AN INPUT OUTPUT TABLE FOR THE CENTRAL AMERICA COMMON MARKET: THEORETICAL FOUNDATIONS

by

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Submitted in Partial Fulfillment

of the Requirements for the

Degree of Master in City Planning

at the

Massachusetts Institute of Technology

September 1973, i.e. Feb. 1974

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Abstract

This thesis has focused on the theoretical foundation that will permit the starting of input-output economic research in the area of the Central America Common Market for the purpose of economic analysis and economic planning. For countries in the process of development, input-output as an analytical tool can play an important role in the finding of structural relationships, in the forecasting and development planning and in the revealing factors of the economy as a whole which needs to be changed for future development.

The great beauty of input-output analysis is that it can show the direct and indirect transactions of an economy and bring them into the realm of effective economic planning.

The bookkeeping involved in this kind of research can create the consistency check that is needed for a better approximation of the planning process. It is my belief that input-output techniques achieve full justification only if applied to economic planning for growth and development.

Input-output techniques are a useful adjunct to the planning process, with benefits that outweigh their costs especially in the area of sound policy measures that can be derived from it.

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AN INPUT-OUTPUT TABLE FOR THE CENTRAL AMERICA COMMON MARKET - THEORETICAL FOUNDATIONS

I. Introduction

A. 1 General Background

Geographically speaking the Isthmus of Central America is a narrow strip of land connecting North and South America and includes -- starting from the isthmus of Tehuantepec in the south of Mexico to the border of Panama and Colombia -- the following states of the United States of Mexico: Yucatan, Quintana Roo, Chiapas, Tabasco, Campeche, and parts of the states of Veracruz and Oaxaca; the republics of Central America: Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama; and Belize, known as British Honduras, a British colony in the stage of acquiring its independence. Politically, what is known as Central America are the five countries, namely, Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica, which constitute what is now known as the Central America Common Market.

Historically and culturally the Central America republics are part of Latin America and as such they share, in a broad context, some similar patterns with the other

countries of Latin America, especially those concerning political instability and numerous forms of dictatorial rule since independence from Spain was achieved in 1821; yet the region has also witnessed many experiments in democratic rule, military governments and left-wing revolutionary regimes.

Immediately after the independence from Spain in 1821, the five republics promulgated a constitution that established the Federal Republic of Central America. The union lasted until 1838, when the federation's members reassumed their independent identities. This "balkanisation" of the Federation was mainly due to local isolation resulting from harsh mountainous terrain, the creation of powerful local administrative centers that stimulated a sense of autonomy among the small, but numerous, centers of the region. Added to this was the "power games" played by the British empire in the area with the purpose of securing some land for the Inter-oceanic Canal. Even when this balkanisation is still a fact, the idea of a United Central America is still alive. The countries of Central America share a number of characteristics, such as a common historical backbround, and roughly the same culture. These common characteristics have not proved in themselves strong enough to

support the repeated attempts to build a federation. The countries, therefore, have existed as five separate entities, with differentiation and the development of nationalism as a natural consequence. Besides the historical and cultural justifications for categorizing the republics of Central America as a region, there is much that serves to make the five countries very distinct.

The salient physical characteristics of the five republics of Central America are the following:

i) 170,000 square miles, slightly larger than the state of California in the U.S.A.

ii) A Caribbean side - characterized by tropical rain forest and coastal plain

iii) A Pacific side - slope experiences alternating wet and dry seasons

iv) The interior - covered by highly mountainous regions in which temperate climate typifies the area.

The ethnic composition reveals three distinct patterns

i) The mestizo population -- mixture of Indian and Spanish blood through four centuries of intermarriage and Spanish speaking -- represents 95% of the population in three countries -- Honduras, El Salvador and Nicaragua.

ii) The Indian population, with their own languages and culture represents slightly more than 50% of the population in Guatemala.

iii) The white population of direct Spanish descent represents 85-90% of the population in Costa Rica.

The total population in the 1970's in Central America is 16 million inhabitants and is growing in excess of 3 per cent per year.

The salient economic characteristics of the five republics can be summarized as follows:

i) The well-known phenomenon of dual economies, which is present in the five countries in varying degrees.

ii) The export dependence upon agricultural crops and raw materials in which the weight of a few commodities is very heavy vis-a-vis the total value of the region's production.

Several specific concerns have been developed in the region with regard to these characteristics.

The first one, concerning the dual economy phenomenon, closely linked to the stagnant, low productivity agricultural sector, is the object of serious analysis with the purpose of allocating a bigger quantity of funds toward the development of this sector through the agro-industries oriented to the internal expansion of the economies.

The second one, concerning the export dependence that severely restricts the area's capacity to influence

its own economic performance, is mainly due to the unpredictable vagaries of world demand and supply conditions. The growing concern here is not focused in short-term fluctuations of the commodity export earnings but on the long-term trends observed for the commodities in which the growth in demand for these primary commodities is slow and therefore unreliable as an impetus to economic development. The short-term fluctuations and the longer-term trend difficulties which such dependence can produce is visualized in the main export crop -- coffee -- which accounts for 50 to 70% of the total value of Central America exports. The average price of coffee fell by 40% between 1957 and 1962.

It is important then to understand that this deterioration in terms of trade has marked the deceleration of economic growth in the region, and also that the unprecedented period of prosperity in the Post-War II years was mainly due to the increases in prices of export commodities and not to an increase in production. This post-war prosperity was not sufficiently deep to change the structure of the productive system.

From this general analysis of the economies of the Central America republics, we can conclude that as long

as the productivity and therefore the purchasing power of the traditional agricultural sector in Central America remains low and relatively stagnant, it represents the major bottleneck to the present policy of industrialization in the area. The industrialization program is essentially dependent upon its own domestic market, and it is therefore not export oriented. If the industrialization program were export oriented, the deficiency of internal purchasing power in the area might not pose a bottleneck to the balance of payments.

The problems of traditional agriculture raise many important and delicate questions concerning the ability of Central American governments to design and implement the needed changes because agriculture (by far the largest sector of the members' economies) has been affected only marginally and remains excluded from the regional integration process. This has principally resulted because the solution of the problems that surround the sector required not only massive financial resources, but a direct confrontation with the most conservative and powerful vested interests existing in the five countries.

It is within the context of this general picture that

the Central America Common Market started and is now operating, or quasi-operating. In 1965, the Consejo Monetario Centro-americano in the document concerning the Balance of Payments of the region predicted that

> a very marked tendency toward disequilibrium in the external sector of the Central America economies is observed, which makes urgent the adoption of decisions to strengthen it, as an indispensable condition for the development of the integration program in the Isthmus.

This document referred to the region as a whole, but it did mention the appearance of intra-regional disparities in the balance of payments of each individual country that is one of the causes, among others, of the quasi-operation of the Common Market.

B. 1. The Common Market

The repeated attempts to build a Federation -- the historical commitment to some form of Central American union -- and the structure of the individual economies were and are the principal incentives to undertake the program of Central America economic integration.

The Influence of ECLA

The external factors that actually shaped the economic integration were, first of all, the influence of the Economic Commission for Latin America, ECLA, which laid down the foundations regarding specific government

policies conducive to the economic development of Latin America.

The ECLA was created in 1947 as an autonomous agency of the United Nations Economic and Social Council, and since that meeting the United States of America was opposed to the creation of ECLA, arguing that it would duplicate the tasks of the existing Inter-American Institution. The first task assigned to the ECLA staff was to learn about the "economic reality" of Latin America and to apply scientific methods of analysis. Under the leadership of Raol Prebisch and Victor Urquidi, a doctrine of Latin America "economic reality," that in essence was a Latin America creation, gained widespread acceptance throughout Central and South America.

The basic theses of this doctrine are the following:

i) Division of the world into "industrialized centers" and "raw material producing periphery," and, of course, Latin America is in the latter.

ii) The main characteristic of the periphery is its dependence on the export of primary products with a persistent tendency toward external imbalance -- DEMAND DEFICIENCY -- for Latin America's major exports.

iii) The prescription then consists of suggesting to the Latin American countries that they should free themselves from their dependence

on the export sector by undertaking the production of manufactured goods -- IMPORT SUBSTITUTION. Industrialization is the most important means of expansion.

iv) In order to achieve the industrialization process, it is necessary to consider the possibilities of expanding demand by means of reciprocal exchanges, and thus achieving a better integration of their economies and an increase in productivity and real income -- REGIONAL INTEGRATION -- as an alternative to development programming.

Under the influence of ECLA and the doctrine, in 1951 the Committee of Economic Cooperation was created with the participation of the five countries. This hegemony of ECLA lasted until 1960 and was full of rhetoric and promises, but the outcome of these many meetings was the creation of sub-committees to deal with questions relating to the unification of tariff nomenclatures and foreign trade statistics; but the main problem remained -- which basically was the unwillingness of the Central American governments to place the regional program above their national interests and preoccupations, even when the ECLA doctrine -- industrial development, import substitution -- was politically "safe."

The Influence of the U.S.A.

