations on export earnings in relation to a long run trend, therefore, it is a

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[2] For a detailed explanation of this measure, see Chapter III. Massell (1970, 1964), MacBean (1966) and Love (1986) also provide further detail.

measure of short term variations on market prices and quantities. The determination of the trend correction measure it is of special importance since it directly affects the results and measurement of instability. Among the various specifications used, the moving five year average has been preferred (Love, 1986).

Following Massell (1970), MacBean and Nguyen (1980) and Love (1986), the instability measure is expressed in percentage deviation (u_t) of total export earnings (X_t) with respect to a trend value (X_{trend}) as follows:

$$u_t = (X_t - X_{trend})/X_{trend} \qquad (1)$$

The use of this measure of instability implies that a country having a stable growth path will show less instability that one which has rapid increases or decreases in its export earnings. These irregularities could be due to policy measures, climatic conditions and other country-specific factors.

These assertions would indicate that in the presence of changing policies one could possibly expect changes in exports earnings instability depending on the effect of these policies upon the causes of instability.

However, under the presence of the trend adjustment, it would be difficult to detect these changes given that the trend correction would indirectly account for possible changes in the magnitude of the variables through time.

For the correction trend measure, a five year moving average was used by MacBean (1966).[3]   This measure is considered to more

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[3] This trend adjustment is defined as the average percent deviation of export earnings from the five year moving average, centered in the mid year.

realistically reflect any changes in policy and comparative advantage affecting the country but still presents the problem of averaging which masks the policy effects. Additionally, by using the moving average technique, the two first and last data points are lost.

An exponential trend correction measure has also been used by Leith (1970) on the grounds that most governments tend to plan based on growth rates and not on gross exports amounts. The relative advantage of moving averages and exponential trend correction measures would depend on the data of the country being analyzed and on the predictive or explanatory nature of the analysis.

Regarding the currency unit of measurement for the instability index, U.S. dollars were used. This is discussed by Love (1986) and he concludes that the instability indices calculated in U.S. dollar and local currency show higher degree of correlation than when export earnings are expressed in other currency denominations.

United States dollars have the advantage of allowing for comparability of export earnings across countries and that, because of the weight of the U.S. market in LDC's exports, many internationally transacted commodities have prices denominated in U.S. dollars.

ECONOMIC GROWTH AND INSTABILITY

As part of economic growth, export earnings instability has been an important issue in the analysis of policy options. Massell (1964, 1970), and many others[4], have tried to estimate the causes of these fluctuations in export earnings and have attempted to draw policy conclusions from their various findings.

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[4] See MacBean (1966), Voivodas (1974)

Export earnings instability has a direct effect on the stability and growth of the LDC's by affecting government expenditures, financing of capital goods, efficient use of resources, development planning strategies and international debt service strategy and compliance.

Domestic instability generated by the fluctuating export earnings can result in important welfare losses which, depending on the country's dependence on these earnings, could be a major upsetting factor in their growth, distribution and political pattern.(Massell, 1964).

In the case of Costa Rica, which maintains one of the most welfare oriented economies in Latin America, stability is an important consideration in order to maintain desired levels of economic assistance.

CAUSES OF INSTABILITY

During the last decades, it has been accepted that one of the main reasons for instability in export earnings in LDC's is their high reliance on raw and primary products as their source of export proceeds.

It is argued that strong price fluctuations of most of these products have been documented and in general they appear to be larger than the variations of manufactured product prices.

These changes in price cause persistently large fluctuations in the export earnings due to the relatively low price elasticity of demand and supply of these products. These low elasticities, combined with unexpected variations in demand and supply or both, can cause

large fluctuations in prices and proceeds of countries exporting these commodities. (MacBean, 1966).

Recent research finds that the reliance of developing countries on a few traditional products might be the reason for their relatively stable export proceeds. Habeck et al (1988) finds that agricultural products vary in their contribution to instability and that in some cases, they prove more stable than manufactured products exported by LDC's. This research also finds that the causal factors of instability in developed countries were related to agricultural products, which tend to cause greater instability than manufactured products.

There exists increasing evidence that specializing in the export of traditional products such as coffee, beef, bananas and cocoa, as is the case of Costa Rica, could increase stability. Increasing the manufacture's share of the exports might indeed cause instability and these linkages to internal and external fluctuations have been modeled in various cross-sectional analysis by Massell (1964, 1970), MacBean (1966), Voivodas (1974), Wong (1986). In general these studies show inconclusive relationships among some of the variables considered as bringing about instability.

In most cases they find an indefinite statistical correspondence between the variables used and, therefore, make few definite conclusions. Aside from this, by aggregating countries, it becomes very difficult to specifically determine causality of the fluctuations in export earnings.

COMMODITY CONCENTRATION

The most commonly argued cause of instability is commodity concentration, often measured as the export concentration index, C_t^2. The argument is that as a country depends more on a single commodity for its export earnings, the more export earnings will be unstable. This instability will depend on the type of commodity being exported and therefore instability will change in time as commodities enter or exit the export activity. Therefore, it has been argued that diversification of exports would promote a more stable flow of foreign earnings and steady growth provided that the types of commodities exported have a certain degree of stability. Then, it would be expected that the value of C_t^2 would decrease in time as the shares of non-traditional products in total exports earnings increase in relation to traditional products.

The most commonly used definition of commodity concentration is the Gini-Hirschman index[5]

$$C_t^2 = \Sigma_i w_{it}^2, \qquad i = 1, 2, \ldots m, \qquad (2)$$

where m is the number of commodities and w_{it} is the share of commodity i in total export earnings for year t. The upper value of C_t^2 is 1 if only one commodity is exported and the lower value $1/m$ when exports are evenly divided among m commodities.

The basis for this commonly held view that diversification enhances stability of export earnings is that a country with a diversified export base would be less susceptible to changes in the patterns of export earnings of the country major products; thus a decrease (increase) of export earnings of the major crop would not decrease

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[5] Massell (1964, 1970) discusses this index and its properties.

(increase) drastically the total export earnings if the country has a diverse source of earnings.

This variable is subject to policy induced changes and is often affected not only by direct and indirect intervention by the exporting country but also by quotas and tariffs in the importing country. It would be expected that commodities with restricted quotas will have limited effect on changes in C_t^2. Changes in this index will probably come from changes in the relative export earnings from other products.

The units of measurement for the commodity concentration index, as is the case with the food, raw materials and manufacture ratios, are independent of the choice of currency (Love, 1985).

The statistical significance of commodity concentration as a causal agent of export earnings instability has not been definitely asserted. When analyzing cross country data this can be a result of:

a) countries with little diversified economies which tend to specialize in relatively stable export commodities;

b) proceeds for export commodities which tend to move together, causing some degree of multicollinearity when estimated and

c) the high degree of dispersion in the stability of earnings for the various commodities. (MacBean and Nguyen, 1980).

More recently, Soutar (1977), Lloyd (1983), Wong (1986) and Love (1986) have concluded that this dispersion, c), is an important cause for the instability of export earnings in both cross country and time series data.

MacBean and Nguyen (1980), assuming the concentration index, C_t^2, as given for cross country analysis, demonstrated that there does not exits a clear correspondence between instability of export earnings and the level of concentration. However, Naya (1973) suggests that the value of C_t^2 is sensitive to the choice of year given that the relative weights, w_i, change from year to year. This would be especially true under rigidities in the trade volumes such as quotas.

There are also in-country effects that would affect this index. The elimination of export tariffs, credit availability, transportation improvements, subsidies and technological changes could decrease the value of C_t^2 for a given year or period. It is assumed that a country faced with a foreign import policy that facilitates exports would, acting reasonably, try to implement some or all the measures listed.

From the preceding paragraphs, a decrease in the value of C_t^2 is expected once a trade promoting policy is implemented both in the exporting country and in the importing country. This is expected from the implementation of the Caribbean Basin Initiative (CBI).

The statistical significance of C_t^2 in bringing about instability is uncertain. These uncertainty seems to be supported by the mentioned results by Habeck et al (1988) which find that exporting a few agricultural products could be a source of stability in export earnings.

FOOD, RAW MATERIAL AND MANUFACTURE RATIOS

As an indication of the changing emphasis on export commodities, the food, raw materials and manufacture ratios to total exports have been used to estimate instability models with some success.

In the case of the food ratio in exports the argument is twofold.
A country which exports a larger share of agricultural and food
products will tend to have larger shifts in the export earnings and
possibly a slow increase in supply because of the usual rigidities
related to the traditional agricultural exports.

This ratio is expected to show increasing or decreasing trends
depending on the internal and external factors affecting demand and
supply of these exports. A decreasing ratio relative to an increasing
manufacturing ratio could indicate a shift from reliance on
agricultural exports as the major earnings source for the country.
This would also indicate certain degree of competitive advantage for
the production of manufactures.

An increasing value of the food ratio in exports could indicate
an increase in agricultural goods in exports. This behavior could be
due to the increase of traditional products in exports, increase of
non-traditional exports or both. Also, a decrease in manufactures and
raw products would be reflected in a relative increase of this ratio
since total exports is composed of the three classes.

MARKET SHARE

The ratio of U.S. total imports from Costa Rica to total U.S.
imports has been included in this research as an indication of the
importance of the U.S. market for Costa Rican products and to
illustrate how there could exist a change in market share due to
policies such as the CBERA.

It is expected that an elimination of tariffs and the other
related "benefits" of the CBERA would induce increased values of this

ratio, especially after the implementation of the policy in 1983.
However, given that other countries in the Caribbean Basin might have
a greater competitive advantage, and given that they could produce the
same products at reduced costs, this share could very well be
decreasing as exports from these countries substitute for more
expensive Costa Rican exports.

U.S. SHARE OF EXPORTS

The share of Costa Rican total exports traded with the U.S.,
defined here as:

SUS = Total Export to the U.S./Total Exports,

is an important measurement of the change in the trade relationship
between the two countries. It is expected that as a country's trade
relationship improves with respect to other trade partners, larger
amounts of exports and therefore earnings will be generated.

This variable would reflect the Costa Rican reliability or
dependability on the U.S. market in the sense that earnings will have
a major source and the associated risk. Also, the diversion of Costa
Rican exports to other countries would be reflected by how this
variable fluctuates. An increase in this ratio would reflect a
relative diversion of export trade to the U.S. market.

OTHER VARIABLES

Massell (1970), identifies other variables such as geographic
concentration, per capita income, as those which could also cause
instability and although in his cross country studies no definite
correspondence was found to be statistically significant, the use of

the variables is well justified and has been used with limited success by MacBean and Nguyen (1980) and Wong (1986) as well as other earlier studies.

Per capita income has been used in cross-country studies to differentiate between countries. In this study it was not viewed as necessary since no cross-comparisons are being made.

The same argument holds for geographic concentration, although it is recognized that such an analysis would be important when considering export diversion towards other trading partners as a result of this policy. These variables also have been ambiguous in their statistical significance in some of the earlier studies.

Massell (1964), Khalaf (1974) and also MacBean (1966) reported weak statistical correspondence between export earnings instability and geographic concentration. Their results have interesting connotations because they do not support the argument that diversifying trade partners would also decrease instability. Khalaf (1974) even suggested that if this findings were to hold, geographic concentration should not be an impediment to development.

However, later work by Kingston (1976), Soutar (1977) and Wong (1986) revealed that this variable is an important factor to consider and that the diversification of trade partners would have a positive effect on stability.

Sectoral instability of export earnings can be of importance in influencing the total instability of the export earnings specially depending upon the destination that these products might have. Wong (1986) reports that geographic concentration and high ratios of foods in exports play an important role for those countries which export a

small proportion to developed countries.

There have been various reports on the effects of the significance of the other variables mentioned. They will be analyzed in more detail in Chapter III of this Thesis.

POLICY AND INSTABILITY

The variables mentioned above can be directly or indirectly influenced by policy makers. A government that engages in the promotion of non-traditional exports by using special financial, transportation, technical and institutional arrangements can affect the shares and ratios of the variables.

On the other hand, an importing country that liberalizes trade restrictions for certain non-traditional products and sets quotas for traditional commodities, can also be viewed as trying to change the same ratios and shares.

These two simultaneous actions, it appears from the actions of the Costa Rican government and the CBERA policy itself, are happening with the Caribbean Basin Economic Recovery Act (CBERA). Countries in the Caribbean Region are modifying their own export structures to take advantage of the program and to achieve this, they try to diversify their export earnings and promote more foreign investment in areas such as manufacturing and agro-industry.

Differentiating and separating these effects is a difficult task, however it is reasonable to think that some policy variable could reflect such changes and the relative importance of causes identified.

A recent study by Ray (1987) partially supports the opinion that CBERA has been more advantageous in promoting trade and eliminating

special protection to U.S. products commonly subject to high internal pressure for protection. However, Ray (1987) recognizes that this effect might be small and asserts that special interest groups could be causing the ineffectiveness of this preferential trade program by seeking to obtain protection for their industries.

The relative beneficial effects of CBERA on the economic growth of an individual country could be measured by determining how export earnings, their stability and the variables affecting it have changed after the implementation of the program. An increase in diversification and ratios of manufactured goods in exports could be indicative of some positive effects, as well as a decrease in the variability of the export earnings with respect to an export earnings model.

MODELS

CROSS-SECTIONAL MODEL

Most of the research in the area of export earnings instability has been done by analyzing cross country data. A common formulation of the regression equation used is the following: (Massell, 1970)

$$S^2 = \alpha_0 + \alpha_1 C_t^2 + \alpha_2 G_t^2 + \alpha_3 R_{rt} + \alpha_4 R_{ft} + \alpha_5 Y_t + \alpha_6 Q_t + e_t \qquad (3)$$

where:

$S_2 =$ Sample statistic of the variance of u_t.

$C_t^2 =$ Commodity concentration index

$G_t^2 =$ Geographic concentration index

$R_{rt} =$ Raw material ratio

$R_{ft} =$ Food ratio

$Y_t =$ Per capita income in current $ U.S.

$Q_t =$ Export market share coefficient

Wong (1986) tried, using cross country data, to estimate similar relationships using more sophisticated modeling techniques and not attempting to decompose the sources of variation but rather using as independent variables various indexes of domestic and foreign demands and domestic supply fluctuations. His results suggest a foreign source of instability as well as a geographic concentration component, especially for countries which export comparatively low proportions to developing countries and higher food ratios in exports.

These results from Wong (1986) need to be interpreted in the context of cross-sectional regression and specific country factors. They could be very important in explaining export earnings instability from the aggregated results from the analysis, however they are limited in their individual applicability to a particular country.

Due to the various concerns about the use of cross country

analysis and the assumptions implicit in the indexes used regarding comparability across countries with different export base and organization, as well as the homogeneity implied in the aggregation of the concentration index, $C_t{}^2$; Naya (1973), suggested averaging the series of values of this index for an individual country in the cross country context.

Furthermore, Love (1986) recommends and presents empirical evidence on the appropriateness of using time series data to estimate these relationships between export earnings instability, commodity concentration and some of the variables which had been used in the cross country analysis.

TIME SERIES MODEL

The basic model suggested by Love (1986) is a linear equation in which u_t, as defined by (1), is the dependent variable as follows,

$$u_t = \alpha_0 + \alpha_1 C_t{}^2 + \alpha_2 R_{rt} + \alpha_3 R_{at} + \alpha_4 Q_t + e_t \qquad (4)$$

where the variables are defined as in equation (3).

To deal with the trend correction which is of great importance in the estimation of this equation, Love (1986) uses a five year moving average previously applied by MacBean (1966) instead of the linear or exponential averages. He considers this measure to reveal more appropriately the changing policies and comparative advantage affecting the country.

This procedure used by Love (1986) tends to minimize the problems of multicollinearity that have been detected in the cross sectional studies especially between $C^2{}_t$ and $G^2{}_t$. This situation was due mainly to the fact that many LDC's tend to trade with former colonizing

countries and because the weight of the U.S. as a market for LDC's exports tends to be very large.

AN ALTERNATIVE MODEL

Given the difficulties of detecting structural or policy induced changes in the models presented previously resulting from the trend adjustments assumed in the estimation of the deviations, an alternative, more general model is developed and presented here.

The suggested modifications make it more suitable for the estimation of policy effects on export earnings and export earnings instability since it explicitly determines the functional form of the instability components in the general export forecasting equation and utilizes a measure of the variance of the residuals and independent variables to determine these relationships.

Export earnings on a given year, X_t, are defined as:

$$X_t = \Sigma_{i=1}^{m} P_{it} * Q_{it} \tag{5}$$

where i is the commodity and t is the year.

To correct for price fluctuations, a price or quantity index of exports could be suitable for deflating X_t, showing the effects of these factors on the export earnings variability.

When lack of data on export commodity prices is a problem, some alternative indicator could be used.

A time trend can also be introduced reflecting other changes due to quantity and production policies.

The initial equation would be the following:

$$DX_t = X_t/PIndex_t = f(z_1) \tag{6}$$

where z_1 is a set of explanatory variables. Then,

$$Var(DXt) = Var[f(z_1)]$$

and, $Var(DX_t) = E[f(z_1) - z_1^0]^2 = E(e_1)^2$

where z_1^0 is the estimated value of z_1 resulting from the estimated function, $DXt = f(z_1) + e_1$.

When time, it is considered that the variability of DX_t would be reflected by the variance of the deviations, e_t, expressed as the variance of $Xt = E(e_t)^2$.

As an example, for the case of a functional behavior of the form:

$$e_t = Ae^{\beta_1 Dum}SUS^{\beta_2}Ct^{\beta_3}Rf^{\beta_4}Rr^{\beta_5}Rm^{\beta_6}\epsilon, \tag{7}$$

the instability equation of the residuals, (e_t), is derived by squaring and taking logs on both sides to obtain:

$$\ln(e_t)^2 = 2\ln A + 2b_1 Dum + 2b_2\ln SUS + 2b_3\ln Ct$$
$$+ 2b_4\ln Rf + 2b_5\ln Rr + 2\beta_6\ln Rm + 2\ln\epsilon, \tag{8}$$

and the resulting regression equation:

$$\ln(e_t)^2 = \alpha_0 + \alpha_1 Dum + \alpha_2\ln SUS + \alpha_3\ln Ct$$
$$+ \alpha_4\ln Rf + \alpha_5\ln Rr + \alpha_6\ln Rm + 2\ln\epsilon, \tag{9}$$

where: $\quad \alpha_0 = 2\ln A \qquad \alpha_1 = 2b_1$

$\qquad\qquad \alpha_2 = 2b_2 \qquad \alpha_3 = 2b_3$

$\qquad\qquad \alpha_4 = 2b_4 \qquad \alpha_5 = 2b_5$

$\qquad\qquad \alpha_6 = 2b_6 \qquad$ and $\epsilon \geq 0$.

Once equation (9) is estimated, it can be used for calculating and evaluating the effects that changes in the variables would have on export earnings stability or risk.

III. METHODOLOGY

GENERAL PROCEDURE

Ordinary Least Squares regression analysis (OLS) for time series data is used to estimate an export earnings equation for Costa Rica and the effects that commodity concentration, C_t^2, the commodity classes ratios in exports: R_f, R_r, and R_m, as well as the Costa Rican market share in the U.S., Q_t; have on the export earnings and export earnings instability from the U.S. market before and after the implementation of the CBERA or CBI. The terms of trade and the unit value and quantity index of exports will also be used to provide some understanding for price and quantity fluctuations during the period and to deflate the export earnings stream.

Time series data from 1960 to 1987 on all Costa Rican export commodities to the U.S. will be used in the estimation of relationships.

VARIABLES

EXPORT EARNINGS

It is considered that export earnings resulting from the Costa Rican-U.S. trade, X_t, would be the most appropriate indicator for detecting changes in the trade relationships between the two countries as a result of CBERA.

This variable will be used as the dependent variable since it would reflect direct effects of the bilateral relationships and can be used to make inferences about the potential and actual policy effects. The effects of the diversification of trade, the relative ratios of

food, raw materials, manufactures and Costa Rican share of the U.S.
market will be used to explain the changes in the export earnings
after 1983, when CBERA went into effect.

It is expected that X_t would increase in time as more products go
into the export market and additional incentives are implemented for
increasing of exports.

An increase in X_t could be due to the increased diversification
and volume of export commodities resulting from internal policies,
improved external market demand conditions, prices, institutional and
transportation factors.

In this research, the values reported for export earnings will be
deflated in order to correct for price effects during this period and
allow inferences from the obtained results. As Love (1986) reports,
there has been some disagreement on which indices to use in order to
permit a more accurate estimation of these trade models.

Some of the deflators used have varied from the exchange rates,
real exchange rates, the importing or exporting countries consumer
price index (CPI) and others. In this case an export price index of
all export commodities seemed appropriate even if it is not specific
for commodities exported to the U.S. Given that the largest
percentage of Costa Rican exports earnings originate in the U.S. and
the prevalence of the U.S. market as a price leader in the
international trade, this measure is considered adequate.

The variability of X_t will be important in this research since it
will indicate instability in export earnings being caused by the
variables utilized and the policy change. Such variability will be
estimated by using the variance of the X_t on the regression equation

before and after 1983. It is considered that this procedure will provide some indication of possible effects of CBERA on export earnings instability.

It is expected that due to incorporation of a the trend, which tends to smooth changes in export earnings due to specific factors, it is not likely that any changes due to the time period difference would be detected.

MEASUREMENT OF INSTABILITY

Export earnings instability, e_t, will be measured as $Var(e_t) = E(e_t)^2$,

where: e_t = residual resulting from fitting the

Costa Rican export earnings DX_t to a

trend.

The relative suitability of these correction measures will depend on their ability to be of use for policy purposes, and the argument for using one or the other will depend on how policy makers plan the economic growth of export earnings, whether it is by applying growth rates as would be the case of the exponential trend or more oriented towards structural changes in the export economy as the case of linear and moving averages might be.

COMMODITY CONCENTRATION

For calculating C_t^2, all commodities were divided into 3 digit SITC numbers and then C_t^2 was calculated using equation (2).

A total of 151 different commodity groupings were considered for 28 consecutive years.

The formula employed for computing $C_t{}^2$ was:

$$C_t{}^2 = \Sigma_{i=151} (X_{it} / X_t)^2 \qquad (11)$$

where X_{it} = export earnings from commodity i exported to the U.S. market. Mill. of U.S. dollars.

i = 3 or 4 digit SITC commodity group.

t = year. 1960 to 1987.

X_t = Total export earnings from the U.S. market. Mill. of U.S. dollars.

COMMODITY CLASS RATIOS

These ratios were calculated using the same commodity export matrix by 3 digit SITC number as follows:

R_f = Commodity groupings SITC 0 + 1 + 221 + 212 / X_t

R_r = Commodity groupings SITC 2 + 4 - 221 - 212 / X_t

R_m = Commodity groupings SITC 5 to 9 / X_t

where X_t is the total Costa Rican export earnings from the U.S. market.

Each yearly aggregation per sub-group was then divided by the total export earnings for that year.

For R_f, tobacco and alcoholic beverages (SITC 212 and 221) were included, then these commodities were subtracted from R_r.

The raw materials index, R_r, is relatively important for countries exporting large quantities of minerals, oils or other non-renewable resources. This is not the case for Costa Rica, however, it is included to indicate the degree of exploration and exploitation occurring in areas such as aluminum and other minerals. This ratio is

expected to be low due to the lack of mineral and raw material resources of the country.

It is possible to have increasing values of this ratio over time because of the increasing profitability for exploration and exploitation of some of these raw materials as they become scarce and their international prices make it feasible to extract. Also, a certain degree of world price effects might be present in this ratio.

The establishment of an aluminum processing plant in the province of Puntarenas which exports unfinished aluminum could be reflected in the more recent values of this ratio.

MARKET SHARE

It is expected that this variable will indicate the evolution of the Costa Rican export sector within the total U.S. import context. The desirable occurrence will be to see increasing share of U.S. imports being originated in Costa Rica. This share ratio could reflect that, however, it must be noted that this variable is composed of both a price and a volume component. To account for these two factors two more variables will be included in this research: a unit value index, UVI_t, and a quantity index, QVI_t, of exports from Costa Rica.

THE UNIT VALUE AND QUANTITY INDEXES

The unit value index of exports is obtained by calculating the average weighted unit value of exports for a particular year and indexing this on a particular year. The quantity index is the weighted average quantity of exports for a given year and indexing it

to a particular year. The year 1970 was used to index both of these indicators. Both indices are reported by the Organization of American States Economic Commission of Latin America (ECLAC/OAS).

It is important to note that both of these indices have the inherent limitations of the Laspeyres and Paasche indices. The levels of the variables depend on the trade composition of the base year and the relative trade values and volumes. The unit price index then, not only reflects the trend in unit price fluctuations but also changes in the structure of trade with respect to the base year.

A NOTE ON TRADITIONAL EXPORT COMMODITIES

The regression analysis in this research has not separated traditional and non-traditional exports. Traditional exports such as sugar, beef, bananas and coffee have been affected by quotas before and after this trade policy, therefore it is not expected that their export quantities will change significantly, however their share of export earnings will change over time depending on the prices of such commodities in the international markets and export volume fluctuations. For illustration, comparative data on this issue is presented and discussed in Chapter IV. Traditional exports are considered as those which contribute at least five percent of total exports at the beginning of the period, in this case, 1961. Such products, for the Costa Rica - U.S. trade portion, are beef, bananas, sugar, coffee and cocoa.

POLICY EFFECT MEASUREMENT

In this research, given that the goal is to measure the impact of a particular policy towards a specific country, the variable on geographic concentration, G^2_t, has been excluded. Instead, the relative share of the U.S. market as an importer of Costa Rican exports is expected to be reflected by SUS. This variable would indicate the degree of "dependence" of Costa Rica on the U.S. market as a source of export earnings.

Multicollinearity may occur between R_f, R_r and R_m. For this reason the final model will likely do not include all three of these ratios.

The detection of structural changes in the economy between the period before and after the policy went into effect would be attempted through the use of a dummy, DUM, variable which takes values of 0 for years previous to 1983 and values of 1 in 1983 and after.

Beside this colinearity complications, it is expected that some effects of CBERA could already be reflected in some of the other variables since it is difficult to determine to what extent the variables or the policy have caused changes in the export earnings. To detect causality and effects, the individual variables will be regressed against the dummy to determine whether the time period is statistically significant.

THE ESTIMATED MODELS

The following econometric models will be estimated and tested by using OLS:

$$DX_t = \alpha_0 + \alpha_1 t + e_t \tag{12}$$

where t is the time trend and DX_t is the deflated export earnings of Costa Rica resulting from trade with the U.S. The deflation was done used the UVI_t index to divide:

$$DX_t = X_t / UVI_t \tag{13}$$

The error term, e_t, is then specified as a function of the instability variables previously used in other research papers. In this case this risk components will be proposed to have the form:

$$e_t = Ae^{\beta_0 Dum} SUS^{\beta_1} Rf^{\beta_2} Rr^{\beta_3} \in, \tag{14}$$

where:

A   = Constant

Dum = Dummy variable for policy change.

Rf_t and Rr_t as defined in equation (3).

$\in$ = stochastic error.

In order to estimate this error, the residuals, e, are squared and then transformed using a natural logarithmic form to yield:

$$\ln(e_t)^2 = 2\ln A + 2\beta_0 DUM + 2\beta_1 \ln SUS_t + 2\beta_2 \ln Rf_t +$$
$$2\beta_3 \ln Rr_t + 2\ln\in. \tag{15}$$

and transforming it in order to estimate it by OLS:

$$\ln(e_t)^2 = \alpha_0 + \alpha_1 Dum + \alpha_2 \ln SUS + \alpha_3 \ln Ct$$
$$+ \alpha_4 \ln Rf + \alpha_5 \ln Rr \tag{16}$$

First, equation (12) is estimated using OLS and the residuals calculated. The residuals are then squared and transformed to logarithmic form. This becomes the dependent variable in equation (14). The other relevant variables are then transformed to logarithmic form and equation (16) is estimated using OLS. The coefficients of the independent variables in equation (15) are tested for statistical significance using the t test.

Several alternative models using other combinations of explanatory variables such as C_t^2, and R_{mt}, will be tested to try to detect consistency in the signs, magnitudes and statistical significance of the independent variables, these results will be briefly discussed in Chapter V.

Serial correlation in both estimations was corrected using the Cochran - Orcutt procedure included in the software program Shazam which was used to perform the statistical analysis.

DATA

To calculate the commodity concentration index, C_t^2, the United Nations Trade Yearbooks as well as the World Trade Annual were used. The period selected for analysis was from 1960 to 1987. Because of difficulties in obtaining accurate data for some of the commodities, information from the United States Department of Commerce was also used for the years before 1964 and the years after 1985.

Information from the Costa Rican Central Bank and the OAS Economic Commission for Latin America was used for the merchandise Terms of Trade, the quantity index and the unit value index of exports.

Commodities were selected according to the SITC code using a minimum of three digits and a maximum of four when available. Variations in the SITC code classifications were detected in 1964 and 1980. For the purpose of the independent variables constructed using this information, this occurrence should not alter the calculated variables given that all commodities were accounted for and there were no gaps in the time series. Appendix A consists of a 360K, double

sided, double density computer disk which includes the 151 x 28 data matrix used for the computation of C_t^2, R_f, R_r and R_m, as well as other time series data used in the analysis. Empty entries have values of zeros or were not reported for that year in the mentioned data sources.

The variables UVI and QVI were obtained from various issues of the OAS Economic Commission for Latin America publication "Statistical Yearbook of Latin America".

IV. RESULTS

GENERAL TRADE SITUATION

In order to place in context the current import -export trends between the U.S. and the countries involved in the Caribbean Basin Economic Recovery Act, data on the most updated indicators are presented first. The large import capacity of the U.S., as well as the steady increase in the value of U.S. imports since 1970 is illustrated in figure 1. The total value of U.S. imports from all countries have been increasing continuously in the past decade. It is interesting to observe the drop of U.S. imports which occurred in 1982 possibly due to the reduction in U.S. import demand caused by the economic recession of the early 1980's. Rapid increases have taken place after 1983 reflecting to some degree some U.S. economic recovery. The capacity of the U.S. market to absorb large quantities of Less Developed Countries exports and the major share of imports it consumes make this a major market for most CBI countries, particulary for Costa Rica which obtains more than 60% of its export earnings from sales to the U.S. market.

The amounts imported and exported from and to developing countries included in the CBERA are illustrated in Figure 2. It should be noted that there exists a noticeable decreasing trend in the values of total U.S. imports from these countries.

Also, total U.S. exports have been increasing slowly since 1983 and in 1986 the trade balance of the U.S. with CBI countries turned positive for the first time in many years.
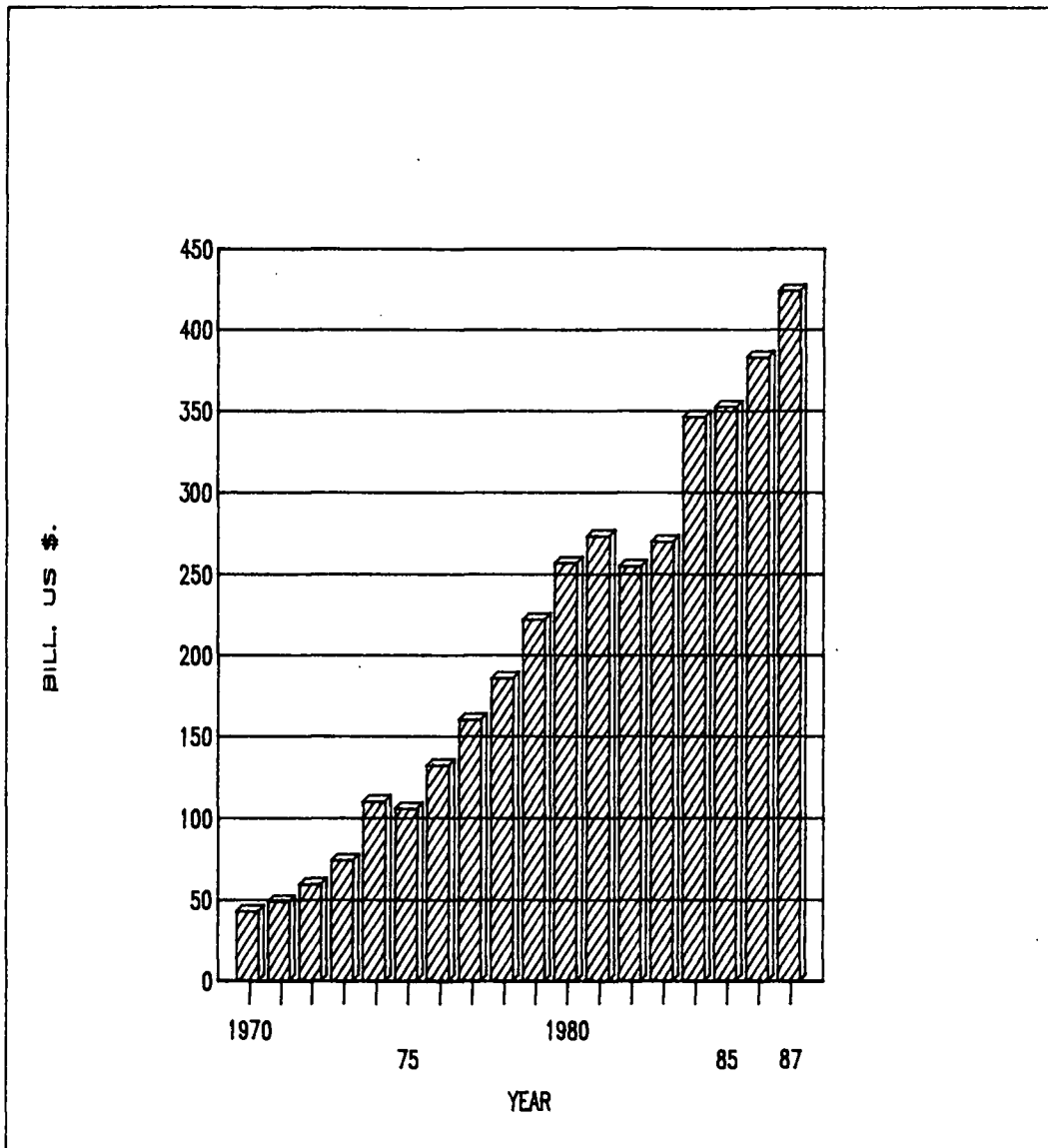
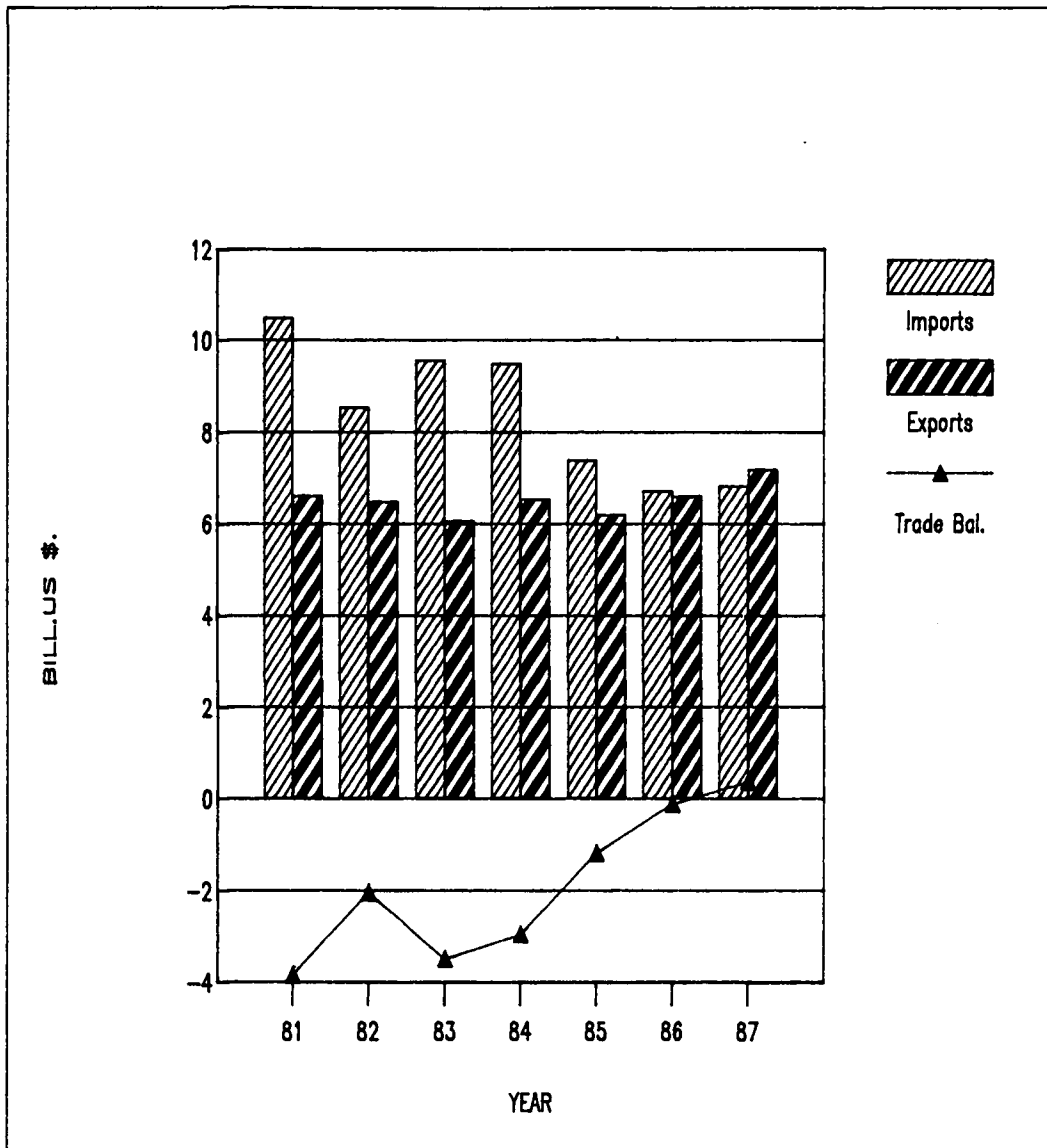FIGURE 1. Total U.S. World Imports.(Billions of U.S. dollars).(U.S. Department of Commerce)