During the years of the Marshall Plan in Europe, there was a feeling of neglect among the Latin American countries, neglect that was manifested by what the

Latin Americans considered the indifference of the United States of America to the efforts to protect their economies. The main criticism against the U.S.A. was its unwillingness to accept and support the "developmental" efforts of Latin America because at that time the Latin American countries were very worried about the short-term problem of the effects that the removal of price controls in the United States of America would have on their main exports.

As time went on, many crises occurred in the region, the most important one being the removal of the Arbenz regime in Guatemala in 1954. After the ousting of Arbenz, the Guatemalan government enjoyed a resource windfall when the United States government, in an attempt to shore up the Castillo Armas regime that it had aided in the overthrow of Arbenz, poured loans and grants into the country between 1955 and 1958 that were made with a bi-lateral assistance program with Guatemala to make of it "a showplace for democracy." Guatemala received more than $80 million in grants and a World Bank loan of $18 million.[1] Never before had any country in Central America received such large amounts of assistance.

Another event that contributed to the shift in the atti-

tude of the United States toward the development aspirations of the Latin American government was the establishment of the first socialist republic in Latin America in 1959 -- Cuba: then the U.S.A. began to support the Central American integration.

This series of events ended the ECLA hegemony in the area and added to this was the arrival of the Democrats to power in Washington with grand fanfare of the Alliance for Progress. The U.S.A. policy toward Latin America changed. The orientation was to avoid revolutions in the area by emphasizing reform as a solution to the backwardness of the Latin American countries. Within this framework integration was a favored project. The United States contribution to the integration of Central America was the catalytic factor which made it possible.

The main contributions were the following:

i) Opposition to ECLA and its theses

ii) Supply deficiency -- in which the emphases was "the failure of these countries to expand their exports because of supply deficiencies which arise from the combination of physical and technical bottlenecks in the production of export goods, coupled with increased domestic demand for these goods as a consequence of the growth of population, income and industrial production."[2]

iii) Lack of flexibility or adaptability to the world demand conditions. Underdeveloped

> countries should not turn their efforts away from foreign trade toward industrialization; rather they should concentrate on developing a flexibility in their economies which will allow them to maximize the gains from foreign trade in the growth process by developing export capacities for newer products with higher demand elasticities than those characterizing some of the traditional exports.

The problem with these two kinds of doctrines is that both are applicable in the Central America case, e.g. demand deficiency -- ECLA, supply deficiency -- U.S.A. because world demand for coffee and bananas is and will continue to be sluggish; rising income in developed countries will not increase consumption of coffee to any noticeable extent. But, in contrast, it is the supply deficiency that prevents Central America from selling more meat, seafoods and other commodities on the world market.

The proposed strategy of the U.S.A. consisted of three aspects:

i) To encourage the establishment of industries of optimal size with "exclusive" access to the expanded market

ii) To avoid duplication of investment.

iii) To make industrialization reciprocally beneficial to all the participants, compensating the relatively less developed countries to encourage balanced growth in the region.

It was not until 1961 that the General Treaty for the Economic Integration was finally signed and with it the

creation of a regional development bank occurred, according to the guidelines developed in Washington, D.C. The first financial support from the U.S.A.[3] consisted of $7 million upon the establishment of the Bank and $3 million in the next fiscal year. The countries' contribution to the fund was $10 million. Although no permanent system for contributions of the initial fund was forthcoming, the United States in July 1965 approved its first contribution of $35 million.[4]

It is now possible to see the external factors and the importance of these which made possible the Central American economic integration with the financial assistance of the U.S.A. With the money came the cascade of foreign advisors, the foreign banks, and foreign capital that has been expanding rapidly into the traditional manufacturing fields and into newer assembly industries. The process of integration has followed the pattern of

i) import substitution and protection
ii) duplication in industrial establishment
iii) foreign capital
iv) unbalanced regional growth

B. 2 The Achievements of the Common Market

With the general and specialized instruments the Central

American integration effort during its initial years of operation has achieved a very important level of economic activity, which can be divided into three parts:

i) The growth of the regional trade -- which according to SIECA (one of the instruments) has had an increase of 316% between the years 1960-1965. This is probably the proof of improved resource allocation and use of Central American resources, especially the established traditional industry.[5]

ii) The appearance of only slight structural change in the productive system of the Central American economies, which includes basically the expansion of the industrial and the appearance of newer products, new plants and diversification.

iii) The international support, especially in the field of technical assistance, vital infrastructure expenditures and long-term loans for the private sector of Central America.

As a convinced integrationist in the Central America context, it is my belief that the crucial problems faced now by the Central American Common Market can -- with the known limitations of INPUT-OUTPUT TECHNIQUES -- be better analyz-d with the Input-Output Table that this paper proposes for the region. In the last section, we present the reasons why this technique should be used and the benefits that can be derived from it.

II. Input-Output Analysis for Central America

A. 1 The Problem

Fifteen years ago the combined gross domestic product of the five Central American republics was less than $3 billion, and their isolated economies were excessively tied to the export of two major crops. Under these conditions, it was really difficult to exert any major and decisive influence in the economic performance of each individual country. The regional integration, under the combined stimulus of rising domestic demand and increased tariff protection, gave impetus to the industrialization that can be judged in part by the increase in manufacturing as a percentage of gross domestic productof the region.

Recent findings indicate that the effort of industrialization that has been geared toward the modernization of the economy has resulted in a marked drop in the percentage of traditional industries as the industrial product increases. In 1950, traditional industries represented 90% of Central America industrial production, in 1960 it represented 87 percent, in 1965 it represented 82 percent and in 1970 approximate figures put this percentage at 74%.[6] At the same time, newer types of industries producing various intermediate goods increased their share in

production from 9 percent in 1960 to 14 percent in 1965.

It is in this bracket of intermediate goods that the future development and economic growth has posed the most serious questions and the problem faced by a most rational resource allocation. Even when there is a growing ability of the Central American Common Market countries to cooperate for resolving regional problems faced with the slow developing structural change of their economies, the lack of more powerful analytical tools used in a more complementary and efficient way is a constraint for the rational political decisions on economic matters concerning the Common Market. This is proved later in the text.

The presence in the region of too many assembly factories in which almost 100 percent of the material inputs are imported parts is the most notable example of questionable resource allocation. The introduction of assembly plants is definitely a step forward in the process of industrialization when it leads to a gradual production of component parts in the region. It is necessary then to implement a policy concerning this intermediate goods production that will encourage effective economic growth and that will, needless to say, promote the direct and indirect

effects that such a policy would imply. The import content of these numerous assembly lines is very high, and they therefore often contribute little in the way of value added in Central America; besides that, they involve a considerable loss of revenue to the Central American governments due to the fact of tax incentives, special permits and so on. Last, but not least, and perhaps most important, they have intensified the balance of payments difficulties. The table below shows the marked degradation of the balance of payment deficit in the region, with extremes in the current account balance in Guatemala with 71.8 millions of dollars and Nicaragua with 8.8 millions of dollars.

The severe testing of the ECLA theses and U.S.A. theses, which are in agreement concerning import substitution in the context of the regional integration (theses adopted in order to free underdeveloped countries from chronic balance of payment difficulties), proves ironically enough to produce unintended results. These unintended results are, in fact, partly due to the lack of analytical tools that could be used to answer questions like:

i) What is the foreign content of that particular good produced in the region?

ii) What is the domestic content?

iii) When should the governments promote import sub-

BALANCES ON TRADE AND CURRENT ACCOUNT
1961 - 1965
(millions of dollars)

	Guatemala		El Salvador		Honduras		Nicaragua		Costa Rica	
Year	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Ex.	Im.
1961	114.0	120.6	118.8	100.6	74.0	66.3	62.2	58.7	83.3	96.0
1962	119.0	122.9	138.9	115.4	82.5	73.9	83.1	78.7	92.7	102.4
1963	153.4	150.4	150.2	140.4	84.3	88.3	100.2	91.0	93.2	113.4
1964	158.7	184.5	175.5	176.8	95.0	95.1	116.9	109.9	112.9	124.7
1965	176.3	218.7	198.9	192.4	112.7	104.8	125.1	110.0	112.4	159.2
Trade Balance										
1961	- 6.6		+18.2		+ 7.7		+ 3.5		-12.7	
1962	- 3.9		+23.5		+ 8.6		+ 4.4		- 9.7	
1963	+ 3.0		+ 9.8		- 4.0		+ 9.2		-20.2	
1964	-25.8		- 1.3		- 0.1		+ 7.0		-11.8	
1965	-42.8		+ 6.5		+ 7.9		+15.1		-46.8	
Current Account Balance										
1961	-22.5		- 2.1		-		- 7.0		-17.8	
1962	-23.6		+ 0.2		- 3.3		-12.8		-19.8	
1963	-19.7		-13.6		-17.4		- 7.4		-29.0	
1964	-51.6		-27.5		-15.1		-13.4		-25.7	
1965	-71.8		-23.3		-10.6		- 8.8		-69.5	

Source: ECLA, Economic Survey of Latin America, New York: United Nations, 1967, pp. 80, 82-83.

stitution? -- which sectors?

iv) Where should the government promote export promotion? -- which sectors?