FIGURE 2. U.S. Imports, Exports and Balance of Trade with CBI
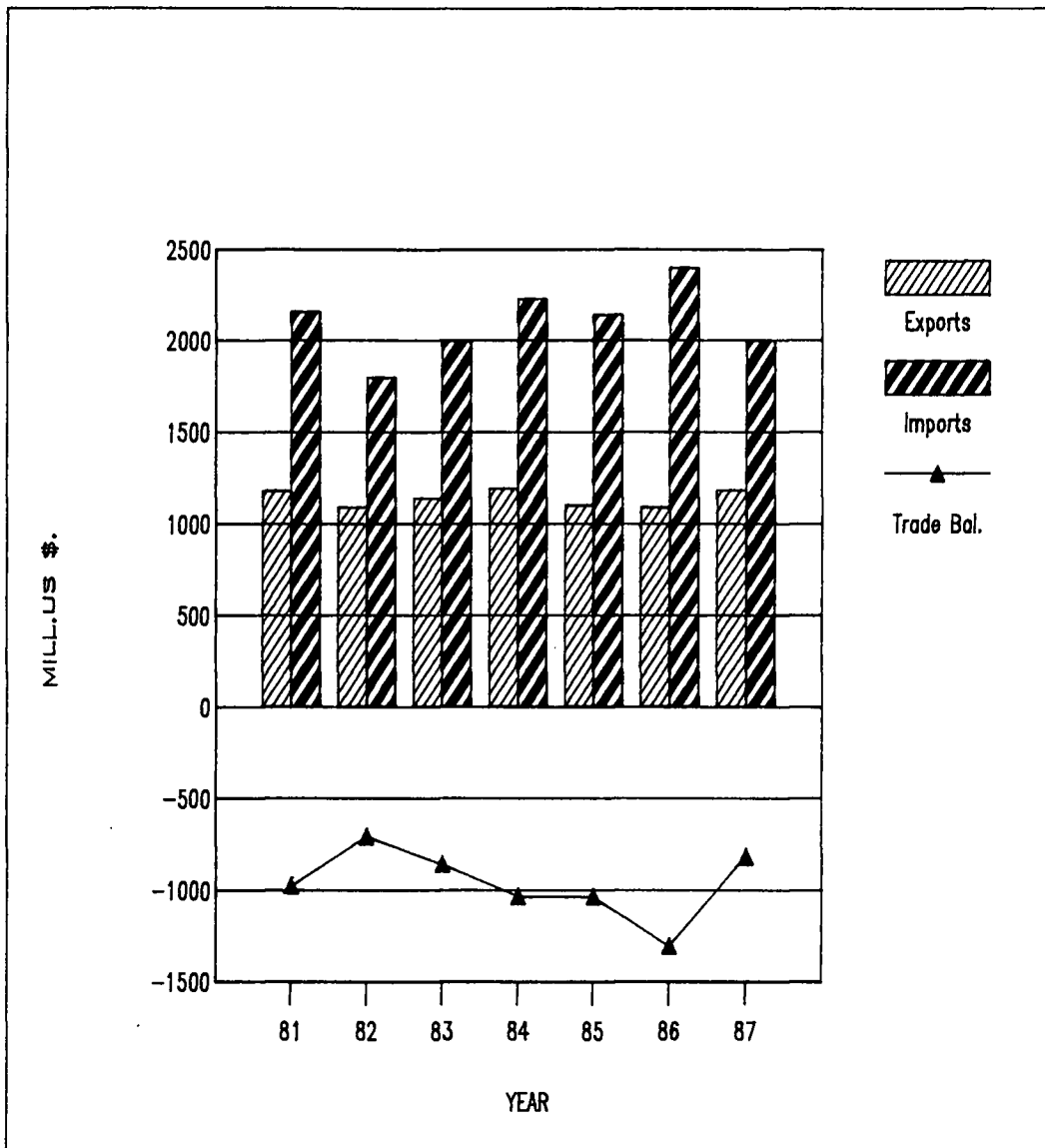countries.(Bill. U.S. $)(Dept. of Commerce)

FIGURE 3. U.S. Agricultural Imports, Exports and Balance of Trade
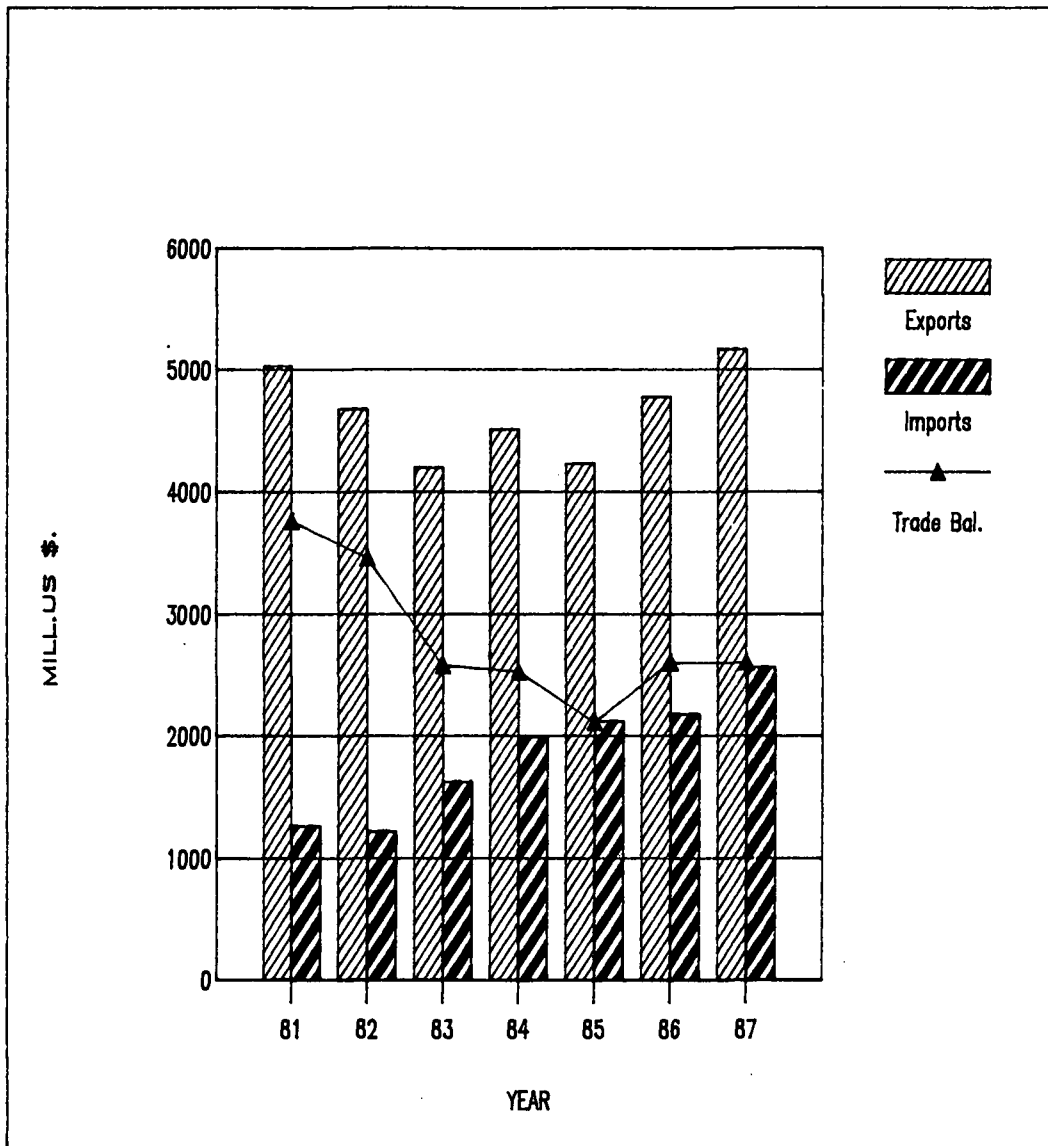with CBI Countries.(Mill. U.S. $)

FIGURE 4. U.S. Manufactured Imports, Exports and Balance of Trade
with CBI Countries.(MIll. U.S. $)

U.S. agricultural imports from the region have fluctuated around 2.2 billion dollars per year, as illustrated in figure 3. The 1987 level of U.S. agricultural imports decreased 8% from the 1981 level. However, large increases seem to have occurred in the 83-84 and 85-86 periods, followed by declines. U.S. agricultural exports to the region have remained basically unchanged at 1.2 billion per year, accounting for most of the large trade balance deficit in agricultural product trade with participant countries.

This lack of growth in U.S. agricultural exports to the region could be due to increased self-sufficiency as well as other factors such as comparatively better trade and pricing arrangements for agricultural products from other countries.

Also, in figure 4 as in figure 2, it is interesting to observe a significant increase in U.S. exports to this region, especially of manufactured products. This fact could be indicative of increases in the purchases of capital goods such as machinery, raw materials or unfinished products by CBI countries.

Since 1982 U.S. manufactured imports from CBI countries have increased considerably, more than doubling in 5 years. The positive balance of trade in these products which had been deteriorating until 1985, started to recuperate in 1986 and 1987. This comeback is due mostly to the marked increase in manufactured exports which occurred after 1985 as a result of an increase in consumer demand in CBI countries and a depreciating dollar which made U.S. products more competitive in this highly contested market.
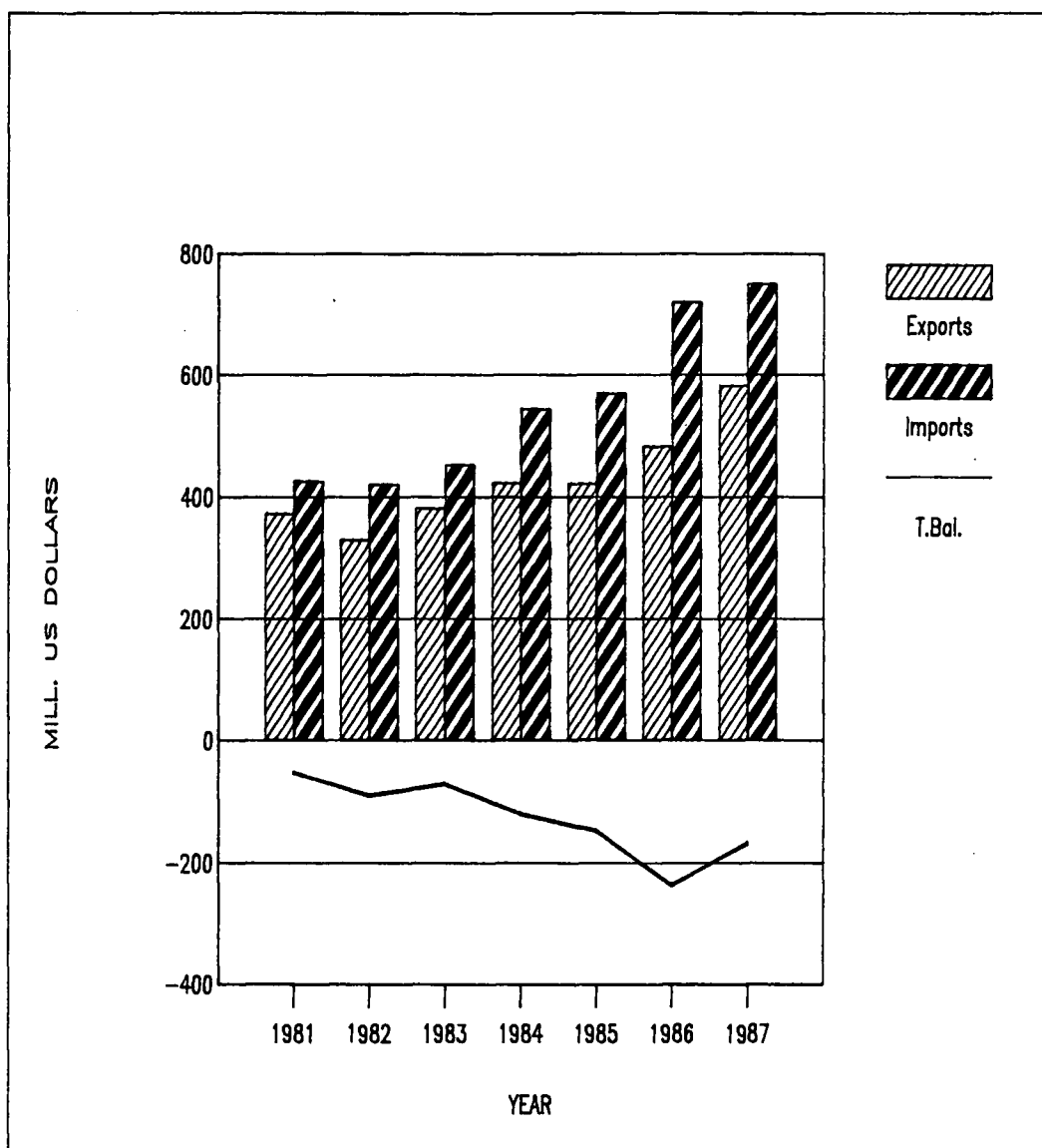
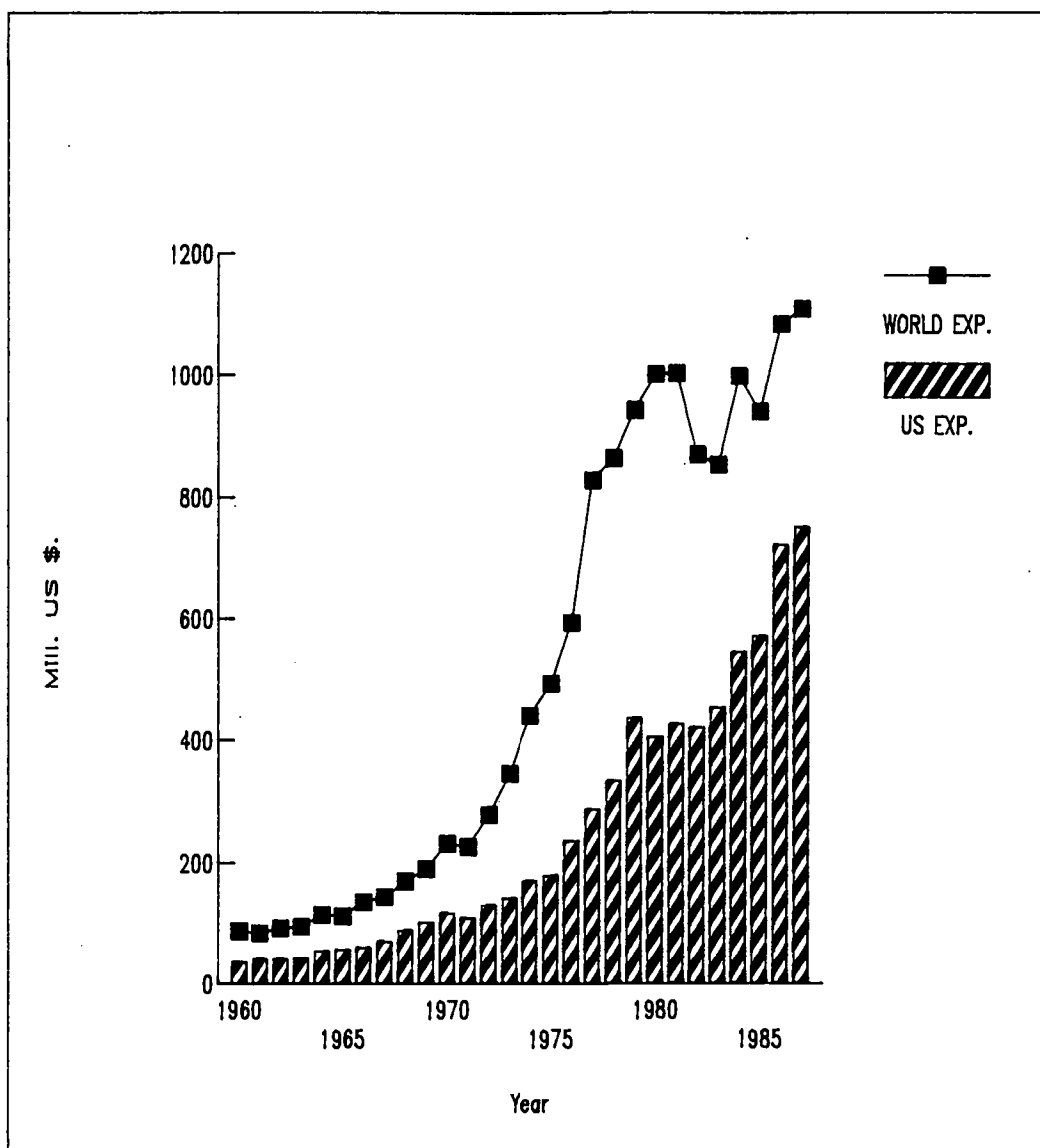FIGURE 5. U.S. Imports, Exports and Balance of Trade with Costa Rica.(Mill. of U.S. $)

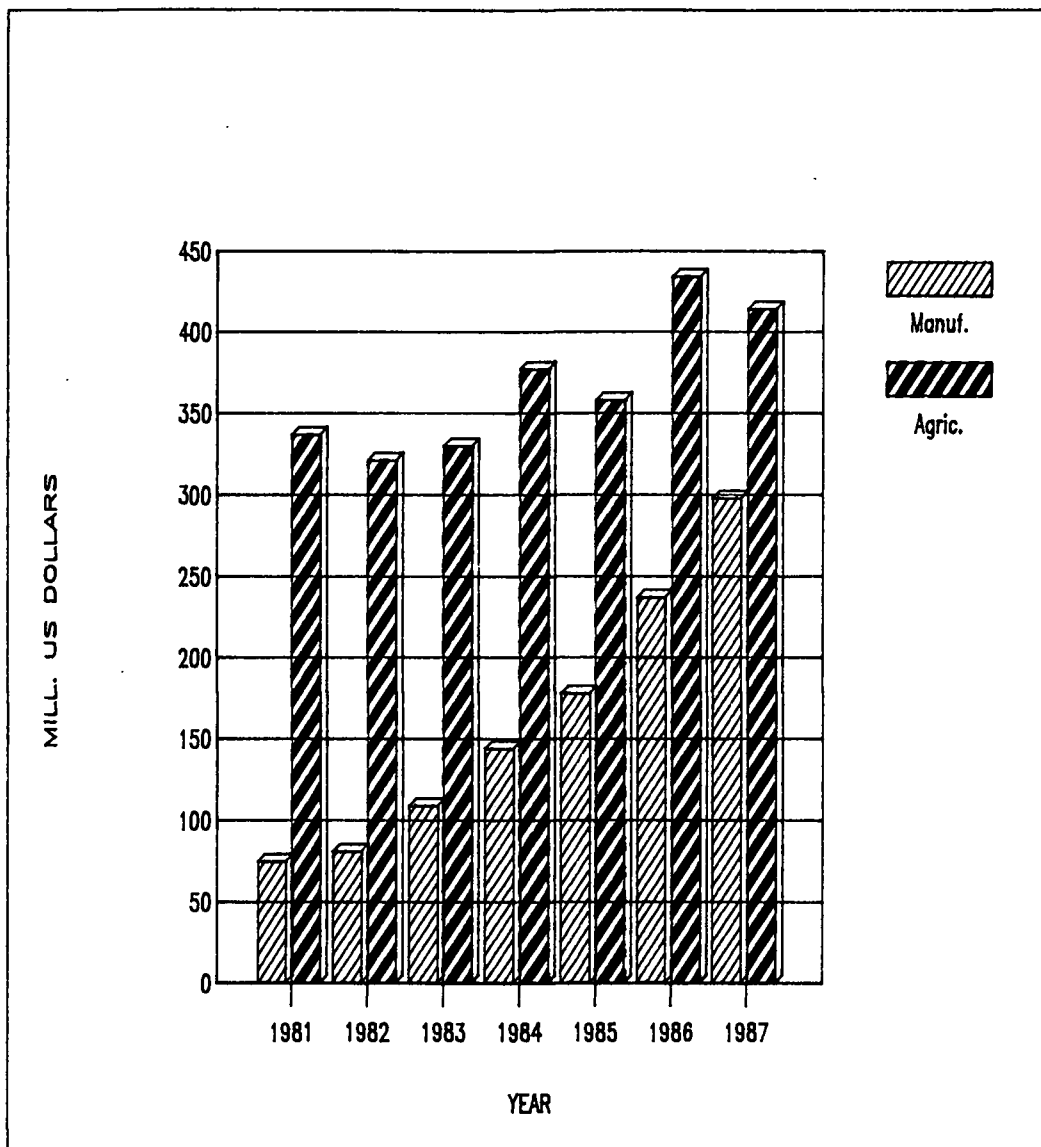FIGURE 6. Costa Rican World Total and U.S. Export Earnings.
(Mill. of U.S. $)

FIGURE 7. U.S. Agricultural and Manufactured Imports from Costa
Rica. (Mill. of U.S. $)

A factor which would account for large amounts in this manufactures balance of trade is the importation of machinery and equipment to be utilized to increase production of non traditional exports for the U.S. market created by the CBI. There are incentives for U.S. companies to invest in new equipment in the region since some benefits can still be obtained in terms of taxation and depreciation. Some of these benefits were eliminated in the tax reform of 1986 and it is likely that there will be a decrease of this type of investment spending in the coming years.

With this background in mind, it is reasonable to question the benefits and beneficiaries of this program. It seems that major benefits are being obtained in the U.S. while the effects of the policy in the other participants is at least unclear.

In the case of Costa Rica, figure 5 shows its most current annual trade indicators with the U.S. and the world. The value of total export trade with the U.S. accounted for over 65% of the total Costa Rican exports earnings in 1986 and 1987, therefore consisting in the most important market for this country.

In fact, 78% of the total exports earnings of Costa Rica can be explained by the U.S. export earnings with a statistical significance of less than 1% error.[6]

Figure 6 depicts the development of U.S. imports from Costa Rica in the last seven years. There is a noticeable increase in the value of manufactured imports and, for 1987, the level of agricultural imports have decreased 5% from the 1986 level, reflecting lower Costa

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[6] This can be obtained by regressing total export earnings on U.S. export earnings during the estimated time series.

Rican production of crops such as coffee and beef and the withdrawal of a major banana corporation from the country due to labor problems.

However, in spite of the relatively stable U.S. agricultural imports, there has been an increase of U.S. manufactured imports which could provide some room for an improved Costa Rican trade position.

Increases in Costa Rican manufactured product imports could be caused by increased domestic demand, need for capital goods and the unfinished materials needed for "drawback" industries operating for the export and local markets. Such could be the case of the clothing and computer components industries whose materials are manufactured in the U.S. but the final products assembled in the Caribbean and other countries.

These "drawback" or "in-bond assembly" industries have had a particular effect on Costa Rican exports as can be perceived from Figure 7, 8 and 9. The increase in U.S. manufactured imports from Costa Rica is due largely to clothing, footwear and lingerie as well as some increases in machine and electronic components industries. These earlier increases in these industries, as figure 8 indicates have not been maintained in latter years possibly because some loss of competitive advantage.

Manufactured goods have become an important component of the export earnings derived from the U.S. market. This sector has moved from contributing less than one percent to the total U.S. export earning, in 1980, to more than 10 percent in 1987.
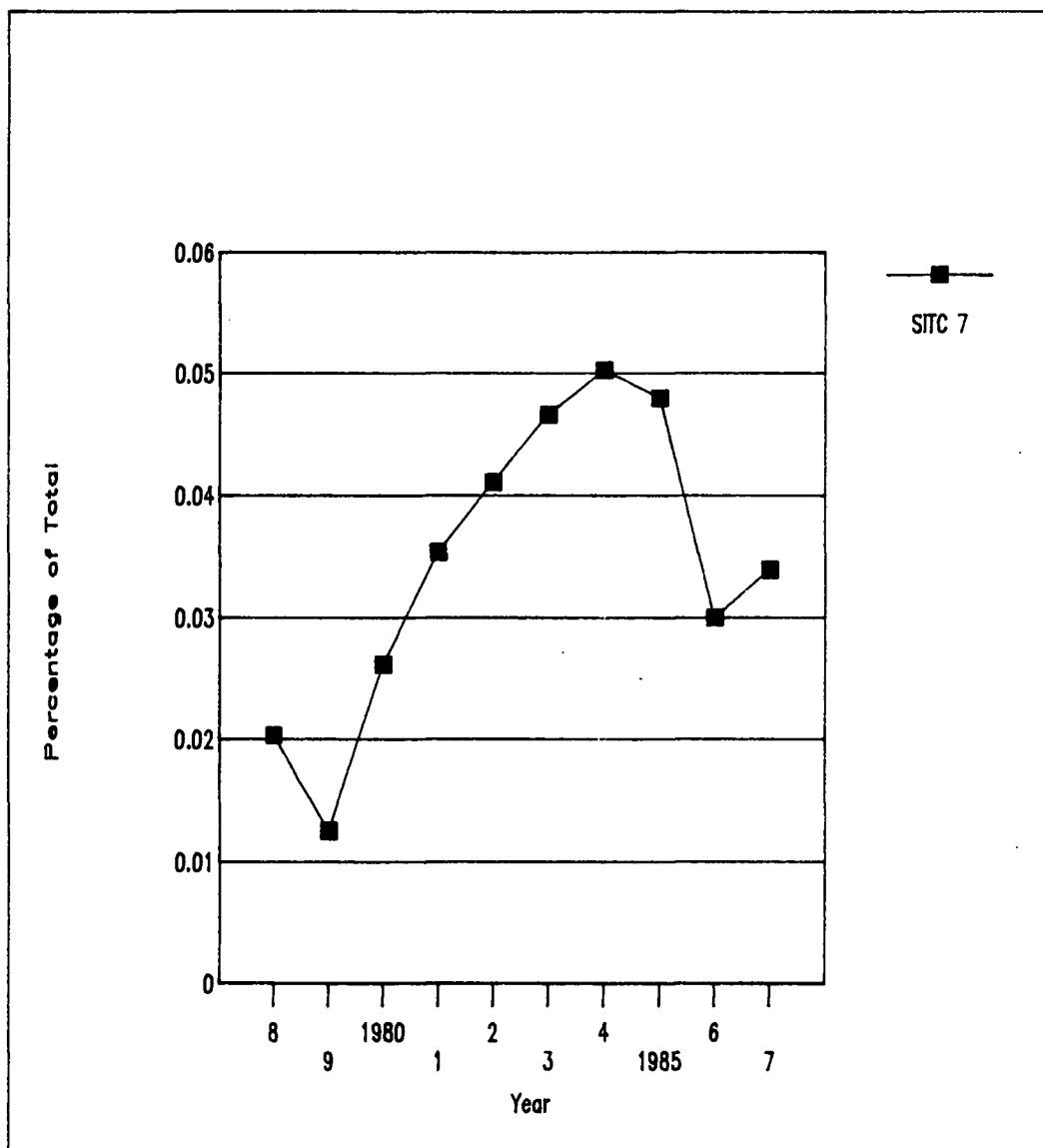
FIGURE 8. U.S. Machinery and Electronic Imports from Costa
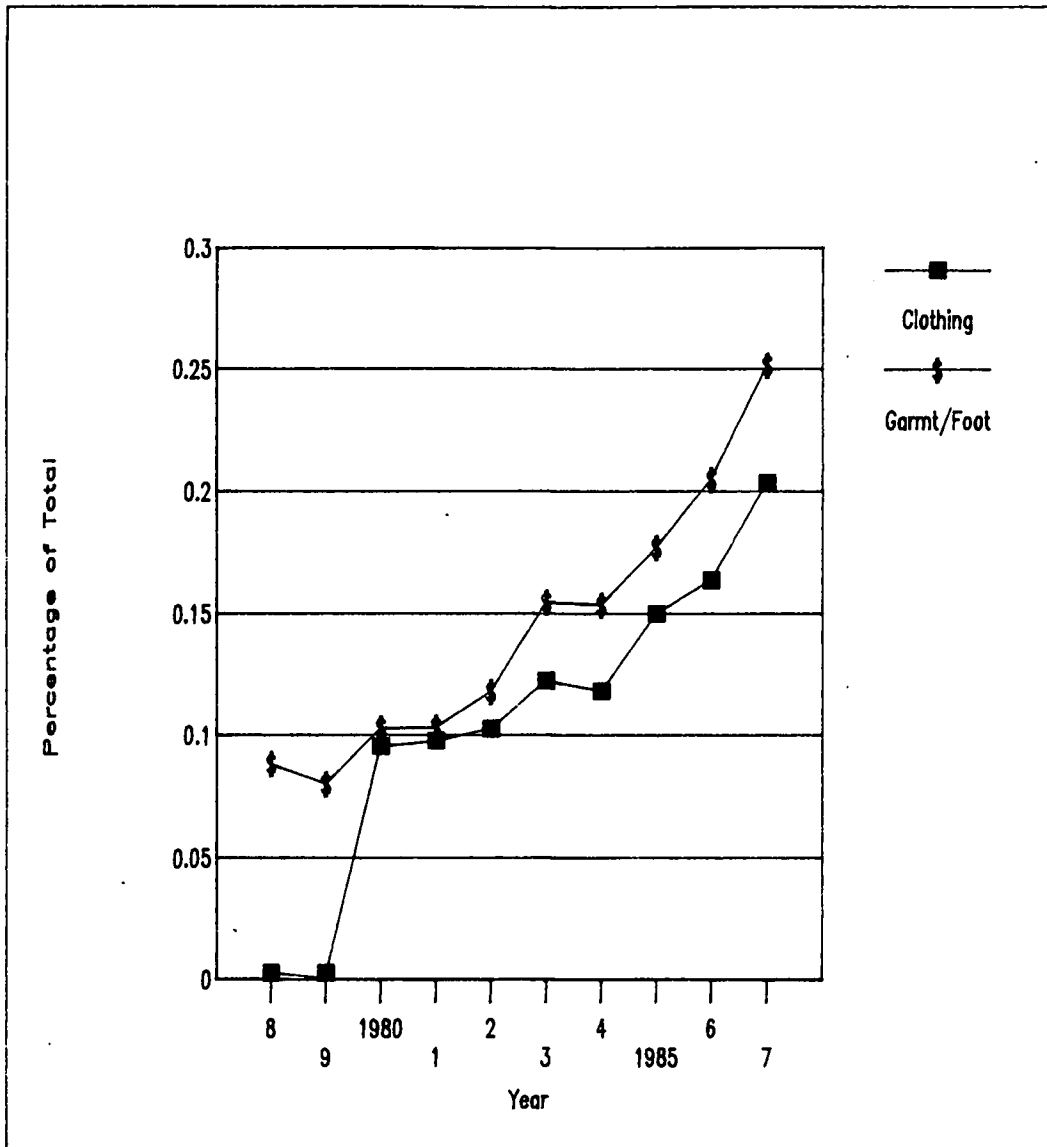Rica. (SITC 7)(Percentage of Total CR Exports to the
U.S.)