These questions are crucial and with input-output analysis it is possible to have at least an operationally satisfactory answer. This is especially needed in an underdeveloped economy because the diagnosis of the ills of any developing economy requires a detailed quantitative analysis of the dependence upon imports and of the structural relationship of the domestic industries that are linked not only to domestic demand but also to the composition of the country's foreign trade.

It is at this stage of the development and economic growth of the Central American republics that it is necessary to have a map of the economy as a whole and of each country in particular before any positive action can be taken. This map can be built with clarity, content and precision by the Input-Output technique, as will be shown below. The map as such will be the description of the existent economic system in the region, and, obviously, the accuracy will depend on the availability of basic statistical information.

B. The Objectives

There are numerous reasons why Input-Output studies in the

context of the Central American Regional Integration need to be started.

First of all, there is the need of more detailed information. The objective requires that as complete a picture as possible be obtained at a particular point in time or in a cross section of time. This can be achieved if the level of the numerous economic activities in the region and the level of the many existing inter-relationships are determined. The input-output model is ideal for such inquiry.

Second: The public administrators need to know the possible effects of their decisions before they are implemented. For this, many tools are available but the consistency checks that the Input-Output technique provides become crucial for a more reasonable forecasting. The policies that many undeveloped countries are trying to implement for deliberate economic development are frequently hindered when bottlenecks are encountered, especially bottlenecks concerned with the composition of demand, production, trade and income. It is difficult to anticipate changes that occur in the above-mentioned economic variables.

Third: The framework provided by the Input-Output analysis

will identify and quantify the industries operating in the region, by setting up common definitions, conceptions and terms that will allow direct comparisons for more realistic analysis, because it is the setup of the accounting concept that makes the input-output system superior in applying discipline to the collection of data. Input-output, after all, is a superior accounting system.

Fourth: In the context of the regional integration of the Central American republics, another objective of Input-Output studies can be to determine the relation of imports and exports to domestic production and consequently to find policy outlines that can be guided to influence the behaviour of both sectors.

Fifth: Sometimes it is implied that underdeveloped economies are so simple that Input-Output analysis is not needed because of the lack of intermediate consumption, the lack of sufficient data, the costs involved and the thought that, after all, the end result, after the exertion of great effort to construct an input-output table, is just a production matrix that is practically empty except for a few transactions. In the context of the Central American Common Market and given the fact that

the construction of input-output tables in the Latin American countries has proved to be a feasible task as far as the statistical data are concerned, it is my belief that the data for an input-output table are dispersed rather than scarce. In any case, the lack of reliable statistics should not be a constraint because the postponement of the construction of the tables leads necessarily to the postponement of a serious review of the gaps in the data and their processing. Indeed, the lack of interdependence represents the most serious argument against the construction of input-output tables. The different economies of the region, however, are not the type of highly underdeveloped countries in which the degree of non-interdependence among productive sectors is usually very high. In any case, the need for Input-Output analysis must be judged from the nature of the demand for output of new investment rather than the present economic structure. This led to the most important objective, namely:

Sixth: Input-Output can measure as precisely as possible the impact upon the economy of autonomous changes in final demand and will show the levels of activity that will have to be met within the endogenous sectors to sustain this level of final demand. As such, Input-Output analysis is a powerful tool as an aid to planning economic

development, and by comparisons with other developed economies it will show the relevant and different gaps that have to be filled by the developing economy of the region.

C. The Building of the Input-Output Table

The input-output system is derived from the neo-classical theory of general equilibrium. It provides a means of assembling data and constructing a framework to do research and a detailed quantitative economic analysis of the interdependence between the mutually related economic units of the complex structure of any economy.

The system requires a consistent record of the flows of goods and services between all the individual sectors of an economy over a particular period of time -- generally a year. That year becomes the landmark -- the first map -- of the economy and as such becomes an historical document. The building of an input-output table involves the grouping and categorizing of a great quantity of data from numerous independent sources, and the idea is that all these data must fit together, just as when solving an enormous crossword puzzle. One of the main functions of this account is to trace the flow of goods and services from one productive sector to another.

The ideal construction would be to specify as many activities as possible. It is easier to aggregate data than disaggregate. The number of the sectors is determined not only by the objectives of the analysis but also by the availability of data. The summary of basic input-output tables made by Chenery and Clark[7] present I/O tables with 12 sectors in New Zealand and up to 450 sectors in the United States.

For most research purposes, the experience of many countries indicates that a table between 40 and 90 sectors is sufficient. The sectors that appear in the in-put-output table should be specified in such a way that each product or service is produced by one sector, and that each sector produces one product or service. This is the internal logic of the table in accordance with the principles established by Leontief. It is partly because of this principle that the actual construction of a first input-output table becomes a complex task. Internal consistency has to be preserved, and a deliberate effort has to be made to bring about external consistency with the existing system of national/regional accounts. All of this must be done taking into account the composition and state of the available statistics. In the Central American context, consideration must also be given to

statistical sampling or, if possible, a general inter-industry survey. Many steps forward have been made in this respect, the most notable one being the existence of uniform tariff and industry nomenclatures and foreign trade statistics in the Central American Common Market.

The consistent accounting record of the flow of goods and services required by the input-output framework means that each sector is shown jointly as a producer of output and as a user of inputs. The row for each sector shows the disposition of the output for that particular sector during the stated period of time. The column for each sector shows the sector as a purchaser of inputs. This is the INPUT-OUTPUT TABLE - TRANSACTIONS MATRIX -- and it must cover all the goods and services produced in the economy in a breakdown that formally is categorized as intermediate use and final use. Each row then will show the distribution of output among different sectors, plus the final use of the output, together representing the total supply in each sector. Each column then will show the inputs purchased from other sectors plus value added in the sector, together representing the total production of each sector.

The input-output system is a formal economic model and

as such is based upon the basic assumptions about economic behaviour and the definitions of the economic variables used. The formal structure of an input-output model starts with the general equilibrium condition.*

Supply = Demand

Using symbols, the elements are:

Z_i = total supply - sector i

X_i = total production - sector i

M_i = imports - sector i

X_{ij} = amount of production of sector i used by sector j

Y_i = final demand - sector i

W_i = total intermediate use of sector i, row sum

U_j = total use by sector j of inputs purchased from other industries, column sum.

V_j = total use of primary inputs in sector j

then:

$$(2.0) \quad Z_i = M_i + X_i = \sum_j X_{ij} + Y_i = W_i + Y_i \qquad i = (1,.....n)$$

$$(2.1) \quad X_j = \sum_i X_{ij} + V_j = U_j + V_j \qquad j = (1,.....n)$$

*Chenery and Clark notation.

From these equations the definitions of final demand (Y_i) and the value of primary input (V_i) can be derived. Final demand is the difference between the total supply and the amount used up in production and includes changes in stocks for each sector. The value added being for each sector the difference between the value of production and payments for inputs purchased from other sectors.

As shown by Chenery and Clark, these definitions correspond to the concepts of final output and value added in common national income figures, namely:

$$(2.2) \quad \sum_i X_i = \sum_i \sum_j X_{ij} + \sum_i Y_i - \sum_i M_i$$

$$(2.3) \quad \sum_j X_j = \sum_j \sum_i X_{ij} + \sum_j V_j$$

Eliminating the total transactions, since

$$(2.4) \quad \sum_i X_i = \sum_j X_j$$

$$(2.5) \quad \sum_i Y_i - \sum_i M_i = \sum_j V_j \longrightarrow$$ which is the basic national accounts identify, total gross national product equals gross national income.

From the balanced transactions table is then derived the

table of input coefficients. The assumption here is that the input of each intermediate product into the purchasing industry is proportional to the output of that industry. This is the CONSTANT INPUT COEFFICIENT ASSUMPTION, namely:

$$X_{ij} = a_{ij}X_j$$

where a_{ij} is a constant estimated by the ratio X_{ij}/X_j in base-year prices, and is assumed not to change. But exogenous changes of the a_{ij} are permitted. The relevance of this constant input coefficient assumption to the Central American case is discussed later on pages

The basic Leontief model is then:

(2.6) $X - AX = Y$ (matrix form)

(2.7) $(I - A)X = Y$

(I-A) is called the Leontief matrix.

When imports are added to the system we have,

(2.8) $$(1 + m_i)X_i - \sum_j a_{ij}X_j = Y_i$$

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

or in matrix form:

(2.9) $(I + M-A)X = Y$

To find a solution to this last equation, an operation that corresponds to division in elementary algebra must be performed in order to solve for the outputs X_i in the equation. The matrix operation corresponding to division is called matrix inversion.*

The solution for the last equation is then:

(2.10) $$X = (I + M-A)^{-1}Y$$

where the elements of X are the total production levels implied by a final bill of goods.

The basic Leontief model makes three important assumptions:

i) A given product is only supplied by one sector

ii) There are no joint products

iii) The quantity of each input used in production by any sector is determined completely by the level of output of that sector.