FIGURE 9. U.S. Clothing Imports from Costa Rica.
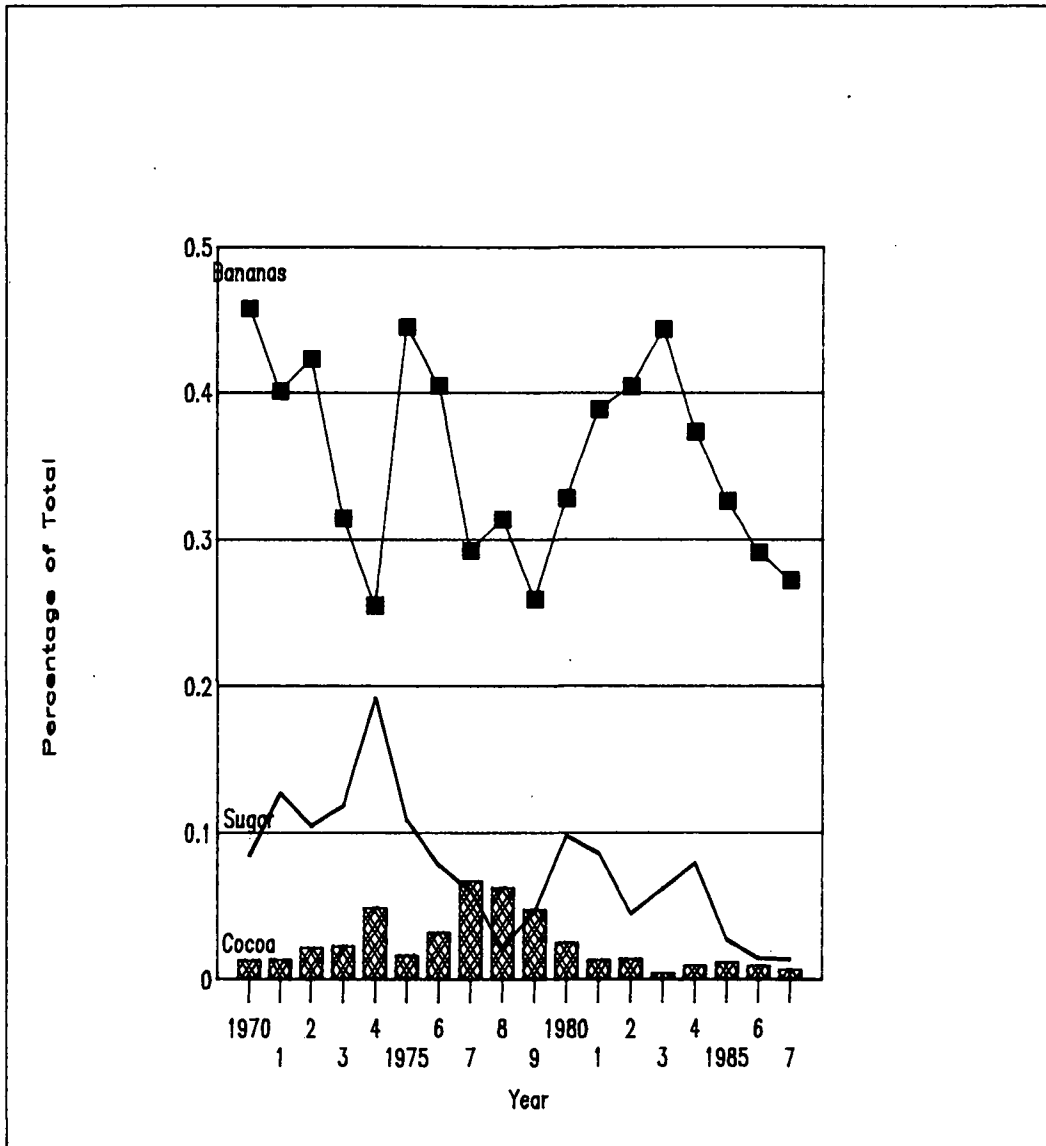(Percentage of Total CR Exports to the U.S.)

FIGURE 10. Costa Rican Banana, Sugar and Cocoa Exports to the U.S.A.(% of Total Exports to the U.S.)

The increase in some manufactured imports from Costa Rica could indicate the effectiveness of the relaxation of trade restrictions on the part of the U.S. as well as relative comparative advantage of Costa Rica in the production of such products. These advantages could be a result of the relatively highly educated labor force and relatively low labor cost of this labor. Also it could reflect the increased government support to these type of industries as a fast way to take advantage of the CBI.

It should be noted that during the late 1970's and early 1980's, a large number of Costa Rican industries closed their doors due to currency exchange problems. It is estimated that close to 30% of the manufacturing sector was having problems. Many of the manufacturing plants were left idle and it was relatively easy to bring them back into production when the exchange situation was stabilized after 1982.

On the other hand, the slow increase of U.S. agricultural imports from Costa Rica could illustrate the presence of quotas which restrict the amounts of the traditional exports therefore preventing major changes in the export earnings derived from these important products which already have a production base and which supplies would be the ones to more rapidly adapt to demand changes. Also, this tendency might be caused by the relatively low elasticity of agricultural products supply and the relatively higher production costs of this sector when compared to other CBI countries with less burdensome social benefit schemes, lower labor costs and less stringent input taxation systems.
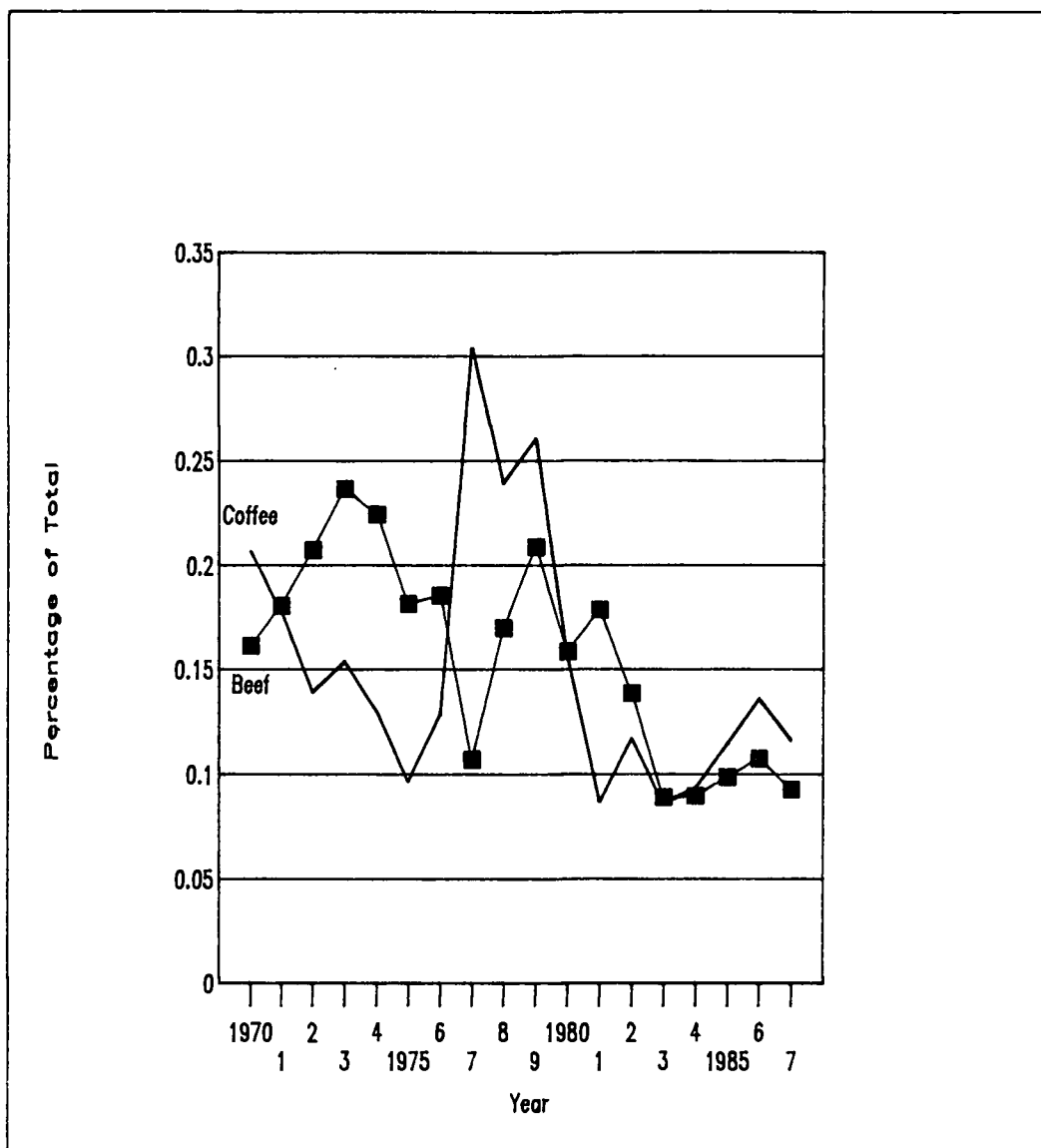
FIGURE 11. Costa Rican Coffee and Beef Exports to the
U.S.A.(% of Total Exports to the U.S.A)

The presence of high interest rates for loans in this sector make it very difficult to convince farmers to invest in new production enterprises. An indication of this is that the contribution of agriculture to the real Gross Domestic Product growth of the country has shown negative growth rates for 1982 and 1985. In spite of this, foreign and domestic investors, by using foreign capital and paying lower interest rates have invested in non-traditional activities such as ornamental plants, flower production, seed and shrimp production.

For these investments to happen, assurance of the possibility to repatriate some of the profits and accessibility to transfers is necessary to allow companies to pay back their debt and to still affect the Costa Rican Balance of Trade. In this regard, some provisions have been implemented in the Central Bank of Costa Rica that permits such arrangements.

Regarding traditional exports, it is important to note that the percentage of total export earnings from coffee, bananas, sugar, beef and cocoa, have decreased steadily throughout the period. This decrease is accelerated after 1982, especially in bananas, cocoa and sugar exports. Bananas continue to be the major export earner product from the U.S. market, accounting for just over 25 percent of total U.S. export earnings (Figure 10). Sugar and cocoa contribute relatively small amounts to the more recent year's exports to the U.S. The drop of the value of banana exports to the U.S. from 1983 to 1987 is striking. This drop of almost 20% is due mostly to the exit of a major U.S. Banana Corporation from the Southern Zone of Costa Rica due to labor problems and major losses due to infestation of the "Sigatoka" fungus in some Atlantic plantations. High winds and bad

weather also affected the 1984 crop drastically.

Sugar exports have also suffered reductions after 1984 and it has dropped conspicuously from the 1974 high of 20% of total U.S. earnings to a mere 2% in 1987.

Coffee and beef export earnings have been relatively stable the last 4 years (Figure 11), although their levels are also much lower than those highs attained in the seventies. Each of this crops comprise about 10 percent of total U.S. export earnings 1987. Production of coffee was down in 1986 due to the seasonal nature of the crop and increased problems with the coffee rust fungus which was introduced from Nicaragua in 1981.

Particulary noticeable is the marked drop of these two products in the total U.S. export earnings from 1979 to 1987. This fall is close to 20% for coffee and 10% for beef.

Determining the distinct effects of export prices and quantities upon the total export earnings is a difficult task given the aggregation level used in reporting exports. Quantities and prices vary throughout the year due to external market conditions, quality and availability of products. In order to understand how export prices and quantities have fluctuated during the time considered in this research, the unit value (UVI) and quantity value indices (QVI) are presented in figure 12, and the merchandise terms of trade for Costa Rica are presented in figure 13. These indices are reported by the Economic Commission on Latin America (ECLAC/OAS). The last two years of the series were projected using coffee and sugar prices as a reference due to the lack of data. The year 1980 was used as base year for all indices.

A note of caution about the interpretation of these indices is that they represent the total trade situation, not just the bilateral relationship of the U.S./Costa Rica trade as discussed in the previous section, therefore a complete correspondence of effects is not expected.

In general, the UVI appears to have improved significantly after 1975 and has remained relatively stable around the 250 mark for the last few years. This result could indicate a certain level of stability in the prices of Costa Rican exports. The large increase in 1986 could be due to the relatively higher prices in the coffee market which could in turn tend to overestimate this projection. These high prices of coffee were due to a reduced world supply triggered by frosts in Brazil.

Regarding the QVI, it reflects the relative changes in the quantity of total exports during the period. There exists a trend increase in the years previous to 1975 and since then, there have been many fluctuations. These values may reflect the two year seasonality of coffee production and the periodic droughts which have affected the Pacific region of Costa Rica.

The merchandise terms of trade (MTT), also represented in figure 13, have been below 1980 levels, except for 1986. This indicator reflects the relative price of exports with respect to the price of imports. The general values of MTT below the 1980 base year indicate a deterioration of the general trade conditions for the country.
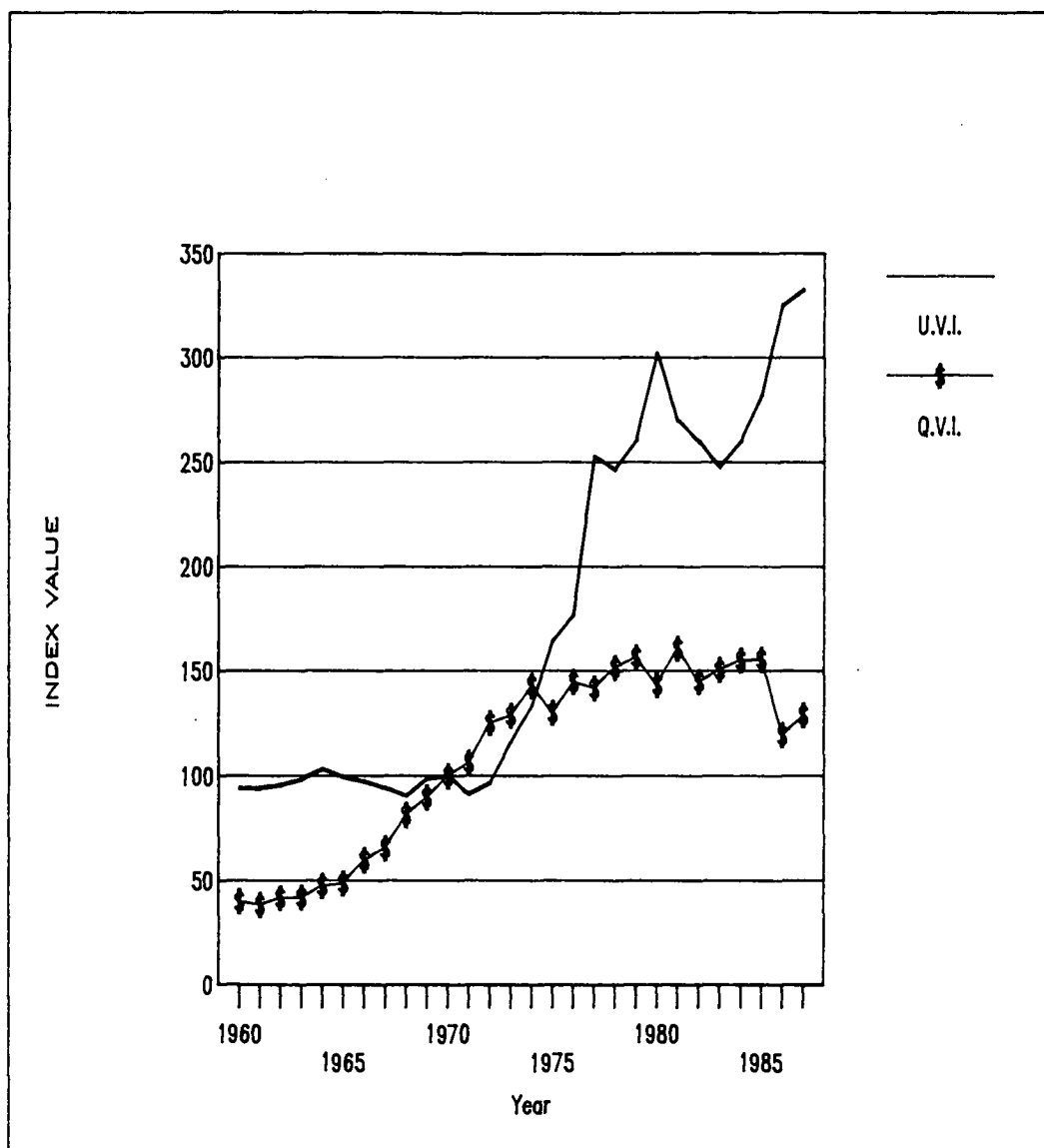
FIGURE 12. Export Unit Value and Quantity Indices for Costa
Rica.(1970 = 100)
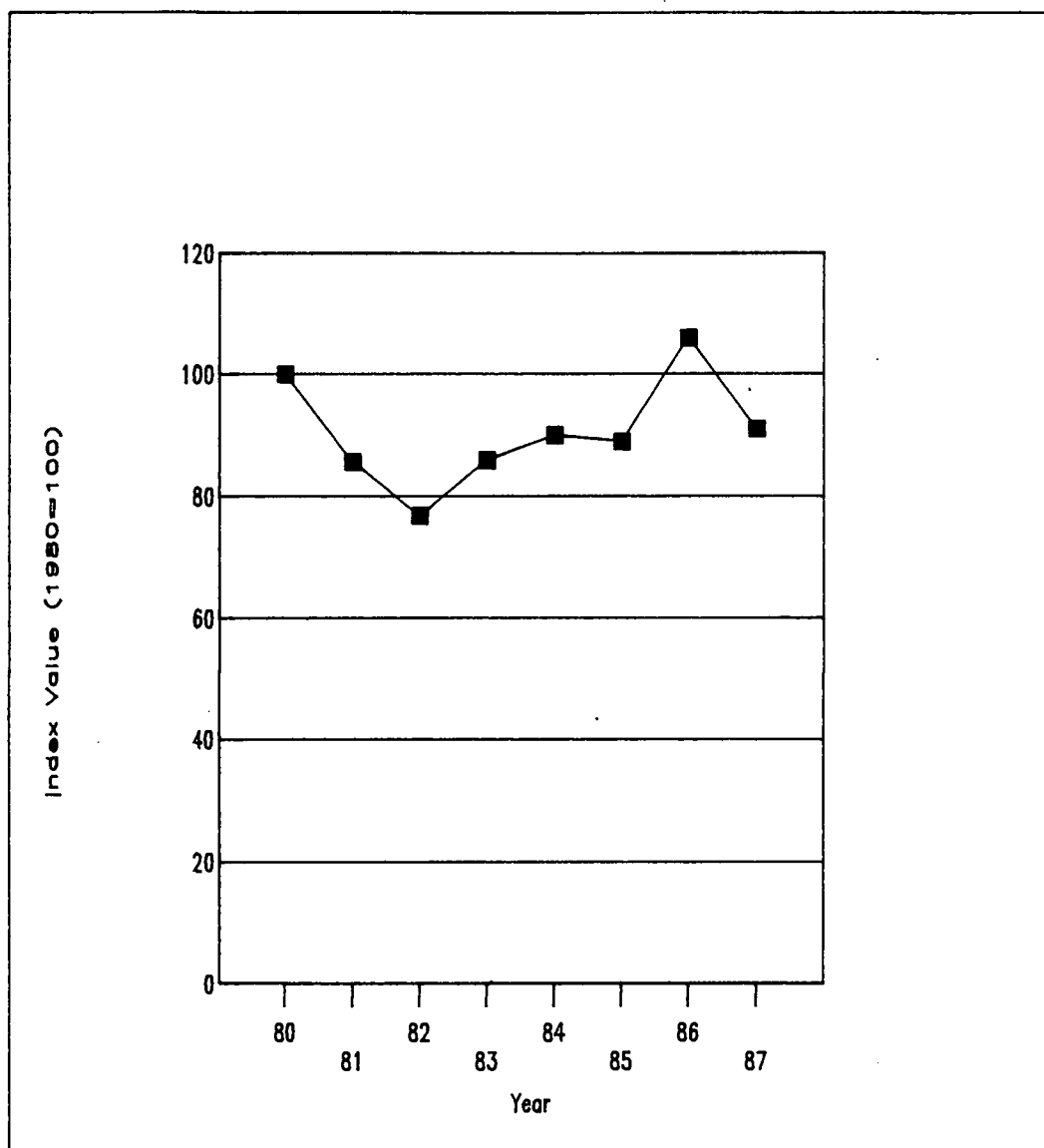
FIGURE 13. Costa Rican Merchandise Terms of Trade. (1980 = 100)

These, however, does not necessarily imply that the U.S./CR trade pattern has been the same, although given the amount of trade taking place between the two countries, it is likely to be highly correlated.

It is clear that traditional crops have suffered drastic fall in earnings in the last 5 years. The fall in the export earnings from these crops, given their large share in total exports, might be causing structural changes in the Costa Rican economy. The desirability of these changes will surely be a matter of concern to economic planners and producers since the major earning sector of the economy are being reduced and possibly some distributional resource and income allocation questions are in order.

To what extent these changes are caused by CBERA or internal policies or both is hard to measure and separate. However, the bilateral data indicate a marked effect in the export earnings structure after the 1982 period.

BEHAVIOR OF INDEPENDENT VARIABLES.

In general, as figure 15 illustrates, the share of food products in total export earnings has decreased from level above 95% in 1968 to 66% in 1987. The decrease of this ratio for the period 1983-1987 has been consistent with the previously observed trend. U.S. agricultural imports from Costa Rica have been maintained at levels close to 400 millions of U.S. dollars. However, the contrasting increase of Costa Rican manufactured product imports by the U.S. is evident in figure 7. If this trend were to continue it is likely that manufactures might be as important for Costa Rica as agricultural products are in earning export dividends from the U.S. market.

The export concentration index, C_t^2, for U.S. imports from Costa Rica has fluctuated markedly during the time series analyzed in this thesis. Figure 14 shows the actual computed C_t^2 for this period. There has been a decrease from levels close to .32 in 1969 to .14 in 1987. This indicates that exports to the U.S. have been more diversified in latter years. It is important to note the marked decrease of .08 points in the actual C_t^2 that occurred between 1983 and 1987. The range of C_t^2, between .35 and .14 is consistent with other reported values for this index.

Regarding the values of the ratio of raw materials in exports, R_m, figure 16 shows the variations observed during the period. The small contribution of this class of exports to total export earnings is confirmed by the low values of the ratio. In general it approaches the 3% level. However, the increase from half of a percent to about three percent between 1980 and 1987 is an interesting fact. This is due to increases in the exports of products such as clays, gold and

some refined petroleum products.

The ratio of manufactures to total exports, R_m, is presented in figure 17. This figure shows the most dramatic increase of all the variables presented here. It goes from less than 5% to levels close to 40% of total export earnings from the U.S. market. This increase is dramatic from 1967 (2%) to 1987 (38%).

The export share ratio, Q_t, has fluctuated from .3% to .15%. A discernible decreasing trend is observable, however as figure 18 shows, this share has tended to stabilize around .17% for the last 10 years. A slight increase is noted in 1985 followed by a fall in 1987. The value of this indicator will likely be related more to U.S. demand conditions and trade structure rather than policies dealing with export promotion in Costa Rica. The significance of this variable in Costa Rican export earnings would depend then on the relative market conditions in the U.S.

As a measure to illustrate the importance of the U.S. market in comparison with other world markets for Costa Rican exports, SUS, the share of total Costa Rican export earnings generated from U.S. trade shows interesting increases in the latter years. This variable has fluctuated through the years and after falling for some 5 years before 1981, started to pick up in value after 1982.

The ratio SUS which describes the share of Total Costa Rican export earnings which are accounted for by U.S. trade is represented in Figure 19. It is noticeable the increase of this ratio after 1980, becoming even higher after 1983.
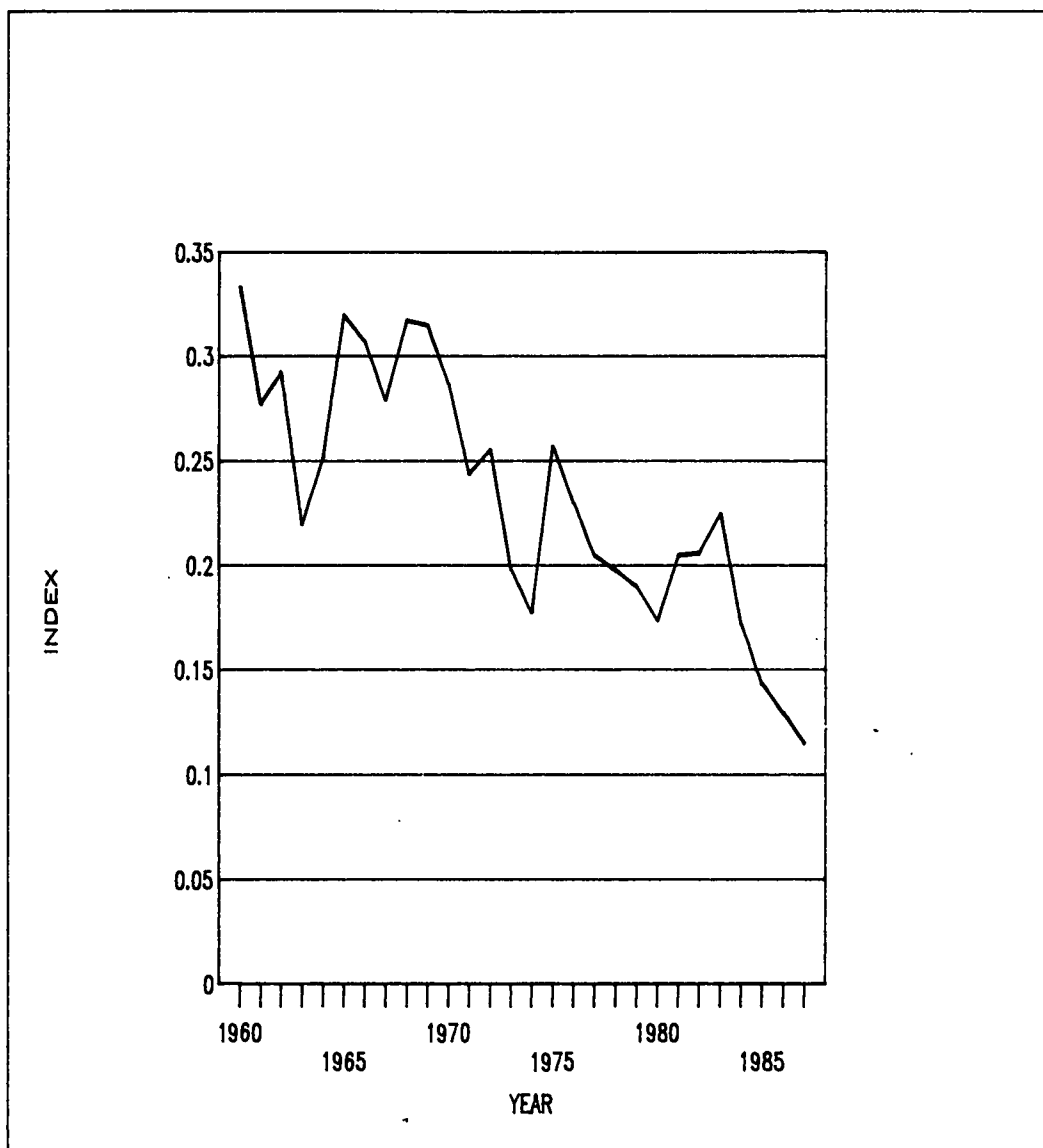
FIGURE 14. Costa Rican Export Concentration Index for U.S. Exports.($C_t{}^2$)

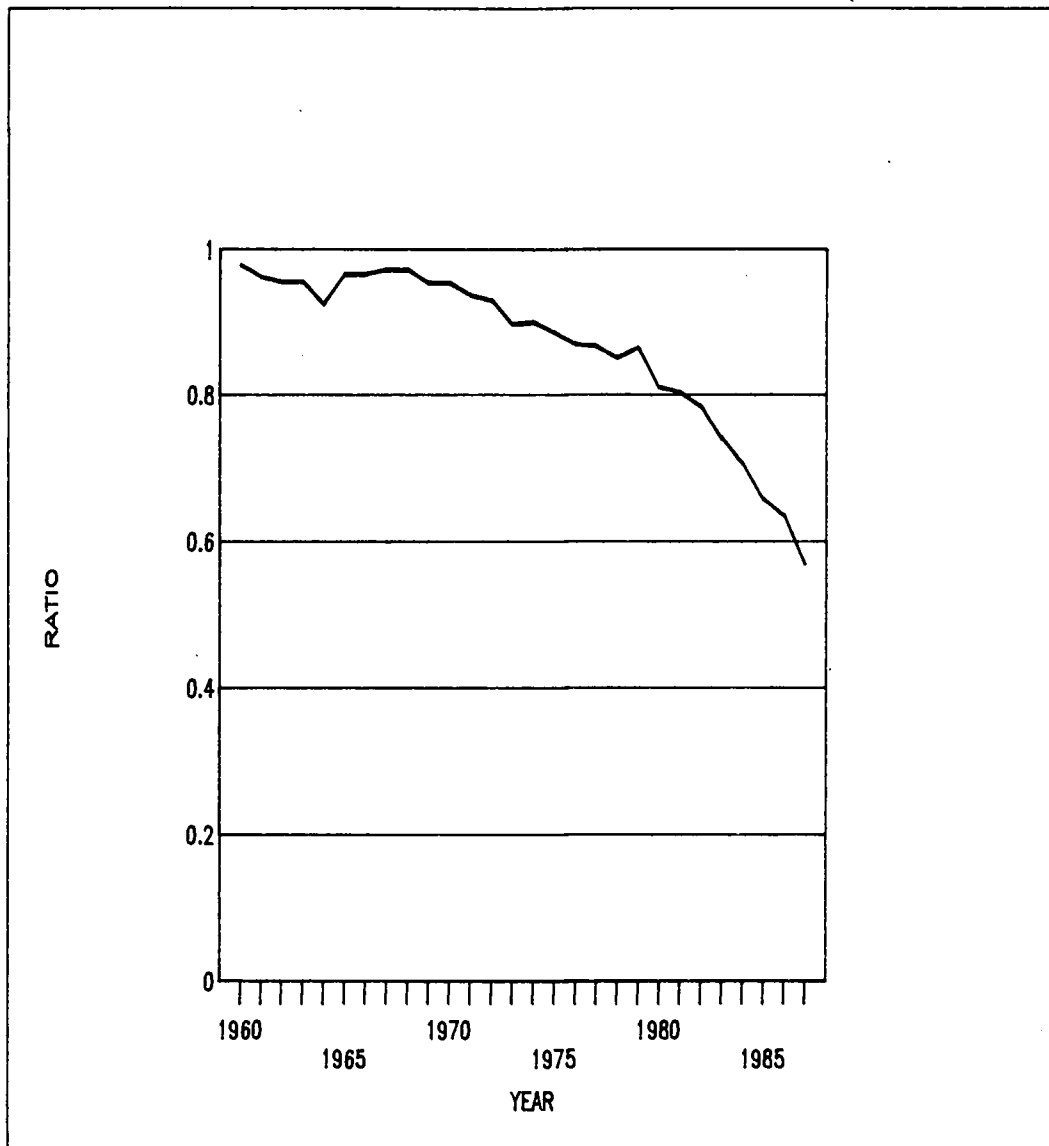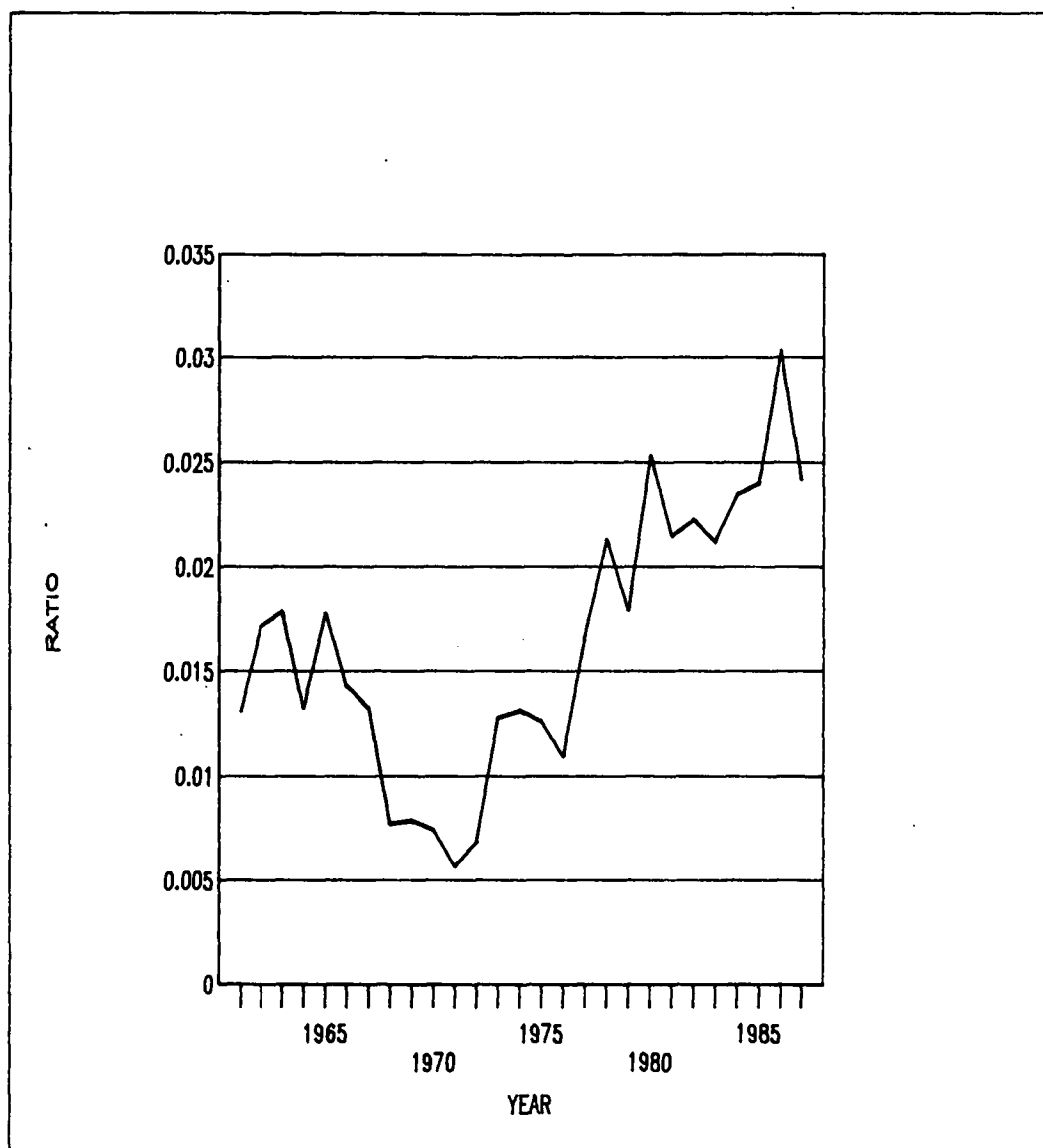FIGURE 15. Costa Rican Ratio of Food Products in Exports to the U.S.