These assumptions make it possible to obtain equations for the demand of each industry as a function of its own output.

The input-output approach is consequently of wider scope than other economic tools because intermediate transactions

*The inverse of a matrix is defined as the matrix that when multiplied by the original matrix gives the identity matrix I, i.e., $A \cdot A^{-1} = I$.

are included within the general accounting framework which permits the research "to penetrate below the surface of global statistics."[8] In fact, it takes explicit account of the knowledge that in any economy the productive activity involves the use of intermediate commodities, which serve as raw material for other branches, and this intermediate output is directly linked to the final output.

To show the details of these intermediate transactions is the purpose of the Input-Output Transactions Table.* Once the transactions table is balanced and the corresponding input coefficient matrix is derived, the next step is to look for the stability conditions of the table of technical coefficients. The table by itself is of limited usefulness because it only shows the "first round" effects of a change in the output of one industry on the industries from which it purchases inputs. This table, however, is the most important tool of input-output analysis.

*The enormous collection of data required for the input-output table involves, along with the need to establish a commodity classification, the fitting of the data for consistency. Usually this fitting raises problems, and it is often necessary and appropriate to construct "dummy" fictitious sectors in order to adjust certain unavoidable gaps in the responses to questionnaires, if obtained by sampling, or simply to unify the information received in different forms and from different sources. Once the relevant allocations have been made using the "dummy" sectors, each row and each column must be systematically checked for consistency. The row consistency is given basically by "supply" equals "demand." The column con-

Certain stability conditions have to be met; these are:

i) The elements in at least one column in the table must sum to less than unity, and

ii) The sum of the elements in any column cannot sum to more than unity.

In the solution of an input-output problem, the inverse matrix or dynamic inverse must also meet a stability condition. This condition is fundamental to input-output analysis; it is known as the HAWKINS-SIMON CONDITION, which states that: There can be no negative entries in the inverse matrix. (Also referred to as the matrix of direct and indirect requirements.) The logic behind this condition is that each time the industry with a negative entry expands its sales to final demand, then the direct and indirect requirements would decline; that, of course, is not an economically viable solution.

At this point, we will assume that the transactions table and the matrix of input coefficients have been obtained. It is here that we have to be very careful because we, the engineers, strongly believe in a "a la Leontief world" -- fixed coefficients kind of world -- and we tend to forget

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sistency is usually achieved with the assignation of the residual to an undistributed demand column, which must definitely be small in absolute and percentage terms.

the rather strong assumptions from which the table is actually built. In order to be fully aware of those strong assumptions, we have to pay attention to the following warnings:*

i) The stability of the technical coefficients, especially in the context of developing economies, is of paramount importance, because it indicates the reliability of the input-output table for purposes of projection. These technical coefficients tend to change abruptly because there are continuous changes in the scale of production.

ii) The substitution of domestic products for competitive imports also has repercussions on the technical coefficients, linked of course to the degree of substitution, the distribution among the purchasing sectors and the technology used in the new domestic production. Evidently this results in higher input coefficients from local production and a lower import coefficient. The

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*All these "warnings" simply imply the need to keep the basic input output table as nearly as possible up to date. The time-consuming operations of building the first basic input-output table is certainly one of the limitations of the technique, but up-dating can be done easily and fast.

path and frequency of changes in the technical coefficients are therefore linked to the rate of industrialization.

iii) The substitution of domestic products for non-competitive imports also has strong repercussions on the technical coefficients, but unlike the case of competitive imports, these non-competitive imports cannot be fitted in the technical coefficients matrix as such because the industry simply did not exist before. In this case there is the need to insert a new row to show deliveries from the new industry and a new column to show its purchases from other sectors of the economy.

iv) The technical coefficients are expressed in value terms and as such they are sensitive to changes in relative prices.

v) The technical coefficients, as was stated earlier, change with increasing scale of production, and the assumption of proportionality between the inputs and the outputs does not always hold in the context of developing economies. Nevertheless, the same assumptions of the input-output system make it possible to formalize an equation for the demand (X_{ij}) of each industry (j) for each commodity (i) as a function of its own level of output (X_j). The input functions are assumed to be linear

over a given range of outputs and they have the form

(2.11) $$X_{ij} = \bar{X}_{ij} + a_{ij}X_j$$

where

a_{ij} = marginal input coefficient

$\bar{X}_{ij}$ = fixed-cost elements which do not vary with the level of output.

And these input functions are derived for purely statistical and computational convenience.

Starting from the ideal case in which we have a highly disaggregated, say, 160 to 200 sectors or commodities and for utilitarian purposes we want to aggregate it to a 40-sector to 90-sector model, the input-output literature describes many methods. One of these methods is due to V. Kossov of the State Planning Committee in U.S.S.R.[9] The main criteria for aggregation in practice is two-fold:

i) If the input structure of different branches is similar -- the relevant input coefficients are the same -- these industries may be aggregated in one sector. If there are changes in outputs, the input coefficients of the aggregated sector will remain constant and, of course, equal to the coefficient of each component branch.

ii) If the demand for products of different branches moves in the same way, then it is possible to aggregate them--the input coefficients of the aggregated sector will remain constant.

In some instances, aggregation is required because of the lack of detailed data.

In developing economies like Central America, there exists a heavy dependence on imports and exports, and it is for this reason that if input-output is introduced in the region it will be necessary to build a transactions table that records imports. The import matrix is an essential tool for the calculation of savings that arise from the policy of import substitution like the one adopted in the Central America Common Market.

One method of handling imports is to separate competitive and non-competitive imports and put the latter as a separate row in the table, while competitive imports are combined with domestic inputs. Another method is to set up two matrices, a competitive import matrix and a non-competitive import matrix, in order to have alternative input-output models that can serve different purposes. For example, the competitive and non-competitive imports separation could measure the effects of a more liberal

trade of the Common Market region with the outside world.

One of the common problems confronted in building an input-output table is the need to diverge from the established industrial classification. The problem here arises from the conflict between the classifications of economic units that input-output analysis requires to achieve the homogenous input structure and the practical need to fill the "cell" according to the information provided by the production unit. In many instances the production unit is not an homogenous activity unit.

The practitioner of input-output techniques recommends that in the building of the transactions table, the flow should be recorded at producer prices for domestic products, the imports have to be recorded at CIF prices and exports consequently need to be recorded at F.O.B. prices.[10]

In the case of imports (and exports), trade and transport margins must be included in separate sectors of an import matrix with the purpose of separating margins on domestic products from those of imports in each cell. The need to record the flows in producer prices arises from the fact that in the case of recording the transactions at

purchaser prices, there is usually a significant variation in the mark-up from producer to purchaser prices for different commodities produced by the same industry; consequently, the same output will be sold at different purchaser prices. A table of transactions in purchaser prices will not therefore express the underlying breakdown in terms of physical quantities. This is a significant point because the tables are frequently used to calculate the value added (primary factor inputs).

We mentioned before that input-output models are commonly used to find the relation between autonomous demand and the level of production needed to fill that demand. The final demand is usually separated into consumption, investment, government expenditures, exports, change in stock and other demands, by sector of course. Demand analysis of the econometric kind is a very helpful tool in finding demand functions, that can be specified in advance, especially in the applications of input-output open model. Many of these demands must be empirically determined; for example, investment demand.

All these supplementary relationships to the input-output model are vital to the operational aspects of the input-output technique. For instance, in the case of exports

(which are part of the final demand and have great policy significance for the Common Market), the common technique of classifying exports by commodity group and by receiving country is satisfactory. In the open model, the income inelasticities and price elasticities, calculated from time-series data, help enormously in projecting exports with given values for foreign incomes and relative prices.

Summary: Economic Structure Derived from the Hypothetical Table

The assumptions of an input-output table that each sector, isolated or as a part of the whole economy, gives a group of goods from a given structure of inputs, and that these inputs are proportional to the levels of production, are, for reasons already explained, very limiting in regard to developing economies. Added to this is the other limiting aspect that the input coefficients are only a weighted average of separate coefficients for each commodity or good included in the sector--through aggregation.