FIGURE 16. Costa Rican Ratio of Raw Materials in Exports to the U.S. (R_r)
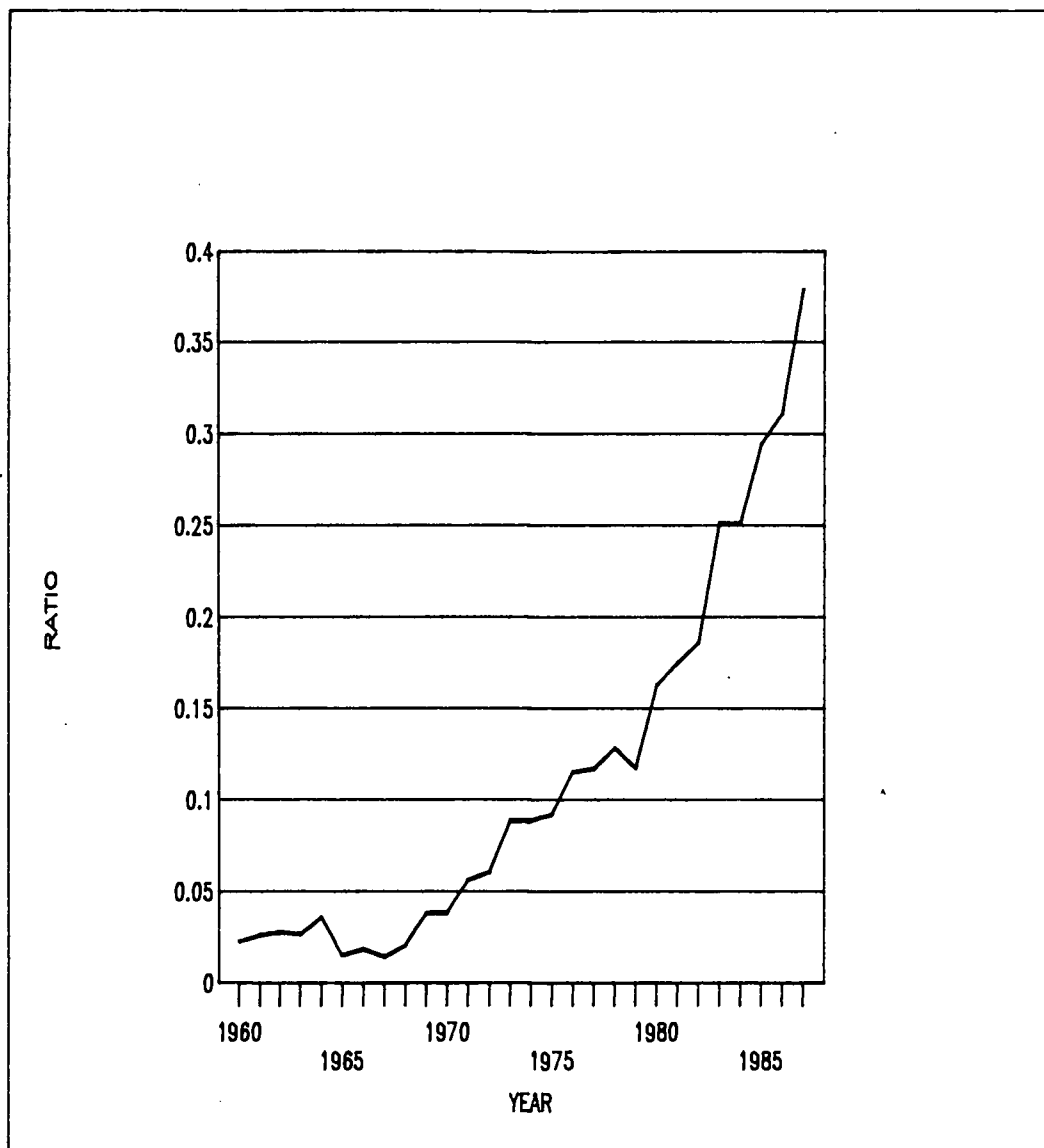
FIGURE 17. Costa Rican Ratio of Manufactures in Exports to the U.S. (R_m)
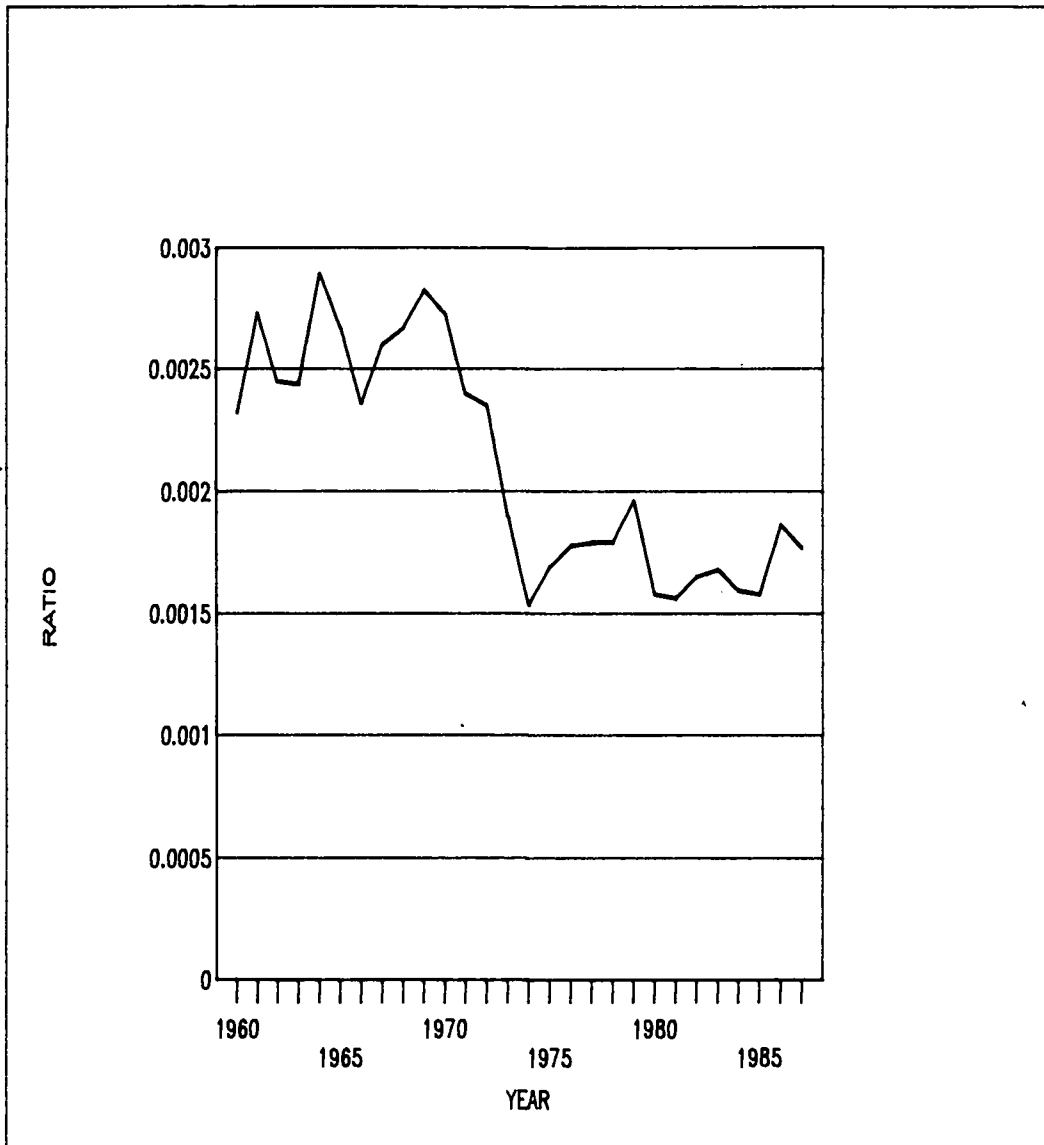
FIGURE 18. Costa Rican Share of the U.S. Import Market.
(Percentage)
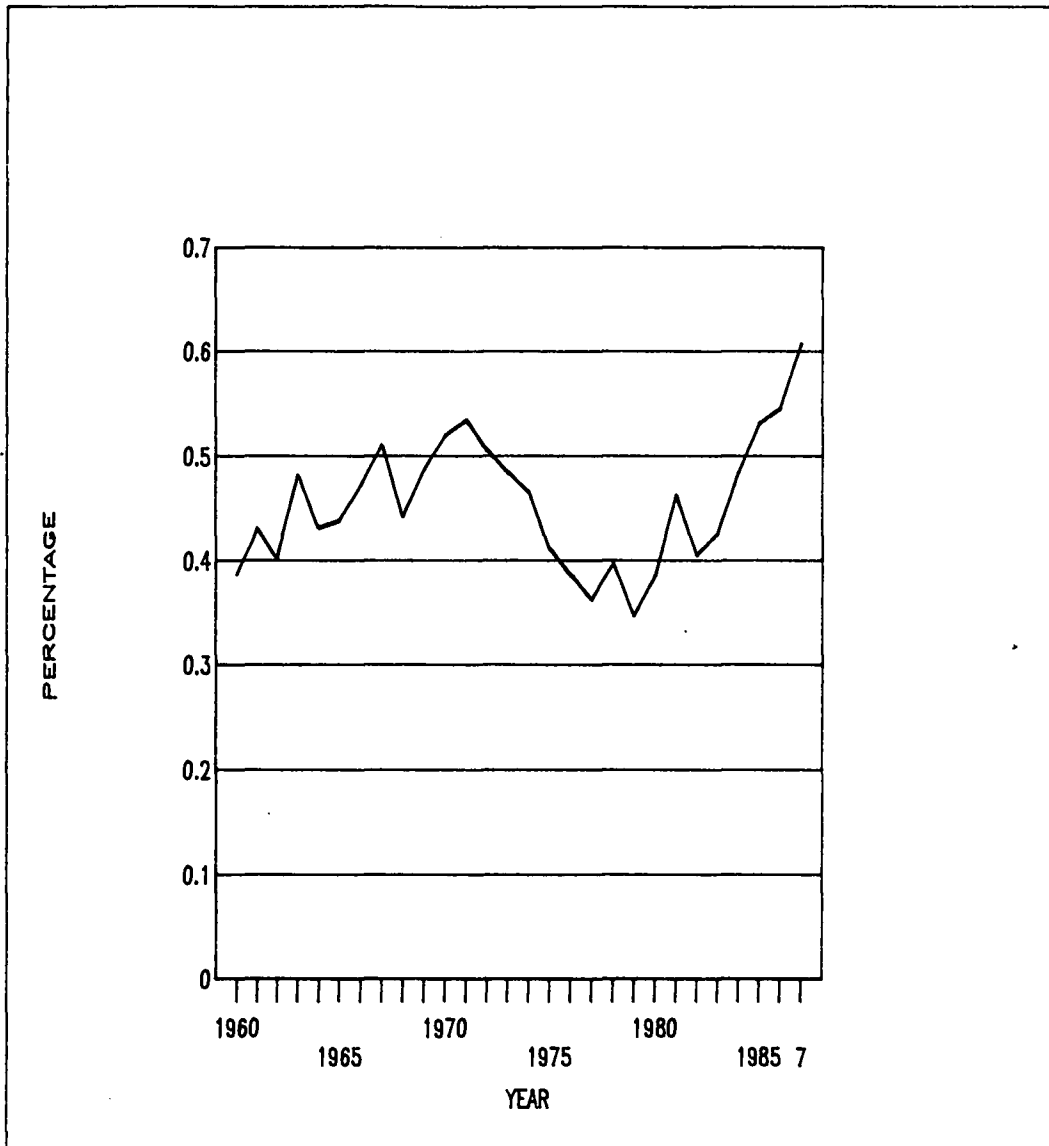
FIGURE 19. Percentage of Total Costa Rican Exports Earnings
Derived from Exports to the U.S. (SUS)

In order to detect the difference in the two time periods involved in this study, pre and post CBI, the Dummy variable Dum is included with a value of one in 1983 and subsequent years. It is apparent from the available data that some changes occurred in the post 1982 period. Whether these changes significantly affect the slope of the estimated equations will be detected by this dummy. A statistically significant coefficient for this variable would indicate an effect as a result of the policy and other factors also affecting the bilateral Costa Rican-U.S. trade structure.

REGRESSION ANALYSIS RESULTS

During this estimation, the deflated export earnings are a function of time and, export earnings could then be calculated by dividing DX_t by the export price index for that year.

Table 1 presents the results of this first stage estimation of equation (12). The results obtained are statistically significant at a 1% level and the resulting R^2 indicates the high degree of explanatory power of this equation. Some degree of forecasting might be possible if potential price index values are anticipated and used to obtain the export earnings as suggested before.

The usefulness of the first equation in directly forecasting export earnings is limited since the value for UVI must be estimated or known. However, as suggested by other authors such as Murray (1978) and Habeck et. al.(1988), price variability should not be as large. Some degree of reliability can then be expected in such estimates.

As expected, this first results indicate DX_t increasing in time, however X_t could well be decreasing depending on the export prices experienced by individual commodities in a particular year.

A deterioration of export product prices could well lead to a decrease of X_t even if DX_t is increasing. Which of these alternative measures is of importance will depend on the goals of the research in attempting to explain or forecast real or actual export earnings.

The distribution of the squared residuals is presented in figure 20. There appears to exist some changes in the range of these values for the latter periods of the time series, suggesting changes in the variability and components of export risk.

The second stage equation (16) yield the result presented in table 2. These results are generally consistent with the expected results and recent literature.

After several alternative formulations and trials of the second stage estimation in which C_t^2 and R_{mt} were used in addition to the proposed model in equation (12), it was found that C_t^2 was not statistically significant in explaining the variability of DX_t but in general the sign of the resulting coefficient was negative indicating that the diversification could be inducing riskiness in the export earnings of Costa Rica to the U.S.

This result would contradict some earlier studies which support this variable as very important in instability however, as stated by MacBean and Nguyen (1980), this could be incorrect because of reasons discussed earlier.
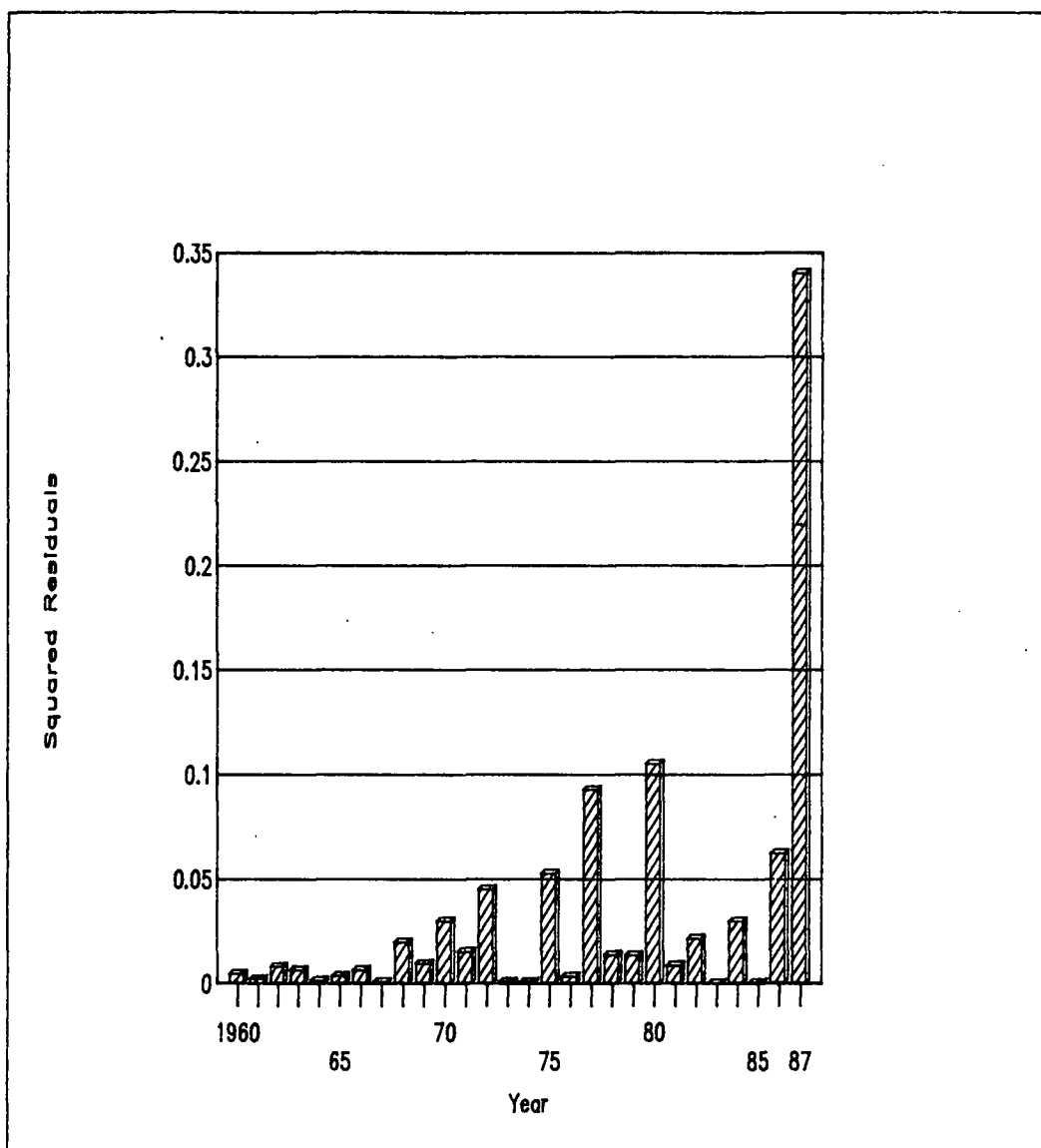
FIGURE 20. Distribution Through Time of Squared Residuals
Obtained from Estimating Equation 12.