Even with this set of assumptions, the input-output model provides an approximation of reality which permits various kinds of analysis with respect to the economy as a whole, some of which are listed here:

i) The table gives "ipso facto" the direct requirements by sector, which, in turn, generate other

requirements for other sectors. It is here that the importance of the transactions of the various industries and their degree of inter-dependence show the overall map of the economy. We have to remember that the salient feature of the input-output model is that the output of any sector is distributed to the other sectors which, in turn, become the input for other sectors.

ii) The table shows what proportion of output goes directly to exports, consumption, investment and what proportion goes to processing industries.

ii..) As explained earlier, the building of the table for a developing economy implies building an import matrix, from which import coefficients can be calculated. This immediately serves as a guideline for import policies.

iv) From the import matrix, it is possible to obtain the import content of each sector; then, we can find total imports that are connected with a given production.

v) From the column sums of the import matrix and the total value of a final commodity--by sub-tracting-- it is possible to find the domestic value of the commodity.

vi) The table provides also the degree of integration of the economy, or "index of depth" as Michael Bruno calls it,[11] in which the measure is the proportion or share of intermediate to total output of the industry. In other words, what proportion of the total factors of production in the economy is employed in the establishment that produces a given commodity.

vii) The table can provide the inputs of capital and labour and the respective rates of return; consequently it is possible to calculate capital/output ratios and capital/labour ratios for each sector and the rate of return to capital by sector.

viii) With the estimates of labour and capital by sector, it is possible to find which industries are labour intensive or capital intensive; this makes it possible to answer questions such as: Are exports capital or labour intensive?

ix) With the table, it is possible to find the profitability of exports to the economy, in which the real net profit is compared to the total costs of capital investment. Michael Bruno in his book Interdependence, Resource Use and Structural Change in Israel[12] has devised a technique to find the costs of foreign exchange earned in

exports.

x) The table can provide, by comparisons with tables of other countries, the efficiency of particular sectors (internal rate of return or net present value analysis). Here the relevant comparisons can be done only if the sector definitions are equal in the tables to be compared. Some inefficient sectors may have efficient industries and we must remember that the input coefficient table is made up from the weighted averages of the individual industries.

In the case that a decision is made to introduce input-output techniques in the region, obviously it will be necessary to build five tables--one for each country--and one table for the whole region, mutually consistent, of course, and within the framework of multi-regional input-output in order to trace the flows between the countries. This requires definitely communality of definitions and aggregation procedures.

The fact that there is different and sometimes complementary industrial development in the region will be revealed by the different economic structures of each country.

The possibility of constructing a multi-regional table is important for the survival of the Common Market because a series of analyses can be done on the inter-regional trade between the countries.

The explanatory power that the input-output tables can provide is relevant in regard to policy issues and is vital to policy alternatives which need to be considered in the context of the Central American Common Market. It is this tool--input-output--that definitely will help us to understand and probably to interpret the economic phenomena in Central America and it will permit us to do planning for future development in a more consistent way. There is a need to have a more disaggregated basis for the analysis of such economic variables like consumption, investment, exports, imports and so on and for the study of the contribution of the different sectors of the economy. This need can be fulfilled by using input-output in conjunction with other tools of economic analysis.

III. The Use of Input-Output Technique in Forecasting and Planning

Economic growth and development planning is based on a very simple principle that can be stated "Produce as much as you can, consume as little as you can, and invest the difference." If no difference exists, a country is not growing. If a difference exists, then the country faces the problem of resource allocation. And this is true regardless of the social political system.

Many models have been devised to meet the above-stated premise, in which many economic and mathematical "niceties" are taken into consideration. Most of these models and their multiple variations are too aggregative and are basically designed to deal with macroeconomic projections concerning the evolution of the gross national product, employment, balance of payments, capital accumulation and so on.

The problem of resource allocation for the many sectors of an economy (especially in the planning process in which we are basically interested in predicting factor uses and the necessary consistency of development plans for the different sectors with each other) requires the use of input-output analysis. As shown in the preceding

section, the input-output framework provides consistency checks and also gives a frame of reference as a basis for discussion between people concerned with macro-economic analysis and those concerned with specific sectors.

The proper application of quantitative planning specifically requires the complementary use or integration of:

i) econometric models--use of statistical information for the related and relevant economic variables

ii) the explicit introduction of key policy variables

iii) input-output techniques

The first two are the feed-back mechanism that made the use of input-output in quantitative planning an important and useful tool.

Input-output analysis provides the basis for

i) Clarification and quantification of goals exogenously specified

ii) Knowledge of direct and indirect requirements to meet the specified goals for any choice of combination of goals (endogenous goals).

The determination of the endogenous goals is the "core" of planning because it is meaningless to specify exogenous goals without the knowledge of the levels of the endogenous goals that have to be determined or met. It is the analysis

of economic structure that an input-output analysis provides.

A. Input-Output Models in Development Planning

The applications of input-output models in development planning are varied, but four distinct categories of models exist:

i) the static model

ii) the dynamic model

iii) static linear programming

iv) dynamic linear programming.

The main difference between the first two is that the static model does not have an explicit theory of investment. The vector of final demand for capital goods is treated just as another component of total final demand. The dynamic model incorporates an accelerator type of investment for which the demand for investment depends on the expected growth of output. The difference between the latter two is that the dynamic linear programming model is just a static linear programming model that is repeated over time. The principal drawbacks of both models are their cost and the problem faced by the user of dynamic linear programming in which the initial conditions are never "just right."

We will mainly concentrate, therefore, on the static and dynamic models.

To implement the static model in Central America, we will need a well-constructed input-output table of transactions and complementary tables for competitive and non-competitive imports. We then calculate the table of domestic input coefficients, A, and import coefficient, M.

i) Using the import matrix, the demand-supply balance equation is

(3.1) $X = AX + Y$

$A = a_{ij}$ matrix of technical coefficients, domestic inputs only

X = output

Y = final demand

The solution is

(3.2) $X = (I - A)^{-1} \cdot Y$

with the matrix of import coefficient, let's call it M, the import requirement is

(3.3) $M \cdot X = M(I - A)^{-1} \cdot Y$

In this calculation, the direct and indirect import requirements per unit of final demand originating in different sectors are obtained. The direct import requirement is given by the import matrix M, the direct and indirect require-

ment is $M^T = M(I-A)^{-1}$. (M^T = total imports.)

ii) Using the breakdown of competitive and non-competitive imports, the basic demand-supply balance equation is (for i = 1, 2, ..., n)

$$(3.4) \quad X_i + M_i^c = \sum_j X_{ij} + C_i + G_i + I_i + E_i + S_i$$

$$= \sum_j X_{ij} + Y_i$$

where

X_i = output from sector i

M_i^c = competitive imports into sector i

X_{ij} = intermediate sales from sector i to sector j

C_i = consumer demand for products of sector i

G_i = government expenditures - sector i

I_i = investment by sector of origin (capital formation and replacements demand for sector i)

E_i = exports from sector i.

S_i = changes in stock sector i.

Y_i = final demand sector i.

The equation (3.4) can be rewritten in matrix notation as

$$(3.5) \quad (I - A)X + M^c = Y$$

The solution to find output requirements concomitant to final demand and competitive imports is

(3.6) $X = (I - A)^{-1} (Y - M^c)$

If the equation (3.4) holds in the base year and the A matrix is not sensitive to small changes in final demand, the changes in each element of vectors X and M can be related via the inverse Leontief matrix. In this case we can use the marginal coefficients mentioned earlier to find the small changes that occur in X, M, and Y.

The final demand is related to the use of primary inputs through the production functions. The assumption in input output of proportionality can be used to find the requirements for capital, and non-competitive imports for each sector

(3.7) $$L_i = \ell_i X_i$$

and in matrix notation

(3.8) $$L = \ell' X = \ell'[I-A]^{-1}[Y - M^c]$$

where:

L = total labor use

ℓ' = transpose of ℓ vector to row form

And we can predict changes in total labor use from changes in the final demand levels.

Alternatively, we can find the same results using the proportionality assumption and finding the sectoral labour-

output ratio, capital-output ratio and intermediate import per unit of output ratio.

If we call:

$\bar{\ell}$ = labour-output ratio matrix

$\bar{k}$ = capital-output ratio matrix

$\bar{nc}$ = non-competitive import-output ratio matrix

These three matrices are diagonal matrices, only the main diagonal has coefficients; the off-diagonal elements vectors are zero.

So we have:

$$L = \bar{\ell}X = \bar{\ell}\left[I-A\right]^{-1}\left[Y-M^{c}\right] \tag{3.9}$$

$$K = \bar{k}X = \bar{k}\left[I-A\right]^{-1}\left[Y-M^{c}\right] \tag{3.10}$$

$$M^{nc} = \bar{nc}X = \bar{nc}\left[I-A\right]^{-1}\left[Y-M^{c}\right] \tag{3.11}$$

These well-known and widely used equations for the prediction of factor uses are the ones that provide answers to various questions that arise in the economic planning process, especially those connected with the evaluation of specific investment projects. For instance, let's assume that we have a "huge" program of road construction and we want to know the total employment resulting indirectly from the road construction program. What is usually done is to plug in the expenditures on road construction as a component of the final demand Y in the

equation (3.8). The same kind of calculations can be done for capital, foreign exchange and value added multiplier effects of the road construction program. This provides a more realistic evaluation of development projects than the standard project evaluation done with limited, fragmentary and isolated data, which is the case of single project evaluations.

By the same approach we can determine the effects of different expenditure policies of the government. Assuming that there will be a general increase of government expenditures., dG_i we have:

$$dG_i = a_i + b_i d\bar{G} \tag{3.12}$$

where a_i and b_i are calculated from time-series data and hopefully will reflect the historical sectoral spending. The equation (3.12) explains that the changes in government expenditures will be equal to some fixed-cost plus the marginal sectoral coefficient times the average increase of government expenditures. The new expenditure packages will employ new people and there will be an increase in consumption. This new consumption will be distributed sectorally by the relation:

$$\frac{dC_i}{C_i} = u_i + v_i\left(\frac{d\bar{C}}{\bar{C}}\right) \tag{3.13}$$

where v_i is the Engel elasticity of consumption of the

social strata to whom the new wages are paid.[13] Then, the effects of new expenditures on total output are, to a first approximation:

$$dX = (I - A)^{-1}(dY - dM) \tag{3.14}$$

$$dX = (I - A)^{-1}(dG + dC - dM) \tag{3.15}$$

$$dX = (I - A)^{-1}\left(dG + \hat{C}\left[u + v\left(\frac{d\bar{C}}{\bar{C}}\right)\right] - dM\right) \tag{3.16}$$

Usually dM will create computational problems but, as a first approximation, it can be assumed to be zero, so we have:

$$dX = (I - A)^{-1}\left[dG + \hat{C}\left(u + v\frac{d\bar{C}}{\bar{C}}\right)\right] \tag{3.17}$$

where $\hat{C}$ is the diagonal matrix of consumption. Consumption as the largest component of final demand needs to be forecasted separately and according to the sectoral output and factor use.

The effects of new expenditures on total output can be determined using the equation (3.17) and the fact that further consumption will be created by the new employment generated by the increase of government expenditures dG and the increase of consumption dC is disregarded. It seems that anyway this effect will be very small due to savings or, even without this effect, the differences of the different expenditure packages on the change of total

output are likely to be large, depending on the sectors to whose demand, the increase of government expenditures contributes and also on the spending propensities of the newly hired workers.

In order to predict more realistically the sectoral consumption, the commonly used formula is:

$$\frac{C_i(t)}{N(t)} = \Phi_i \left[\frac{C_T(t)}{N(t)}\right]^{V_i} \tag{3.18}$$

where

$N(t)$ = population at time

$C_T(t)$ = total consumption at time

V_i = Engel elasticities at time

This equation (3.18) makes the link between expected population and total consumption through the Engel elasticities to find out the sectoral consumption levels. The problem with this latter equation (3.18) is that it will not "add-up" and we must linearize the function around the consumption pattern in the base year

$$C_i(t) = V_i \frac{C_i(o)}{C_T(o)} C_T(t) + \frac{N(t)}{N(o)} C_i(o)\left(1 - V_i\right) \tag{3.19}$$

and, to guarantee that the Engel elasticities "add up,"

they must satisfy the condition

$$\sum v_i \left[\frac{C_i(o)}{C_T(o)}\right] = 1 \qquad (3.20)$$

It is a well-known fact that obtaining Engel elasticities from time-series data poses problems because of lack of data and the non-reliable technique of transferring cross-section estimates to time-series forecasts. To overcome this problem, the common practice is to "play" with the Engel elasticities in order that they satisfy condition (3.20), with support from time-series. Basically then, "intelligent guesses" must be made in order to obtain a reliable $\hat{C}$ which is the diagonal matrix of total consumption.

Other components of final demand need to be predicted, but usually it is not necessary to find elasticities. Any planning office will have people specialized in the different sectors who can provide the necessary information.

Analyses of this kind are applied properly if the knowledge of past and current levels of sectoral consumption, sectoral government expenditures, expenditure elastici-

ties, and propensities to consume and save are reliable. The knowledge of the structure of industry production can give the insights needed for better use of input-output techniques.

Input-output provides the consistent framework that is needed in any serious planning effort which, as anyone knows, is a trial-and-error approach.

Given the aggregate forecast of final demand, **Y**, and competitive imports, **I**; the output level, **X**, the labor, **L**, the capital, **K**, and non-competitive imports **M** become predictions of resource demand that will be needed to fulfill the final demand and imports forecasts. These predictions of resource demands help with determining whether or not there will be sufficient foreign exchange, capital, and so on, over the plan period.

These predictions also help to establish the basis for the necessary serious discussion with sector specialists, and consistency errors can be spotted at once. This is one of the major uses of the input-output system. The trial and error revisions serve to check how realistic the goals of the plan are, in terms of the requirements for primary factor inputs.

The proper application of the input-output system with its implicit assumptions raises various operational problems, especially those related to data handling and communication between macro-planners and sector specialists, problems which are linked basically to the aggregation problems. The proper degree of aggregation for an input-output model is a serious problem and, besides that, different degrees of disaggregation can be desirable for different purposes.

Another common problem is to really take care when building the table that the prices used are producer's prices (or basic prices)[14] because the practitioners have found that the interpretation of the inverse input-output matrix becomes obscure because the input-output forecasts are subject to error due to the instability of margins between purchaser and producers' prices.

Another important consideration when applying the static-imports model with non-competitive imports is that the quantity of imports is difficult to determine and the valuation of competitive imports also is not easy. The solution to this latter problem is to classify imports in the most precise and detailed way possible.

The construction of the initial table -- transaction table -- requires as we now know "great care." This care can make input-output a powerful tool for planning if the primary inputs are carefully and precisely quantified because the major use of the table for planning is the prediction of these primary input factors. When trying to find, for instance, total labor use from changes in the final demand levels, the productivity coefficients are very often unstable and can make the projections based on those labor coefficients not always reliable. This is mainly due to the well-known problem of prices -- because prices in general do not reflect the amount of labor necessary to produce a unit of output, and systematic deviations arise between equilibrium prices (prices of production) and the values of products measured in labour.

B. The Dynamic Input-Output Model

The dynamic input-output model is the logical extention of the static model in which consideration is given to intersectoral dependence involving lags or rates of change over time. It incorporates an accelerator type investment, which mainly depends on future expected growth of output. Basically, the dynamic model treats investment as endogenous. In the static model, investment

projections are forecast according to historical rates of growth in the construction industry and capital goods imports, by origin of course.

In the dynamic model the first assumption is that investment I by origin is related to investment by destination according to the following relationship:

$$I = B\left(D + R\right) \tag{3.21}$$

where

B = matrix for investment demand

D = vector of demands for investment for new capital formation by destination

R = vector of replacement by destination

The second assumption of the dynamic model is that D - investment demand by destination is determined by the accelerator relation

$$D(t) = \hat{K}\left[X\left(t+1\right) - X(t)\right] \tag{3.22}$$

where

$\hat{K}$ = capital-output ratio (a diagonal matrix)

The third assumption is that R, replacements by destination, is related either to capital stock or output level

(3.23) $$R_t = \hat{\lambda} K_t \quad or \quad R_t = \hat{\lambda} X_t$$

where

$\hat{\lambda}$ = "depreciation" coefficients (a diagonal matrix)

These equations 1, 2, and 3 permit the inclusion of capital accumulation in the forecast. The final demand is exogenuously specified with the exception of I

From the basic equilibrium equation

(3.24) $$X = AX + Y$$

we can derive the dynamic equation

$$X_t = AX_t + I + Y_t$$

$$= AX_t + B\{D + R\} + Y_t$$

$$= AX_t + B\left[\hat{K}\{X_{t+1} - X_t\} + \hat{\lambda} X_t\right] + Y_t$$

(3.25) $$= \left(A + B\lambda\right)X_t + B\left[\hat{K}\{X_{t+1} - X_t\}\right] + Y_t$$

$$X_t = \tilde{A} X_t + H\left[X_{t+1} - X_t\right] + Y_t$$

where: $\tilde{A} = A + B\hat{\lambda}$ $\quad t = 0, 1, 2, 3, \ldots$

$H = B\hat{K}$ $\quad X_o$ given

In A, the depreciation vector has been added to the A matrix along with coefficients for competitive imports, stock changes, and so on.

Equation (3.25) defines a forward recursive* relationship for X_t if matrix H can be inverted.

The solution for the basic difference equation starts with rearranging equation (3.25)

$$X_{(t+1)} = \left[I + H^{-1}(I-A) \right] X_{(t)} - H^{-1} Y_{(t)} \tag{3.26}$$

and the general solution for (3.26) is

$$X_{(t)} = \left[I + H^{-1}(I-A) \right]^{t} X_{(0)} + X^{*}_{(t)} \tag{3.27}$$

$X_{(0)}$ given
$t = 1,2,3....$

for the homogeneous equations or closed Leontief system, which do not include final demand $Y_{(t)}$ and $X^{*}_{(t)}$ is a particular solution.

*Recursive is defined as a series of terms, such that each one of them is formed by the sum of a certain number of terms immediately preceeding and is multiplied respectively by an invariant expression.

The behaviour of the homogeneous equation depends on the eigen-values of the matrix $\left[I + H^{-1}(I-A)\right]$ One of these eigen-values will correspond to a "balanced" growth path for the system -- which means that all the elements of $X(t)$ stay at fixed proportions and their growth is constant.