TABLE 1. Results from Estimation of Export Earnings Model.
          (Equation 12).

Export Earnings Model

$$DX_t = \alpha_0 + \alpha_1 t + e_t$$

$$= -131.84 + .0674\ t$$

S.E.:   (9.851)   (.005)

T-Ratio: (-13.384)** (13.507)**

$R^2 = .90$

R^2 Adjusted $= .898$

D.W. $= 1.659$

** = Statistically significant at 1% level.

TABLE 2. Results from Estimation of the Instability Model.
(Equation 16).

Variable	Coefficient	S.E.	T-Ratio	Elast.
Const	-3.304	3.509	-.941	.616
SUS_t	7.997	3.309	2.417**	1.135
Rf_t	-21.911	5.932	-3.694**	-.626
Rr_t	-.559	.477	-1.170	-.457
Dum	-10.003	2.483	-4.028**	.333

n = 28

R^2 = .4235

R^2 Adjusted = .3232

Durbin Watson Statistic = 2.021

** = Statistically significant at the 1% level.

The inclusion of Rmt with Rft and Rrt in the same equation yielded high degrees of collinearity which is understandable because the summation of these three ratios sum to 1 or very close to one[7]. This divergence from 1 is due to computation and reporting errors as well as some unclassified earnings which are not accounted for individually but are included in the whole.

The coefficient obtained for R_{mt} during the trial models was positive and in some cases statistically significant, especially when not included together with R_{ft}, as expected. This finding points towards a decrease in risk when manufacture exports are reduced with respect to total exports. The signs of the coefficients obtained for these ratios are in line with those reported by other researchers, the most recent citation being Habeck, Brown and Abbot (1988) which found that for developing countries, the agricultural sector often brings about more stability in export earnings than the manufacturing sector.

The effect of R_{rt} during the trial estimation sequence was, as expected, very small and seldom statistically significant, reflecting the dominant influence of manufactures and agricultural products in Costa Rican exports to the U.S.

From table 2 it can be seen that the relatively high R^2 obtained and statistical significance might make the resulting risk equation suitable for some forecasting use. However, caution should be exercised because some of the magnitudes of some coefficients, especially R_{ft}.

The coefficient for the ratio of food products in exports was

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[7] The values of (Rft+Rrt+Rmt) in this research range from .97 to 1.003.

determined to be negative and statistically significantly different from zero. This indicates that an increase in this ratio, i.e. increasing food products in exports, would have the effect of reducing risk or instability of export earnings from the U.S. market.

The obtained result might not seem obvious, especially since it has been long regarded that agricultural exports tend to induce greater instability in earnings due to the inelasticity of their demand and supply. Although this argument has proven accurate for developed countries, the opposite has been suggested for developing countries which might specialize in exporting a few stable agricultural products.

The results obtained in this research are consistent with this last position, providing further evidence that the stability process might be different in developing economies.

A series of reasons can be put forward to interpret this results. First, as mentioned in the literature, instability seems to originate mainly in supply related variables and given the often perennial or semi-perennial nature of the crops involved, few disruptions are found in the production other than those caused by weather and natural calamities.

The role of price instability is not, in this case, as important. Secondly, there could exist a common technological base for the production of these crops which make them stable and thirdly, because the political influence of the country stems from traditional production enterprises, there would likely exists some preferential legislation which would facilitate production of these crops, reducing risk by means of different credit and purchasing schemes. Such would

be the case of the "Oficina del Café" and "Liga Agrícola e Industrial de la Caña" in Costa Rica which enforce powerful lobbying and influencing in the making of coffee and sugar cane policy.

With respect to the magnitude of the effect of Rf on export earnings risk, the estimated coefficient seems to be somewhat high when compared to other values obtained for Rm and Rr during the trial estimation progression. This could mean that this sector is very important in the export economy which seems accurate in the case of Costa Rica and also, it could be reflecting the role of other factors not directly estimated in the model such as internal policy variability and some infrastructure and transportation variation over time. In the case of policy, it appears that changing credit and exchange rate policies have been influential in this sector of the Costa Rican economy, especially in regards to risk taking and input cost considerations.

Therefore, in the case of Rf, a certain degree of caution is recommended when using this coefficients for forecasting purposes. Although the direction of the effect might be correct, the magnitude could represent an overestimation due to the factors discussed.

The sign and magnitude of the coefficient for Rr, as expected, is not large; however the effect of reducing risk as more raw material account for export earnings is interesting. The statistical significance of this coefficient is less than 90% but close to be considered relevant. The negative sign of this coefficient could be explained by looking at the type of materials which account for this values. Minerals and some petroleum derivatives would likely possess certain level of price stability which could aid in boosting overall

stability.

The reliance of Costa Rica on the U.S. market as a source for its export earnings is represented by SUS_t and particullary striking is the results obtained from the risk estimation procedure. The statistically significant positive sign and relatively large coefficient seems to indicate that increasing reliance in the U.S. market can increase riskiness in the export earnings from this same market. This result has been indirectly reported by other studies of export earnings instability as the geographic concentration index. It has been regarded that the more dependent a country becomes from a single market, the more unstable it earnings could be.

The firsthand repercussion of this result would be to question if this is indeed possible. The relationship of the squared residuals and SUS through time (figures 19 and 20) show concomitant increases in both variables during the period at hand. This seems to confirm the statistical results.

The question would be then what is the "optimal" level of "dependence" that Costa Rica should have in the U.S. market given that it provides certain level of stability as is discussed next by analyzing the policy effect encompassed in the dummy variable.

The negative coefficient and relatively high magnitude of this component indicates an decrease in riskiness or instability of export earnings from the U.S. after 1983. This statistically significant result would signify that there has been a decrease in the instability of Costa Rican export earnings from the U.S. after the time when CBERA was implemented.

As mentioned previously, it is very difficult to separate between

the direct effects of CBERA and the internal Costa Rican causes which might have contributed to this results. However, if we interpret policy as a dynamic process, it is expected that a policy will "trigger" actions which in cases can enhance or deter the effectiveness of the strategy.

In the case of Costa Rica, it appears that some things must have worked well in spite of the difficult economic situation that the country is going through in relation to its external debt situation. A certain degree of delegation has happened in the production sector. There has been less involvement of government corporations in production as evidenced by the reduced role of the Development Corporation (CODESA) activities in agricultural production, and more opportunities for private enterprise to act, specially in the manufacturing sector. The reduction of some export taxes and import taxes on inputs, as well as special credit arrangements are indicative of this trend.

The procedures for export and financial transactions were expedited and the information was made available through central agencies such as the Ministry of Exports (MINEX), the Center for Export Promotion (CEMPRO) and the Center for Development Initiatives (CINDE). Funds were allocated for training and networking of managers and executives and two new national organisms created to promote foreign investment and exports, the Center for the Promotion of Exports (CEMPRO) and the Ministry of Exports (MINEX).

These institutional factors have contributed to some extent to the situation however another factor which might have caused some effect is the tax/tariff incentive created by CBI. Some new products

have benefited from the elimination of tariffs, however, others which
share has increased during this CBI period are still subject to
tariffs in the U.S. Such is the case of some textiles and leather
goods. This could reflect the geographical advantage, the
availability of skill labor and political stability, which would
encourage investors to invest in Costa Rica. Also although their
product might not qualify for the preferential treatment of CBERA, the
investments made can still qualify under some of the tax incentive
schemes put forward by the program.

In order to evaluate the effect of the dummy variable on the
different independent variables considered in this research, simple
OLS estimations were made by using the dummy as the independent
variable and the different variables as dependent variables. Table 3
shows the results. It is remarkable to note that all the independent
variables that were considered for the estimation of the risk equation
are statistically significant. There were significant decreases in
the Concentration index (C_t^2) and the share of Costa Rican exports in
total U.S. imports (Q_t) as well as in the ratio of foods in exports
(R_f). Increases occurred in the ratio of raw materials in exports
(R_r), the ratio of manufactures in exports (R_m), the share of total
Costa Rican earnings resulting from U.S. trade (SUS), and the export
unit value index (UVI).

As can be deduced from the R^2 values there was a degree of
collinearity among the variables, the reason for not using some of
them in the estimation. A degree of serial correlations was also
present as expected given that these variables are likely to be time
contingent.

TABLE 3.

Relationship of the Dummy variable with the considered independent variables.

Var.	Dummy Var.Coef.	S.E.	T-Ratio	R^2
C_t^2	-.09269	.0244	-3.7990**	.357
R_f	-.24869	.02978	-8.3502**	.728
R_r	.01875	.002840	3.8284**	.360
R_m	.22480	.02694	8.3451**	.728
Q_t	-.0005062	.0002118	-2.4512**	.181
UVI_t	144.14	35.68	4.0396**	.385
SUS_t	.160	.02697	5.9313**	.575

The Constant term was positive and statistically significant at the 5% level (n=28) for all cases above.

d.f. = 26

** = Significant at the 1% level.

The resulting equation from the regression results in table 2, after doing the appropriate transformations as indicated in Chapter III is as follows:

$$e_t = .192e^{-5}SUS^4Rf^{-11}Rr^{-.28}$$

Caution in hand, as mentioned earlier, this equation could be used to forecast the riskiness of export earnings from the U.S. market and the size of the deviation from the estimated trend equation in table 1 if some appraisal about the relative share of the independent variables is acquired.

Also, in the event that minimizing instability were to be the goal of internal Costa Rican policy, it can be used to perform a non linear minimization procedure given some constraints as on the levels of the independent variables.

Min. $e_t = .192e^{-5}SUS^4Rf^{-11}Rr^{-.28}$

$\quad$ s.t. i. $Rf \leq 1$

$\quad\quad$ ii. $Rr \leq 1$

$\quad\quad$ iii. $SUS \leq 1$

$\quad\quad$ iv. $Rf + Rr + Rm = 1$

$\quad\quad$ v. $Rf, Rr, SUS \geq 0$

This procedure would yield the optimal values for Rf, Rr and SUS in the sense that they would minimize the instability of export earnings from the U.S. market and hopefully improve the overall economic stability of the country however, this strategy will not likely maximize benefits from exports.

THE QUESTION OF CAUSALITY

In addition to having examined the effects of CBERA on the
bilateral trade relationships between Costa Rica and the U.S., salient
results have been obtained in this research which pertain to the role
of some of the commonly used variables in explaining export earnings
instability.

First, the effect of the export concentration index was not
statistically significant for this case. Although Love (1984) reports
a significant effect of this variable on total Costa Rican export
earnings, this seems not to be the case for this bilateral case which
account for the majority of Costa Rican export earnings. This
difference is both interesting and puzzling since it would be expected
that they would be at least similar. Love, (1986) also reports a
positive sign for Ct2 in contrast to the consistently negative sign
found in this thesis. It is very likely that the nature of the Costa
Rican commodity export trade could make its earnings more stable when
more food products account for the export earnings.

Second, the positive sign of SUS, the share of Costa Rican
exports derived from U.S. trade, is also of some concern since it
would indicate that it might be dangerous to rely excessively on this
market as a source of export earnings. This result is consistent with
other reports in the literature which characterize geographic
concentration as causing higher degree of instability and risk.

Third, the question that needs additional research is the effect
of domestic or foreign policy in this apparent change in the stability
of export earnings from this market. It is difficult to isolate the
effect of Costa Rican policies on this aspect from those actions

promoted by CBERA. However, the interesting reduction of riskiness
resulting after 1983 is somewhat optimistic.

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V. CONCLUSIONS AND RECOMMENDATIONS

From the analysis of the current trade data between Costa Rica and the U.S. it is concluded that there exists a statistically significant different relationship resulting after the implementation of the CBERA in 1983, relative to the previous period.

The level of Costa Rican export earnings from exports to the U.S. seems to have increased as a direct and indirect result of the implementation of the program. Given the previous decreasing trend of export earnings with this market, this is a significant result which can be viewed as positive and desirable from the total earnings standpoint.

The variability of these export earnings, as measured by the variance of export earnings around an export earnings equation which accounts for the long term trend, also seems to have been reduced in a significant manner.

This result would also be desirable and positive in the context of the funding of development programs in Costa Rica, the repayment of the foreign debt and the maintenance of welfare programs. An indirect effect would be to raise a certain degree of confidence on the economy which would in the long and medium run, induce some degree of private investment, risk taking, innovation and labor creating entrepreneurship.

It has been found that there seems to exist a series of other qualitative and institutional factors which have contributed to this stability in export earnings. Some of such factor could be the implementation of domestic programs seeking to stabilize production

and supply of exports, streamlining of the bureaucratic procedures necessary to export and performing financial transactions in dollars, promoting the expansion of exports through tax incentives, labor arrangements, training grants and institutional development.

Some if not all of these measures have been implemented in some degree by Costa Rican authorities and is likely that their effects would be lasting and consistent as long as the current involvement of the government is maintained. Direct government intervention in the export trade community could likely lead to adverse reactions on the part of exporters and producers.

Another important point detected in this research which have previously been reported in the literature is the insignificance of the export concentration index in explaining the degree of instability in the exports. This general findings reported in the literature can not be directly transferred to this bilateral export earnings analysis, however this specific results are consistent with the idea that the degree of instability depends more on the relative instability of the individual export items rather than the generalized concept that diversification always reduces risk. Therefore effort to diversify should be carefully assessed in the light of the potential increases that such changes would affect the overall instability of export earnings.

Regarding the role of food, manufactures and raw materials in the total export trade with the U.S. it should be noted that all the indications point towards an increase in risk by reducing the shares of traditional exports, increasing the share of exports and decreasing the share of raw material exports in total exports to the U.S. These

results might come as a surprise to some, however, there exist sound rationalization for such results.

Reducing traditional exports, which in general despite the variability of the international market price but relative stability of production are a stable source of earnings, can cause a large degree of overall instability. This is supported by findings which indicate that for developing countries the largest share of instability arises from domestic supply and quantities exported. This is reasonable given that most LDC's are price takers in the international markets for these traditional commodities. Increasing exports in manufactures could create more instability given the increasing importance of these products in exports and the increasingly competitive markets in which their prices are set. The more competitive the market, with most producers having low labor costs and a certain degree of leverage in price reduction, prices are likely to vary substantially. Also supply of these products is more unstable in the sense that new comers can rapidly enter the market and increase the quantities traded in a matter of months, acting the opposite as the case of established agricultural crops which require a longer time period for supplies to be adjusted. This is the case also for the raw materials which have inelastic supply.

In terms of the relative importance of the U.S. market in Costa Rican total export earnings, the finding that increasing export earnings to the U.S. actually increase risk is interesting.

This result tends to support the repeatedly encountered argument that geographic concentration, in this case concentrating export towards one single country increases instability. As Costa Rica

increases its share of exports with the U.S., exports earnings stability has decreased.

In order to assist in the determination of the policy effects that this policy is having in Costa Rican development, the following areas of research are recommended:

1. Estimation of the import price and income elasticities of Costa Rican most important exports to the U.S.

2. The estimation of welfare and distributional effects of the shifting emphasis from traditional exports to manufacturing exports in Costa Rica.

3. An investment analysis of the different areas of the economy which have been affected by the CBERA and Costa Rican Central Bank policies.

4. A regional application of similar models to detect the overall effect of CBERA on other countries in the Caribbean and its effects on economic stability and development.

Given that this policy will have a 12 year application, and the possibility for being extended for another 12 year period, it would be necessary to perform similar research in the future to corroborate some of the results and to be able to assess more accurately the long term effects of this measures.

VI. A FINAL COMMENT

The importance of trade for the Costa Rican economy can not be underestimated. In its current external debt situation, it is crucial to have a congruent policy towards this important sector of the country. As of today the relative efficiency of the various measures taken by national institutions has not been thoroughly assessed and this is a task that need to be undertaken relatively soon to be able to redirect efforts and policies.

This research has dealt with some of these issues in a way that will hopefully assist in the development of policy for those sectors which can be affected with some efficiency and with minimum negative disruption to what seems an encouraging trend. Further developments and data availability would permit further application of the model and maybe the determination of more accurate coefficients in the estimation of export earnings risk. A similar approach could also be employed to determine export earnings risk with other trade partners of Costa Rica and maybe by seeking the minimizing each of the risks, a more stable economy would result.

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APPENDIX

VIII. APPENDIX A.

COMPUTER DISK CONTAINING THE DATA
UTILIZED FOR THIS RESEARCH.

The enclosed computer disk contains the commodity worksheet matrix used to calculate the dependent, independent variables as well as other data used in this study. It can be retrieved using one of the currently available worksheet programs.

It is a 360K, double sided, double density diskette formated using MS-DOS[8].

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[8] MS-DOS is a trade mark of Microsoft Corp.