Now if all the elements of the final demand $Y(t)$ grow at the same rate: $Y(t) = Y(o)\left(1+g\right)^t$ then the sequence

$$X(t)=\left(I-A-gH\right)Y_{(t)} \qquad t=0,1,2 \ldots. \tag{3.28}$$

will satisfy the equation

$$X_{(t)}= \tilde{A}\, X_{(t)} + H\left(X_{(t+1)}- X_{(t)}\right)+ Y_{(t)} \tag{3.29}$$

as long as g is not greater than the Frobenius root or chosen eigen-value of $\left[I+ H^{-1}(I-A)\right]$ and consequently all elements of $\left[I - A - gH\right]^{-1}$ will be positive. If other eigen-values exceed that of the Frobenius balanced growth, the system will diverge and will generate negative output levels in some sectors. Theoretically speaking, the system will have to be dominated by the eigen-value balanced growth rate.

Mathematically the model is perfect but there are many practical reasons to make this extension of the static

model a difficult task, especially in a Central American context. The practitioners[15] of the dynamic model have encountered the following problems:

i) The building of the $\mathbf{B}$ matrix which is assumed to represent the national production or competitive imported goods is a problem because the Central American countries have a strong dependence on non-competitive imports, especially for machinery and equipment, and many rows of $\mathbf{B}$ will be equal to zero for the obvious reasons that many sectors only produce for consumption. But anyway, matrix can be based on data from an investment survey, and construction permits by destination, which will, at least, give the breakdown of the expenditures by origin. This has to be complemented with estimates of destinations of capital goods produced.

The matrix $\hat{\lambda}$ can be built using estimates of capital stock lifetimes by sector and the amount of estimated replacements investment by sector, which permits net investment for capital formation, to be determined as a residual. Given the changes of sectoral output, it is possible to find $\hat{\mathbf{K}}$ = marginal capital-output ratios.

If this process is repeated for several years, the matrices calculated for each year will normally be different, but an averaging procedure can be used to derive an "average" $\mathbf{B}$ and $\hat{\mathbf{K}}$

An alternative method for estimating $\mathbf{B}$ and $\hat{\mathbf{K}}$ is to look at the composition of capital in recent projects of investment. This method is very limited because of the lack of large samples.

Capital stock data compiled on the sectoral level are generally not available, and the construction of the $\hat{\mathbf{K}}$ capital output matrix is very difficult.

ii) The assumption that investment demand by destination is determined by

$$D_{(t)} = \hat{K}\left[X_{(t+1)} - X_{(t)}\right] \tag{3.30}$$

does not reveal the gestation lags involved in investment projects. Many model builders have found that models without a realistic gestation lag cannot provide detail about the beginning of the development process.[16] The problem with this inclusion of gestation lag is that it leads to instabilities and computational problems that are very hard to under-

stand. This is mainly due to the aggregation procedure that is inherent in the introduction of gestation lags and the poor knowledge about the interactions of the different aggregation schemes.

iii) The matrix $\mathbf{H}$, which is the matrix product of $\mathbf{B}$ and $\hat{\bar{K}}$, may have many zeros corresponding to consumer or non-capital goods. An inversion is consequently impossible under these circumstances. What the practitioner does in this case is to reduce the system in such a manner that only stock variables linked to output appear in the system and they are likely to evolve over time.[17]

iv) The main property of the dynamic model is its stability and the practitioners have found that when running the model forward in time divergences appear. After the first and second periods (during which there are still reasonable output levels), it will soon generate outputs that are impossibly large or negative. But when the model is run backward from an arbitrary terminal condition, there is no divergence and the system converges to a balanced growth in output.

v) Running the model backward also gives insights into the real application because it provides information on the adjustment that has to be made in the production structure which would have to precede and accompany expenditures on an investment development project that is expected to be operational in the terminal year.

vi) Running the model forward is generally done assuming that g, the growth rate of final demand, is not greater than the balanced growth rate of the system. The system is so stable that it will generate sound growth over time. The solution is, of course, based on the particular solution X^*_t of the system. This output forecast based on the particular solution by the forward simulation has a major drawback, basically that X^*_0 -- particular solution at $t \neq 0$ -- in general is not the same as the real initial output vector but will be rather close to the real one.

vii) The known divergence between dynamic input-output theory and the actual practice is mainly due to the problems connected with matrices B, $\hat{K}$ and of course H and A. For instance, the coeffi-

cients in the columns of the **B** matrix are assumed not to change in response to changing capital goods prices, and evidently we have to accept the assumptions about non-changing relative prices.

Because of the known exogenous technical changes that are built into the **A** and **H** matrices in the forecasting exercize and because of the fact that the particular solution depends on these matrices being well-behaved, it is quite impossible to derive a particular solution. If the coefficients do not vary too much, it is possible to work out a solution by successive approximations. The solution of fixed coefficients provides the guide to this procedure of successive approximations, using the operator Δ -- a forward difference operator.

viii) The dynamic input-output model has a major deficiency, namely that the approach to the description of the dynamic process does not permit excess capacity. The dilemma of excess capacity is, however, prevalent in the developing countries.

The original formulation to solve this problem was to introduce into the dynamic input-output system "the artificial concept of capacity holding or stock holding activity."* This converts the dynamic input-output model into a linear programming model.

The practitioners[18] have dealt with excess capacity by using models called "almost consistent," in which they can specify exogenously the growth of capital stock by destination and using:

$I = B\{D + R\}$ and $D_t = K\left\{x_{t+1} - x_t\right\}$

they can find $I(t)$ investment demand by origin at time t

Another practice is to determine investment by destination semi-exogenously, assuming a certain growth of output between the base year and final year, given the capacity level of each sector.

Conclusion

Both the static and dynamic input-output models have been used with success in various countries, but it is necessary

*Input-Output Economics, W. Leontief, page 150.

to remember that the calculations with the input-output matrix are related to sectors and not to specific industries. The static input-output model, as we have shown, serves the purpose of forecasting output in order to meet some exogenously determined final demand. In the dynamic model, the fruitful and practical application is on forecasting the demand investment by incorporating capital accumulation in a consistent manner.

The widely accepted use of input-output in planning economic growth and development is centered on providing consistent forecasts of sectoral production with the purpose of using these forecasts to assist in making policies for the government and private sectors of the economy.

The need for consistent forecasts that a development program must consider depends to a great extent upon the existing economic structure. In the context of the Central American economies and given the fact that these economies are growing and becoming more interdependent and more complex, the choice of alternatives is crucial, and, consequently, the consistency of development plans for the different sectors has become very important.

The potential applications of input-output techniques

for the Central America Common Market mean that planners would be able to start with a better understanding of the economic phenomena of the Common Market, and they could use input-output to add more realism to the development programs already engaged in the region.

IV. Evaluation

A. Do we really need to apply input-output techniques in Central America?

The economic integration of Central America, which has reached a transitional stage is basically characterized -- at this state of the game -- by the existence of pressing interest groups in each country clamoring for attention. Each country has different pressure groups in which the interests are not precisely complementary but rather opposite. And this is for the purpose of avoiding sacrifices and costs involved in the integration process. Nevertheless, the goals of national development programs among the five countries are extremely similar, which reveals the need for an integrated planning approach for the Common Market.

The transitional state in which the Common Market is quasi-operating is in large part due to the fact that when plans for economic integration go from the feasibility stage to that of implementation, the different interest groups operating among the five countries exert big pressures. This pressure comes both from those who benefit from the economic integration and those who are adversely affected. In the context of the regional economic integration of Central America, "economics" has

very rapidly become "politics." It is true that in the long run the political question cannot be avoided, but the problem is that it is now in the short run that "politics" is stopping the real economic integration.

In 1958 the basis for the Common Market was laid down with the signature of the Multilateral Free Trade Treaty, but the proposal by the Regime of Integration Industries which consisted of a planned distribution of industrial activities was not approved as proposed by ECLA. The main source of financing regional activities is the United States government and, in accordance with its always suspicious attitude toward ECLA's activities, it refused to support the Regime of Integration Industries. The United States prefers to maintain the integration within the limits of free trade.

The outcome of this kind of policy has been once again the balkanization of the Common Market with the known duplication of industrial establishments. The duplication has reinforced the satisfaction of individual interest groups in each country by means of really anti-Centro-American uncooperative methods, such as retaliatory measures against the other partners and the excessive protection of each country's national producers from regional competition.

"Politics" is occurring mainly because the process of economic integration became one in which short-term benefits were more important than any long-term development. This myopic vision has put regional integration into a transitional stage, in such a manner that the process of integration has lost its character as an instrument for the economic development of the Central American countries. The cyclical crisis of the Central American Common Market is embedded in this myopic vision, jointly with the rather passive role of the permanent institutions that have been created as consultant and financial agents for the Common Market.

At the national level, each government has its own planning agency, which puts time and effort into the creation of five-year development programs. Naturally, the various plans do not coincide. This is a real drawback for regional integration. In addition, each country's plan faces the rather distressing problem of the non-harmony of public and private sectors to sustain economic growth in the region. This lack of coordination between government planning offices and the private sectors has resulted in development plans that have little to do with reality.

At the regional level this lack of coordination within

the countries and among the countries has resulted in an excessive duplication of new investment that has created the problem of excess capacity in various major industries, not only because of the well-known conflict of investment priorities in each country, but also because of the lack of agreement and marked difference in each country's fiscal incentives -- industrial promotion laws -- and taxation. The absence of a unified policy of industrial development is also embedded in the myopic vision that is paralyzing the economic integration of the region.

The general bias throughout this paper is that in order to separate economics from politics it is necessary to:

i) Have a wider vision of the economy,

ii) Maximize the gains of more consistent economic planning,

iii) Derive sounder policies related to economic matters that the Central American Common Market need,

iv) Quantify and put real meaning into the rhetoric of "balanced regional economic development,"

v) Utilize more effectively the actual economic structure, and

vi) Add new features to the present economic integration scheme.

Basically, then, what is needed is the application of a more powerful analytical tool, that has been tested and that has demonstrated its effectiveness not only in the study of developed economic systems, but also in the case of developing economies. This tool is input-output.

An input-output analysis can provide insight into regional integration on economic grounds. Right now this is badly needed because the actual pattern of day-to-day compromises do not represent the sane and optimum economic solutions that are required if regional integration is to flourish. The introduction of input-output techniques for the Central America regional integration will defir-itely help to realize a more creative cooperation toward development through the broadening not only of geographi-cal perspectives, but the economic perspectives as well. The geographical perspective is a parameter that is already working. It is the economic perspective that is lacking.

The input-output technique can as a tool provide:
First: A more ample vision into the quantitative and structural qualitative aspects of the economy. Four major components can be visualized and measured: dependence, independence, hierarchy and multi-regional inter-

dependence. The practical significance from the standpoint of the input-output model consists essentially in the study of the Leontief inverse matrix. The input-output model, being of wider scope and depth, will show the internal structure of the Central America economy and the degree of interdependence among the regions.

Second: As was expressed before, there is a striking similarity in the goals of the national development programs among the five countries. This reveals the need for integrated and complementary planning for the whole region. The input-output techniques permit one to project final demands and then to determine the output requirements needed to meet the projected demand in a consistent and internally structured way. This makes it possible to visualize the future structure of the Central America economy in terms of the composition of the most important economic variables. The detailed projections that the input-output model supply for each type of goods and services that has to be delivered to the forecasted final demand are the most valuable guidelines for a faster and sustained economic growth.

Third: The survival of the Central America Common Market is definitely tied to the application of more rational policies to the economic matters involved in the process

of integration. The need to improve procedures to make the present integration more effective requires tools of analysis that can measure and evaluate the effects of the policies adopted in the context of the regional integration. This urgent need has been compounded by the fact that along with the traditional theory of integration a doctrine of international specialization has arisen. This doctrine maintains that a multilateral removal of trade barriers will cause a country to shift its resources from import-competing industries to export-oriented industries, in which it has comparative advantage. This will result in a decline of import-competing industries. According to the theory, the outcome will be the manifestation of inter-regional specialization or regional inter-industrial specialization in accordance with the principle of comparative advantage, if the economies are complementary. This complementarity implies the existence of a regional integration scheme developed along the line of the import substitution policy. The empirical evidence[19] for the Central America Common Market is that inter-regional "economic integration" cannot occur simultaneously with inter-industry specialization. A definite pattern of intra-industry specialization has developed in which an industry located in all the five countries may continue to import and

export the same commodity without the benefit of protection in the regional common market.

Naturally, and as expected, the degree of intra-industry specialization is greater in the case of consumer goods, which usually are more differentiated in terms of style, prices, quality, or because of ignorance on the part of the consumer, persuasive advertising, and sometimes service. In one word, consumerism. The degree of trade expansion in the common market for these products is positively correlated to the degree of intra-industry specialization. Intra-industry specialization, which has resulted in the duplication of industries in each country, is creating the bottleneck that has actually almost stopped interregional trade of these products. The policy issues that this matter raises are very sensible because of the different interest groups. Many questions arise in this regard. How to harmonize in the context of the regional integration the different kinds of policies that each country proposes in order to protect their own industrial sector? What could be an equitable distribution of the benefits of regional integration? The application of input-output techniques can provide at least partial, and sometimes complete answers to these questions.

The input-output data for each country will reflect the relative prices prevailing in each country. Then, the logical consequence will be that the input-output data will not be comparable, unless these relative price differences are explained in terms of tariffs and excise tax rate differences. There is empirical evidence that the comparative cost of production among the five countries does not vary widely.[20] Consequently, the assumption of differential incidence on tariffs and taxes may be valid, and it will then be possible to convert the individual input-output table of each country into a uniform Central America input-output table. This will permit us to find: What industries or sectors of the different economies have more value added? What is the multiplier effect of the export demand for each sector in each country? Sound policy measures can then be determined in the context of the regional integration, such as: What is the degree of protectionism that can be allowed for a particular industry in a particular country? What is the efficiency of a particular industry in a specific country? Is the protectionism covering non-efficient industries?

These questions are crucial and vital for the survival of a real regional integration. Input-output analysis

is consequently needed as an integral part of government policy-making, not only for each country, but also for the regional economic integration. The implicit linkages that the input-output table for Central America will provide can solve the numerous problems with respect to the choice of alternative policies and other topics leading to improvements of the economic planning in the region.

Fourth: As we have explained before, the absence of a unified policy of industrial development is a real hindrance for the regional economic integration, mainly because the observed pattern of intra-industry specialization is basically a trade diversion and not a trade creation. The important difference is that trade diversion with the help of an import substitution policy tends to replace goods formerly imported from countries outside the region with goods that are now produced within the region. The new suppliers are generally less efficient than those they are replacing. This is partly caused by the common tariff barrier established by the members of the Central America Common Market. Trade diversion consequently results in a shift from low-cost foreign suppliers to higher-cost domestic producers, with the help of the tariff protection. This is a major drawback

for a more sustained growth in the region, and for the long-term it has introduced distortions that will not enhance the ability of the Central American economies to compete in the world market. Trade creation has strong positive effects on consumption and production and tends to eliminate inefficient domestic suppliers who are only sustained by tariff protection.

When you look at the figures of regional trade, there is a sense of achievement. The problem is that trade figures are calculated gross, and a large share of this trade has a high import content and represents very little value added in Central America. Consequently, there has not been any real structural change in the economies. All this is due to the lack of a real policy of united industrial development, whose emphasis should be to tap the particular natural resources of each country and to create the inter-industry specializations that are the ideal of the regional economic integration. Input-output can assist in providing answers not only concerning the import content of any good produced in the region, but also concerning which industries or sectors should be or should not be promoted for import substitutions. Also which industries are efficient in terms of economic costs. In the case of the implementation

of a unified policy of industrial growth with the goal of achieving a balanced regional economic development, input-output is a formidable tool for the evaluation of the needed big industrial projects that the region sooner or later has to start. For instance, the static input-output model presented in Section IV can provide a priori answers in this respect.

Fifth: The rather distressing problem that each country faces in terms of economic planning is linked to the fact that they need to undertake disaggregated planning analysis; for this, input-output is essential. In order to utilize more effectively the actual economic structure in the context of any development program, which depends to a great extent upon the existing structure, input-output is a basic tool for consistent planning. If we have the input-output table of each country and the input-output table of the region, this "fait accompli" can tell us more about the economy of each individual country and the economy of the region than any other descriptive approach. The regional integration has affected only marginally the agriculture sector of the member's economies and the creation of an integrated market of 16 million people is an illusion as long as the capacity to consume of the peasant sector is not

dramatically improved. The need to tackle the agricultural problem of the region is becoming the major concern among planners in the area. Although this rather complex problem requires considerable investigation, input-output can help us, if not directly, at least indirectly. For example, input-output will assist in making an evaluation in terms of direct and indirect effects of the governments' expenditure on agriculture throughout the whole region. One interesting idea that could be explored is to insert in the input-output tables of the Central American economies the row and column coefficients from another country that already has come to grips with its agriculture sector, say, Israel, and start the research of stability or instability and so on, and then find the direct and indirect requirements with the proposed insertion.

Sixth: The development-by-stages approach for Central American regional integration makes sense if there is a defined and unified scheme for the economic development. The theory that industrialization is synonymous with economic development has received very severe testing in the region. This marked tendency to equate the two has been the cause that has accentuated the already existing dualiam omnipresent in the regional economy. It is at

this stage of the integration that it is urgently needed to add new features to the economic integration scheme, whose emphasis should be not on consumer goods kind of industrialization, but on capital goods, intermediate products and exploitation of raw materials with due allowance for the limits imposed by the region's own natural resources.

The input-output table which can accurately provide the map of the region's economy will show the incompleteness and the inarticulateness of the present economic structure. The lack of the working parts of the system will then be more visible. Input-output is essential as one considers the addition of new features into the economic integration. Input-output provides the way to a more balanced economic growth by showing the hierarchy or ranking of activities to be implemented. The table can tell us which "block reaction" we have to identify in order to pass from one stage of development to another.

B. Will the introduction of input-output techniques be useful for Central America?

This is a kind of circularity question, because the answer is linked to another question -- Are the input coefficients stable in the Central America economy? --

The transitional stage of the Central American Common Market is an indication of the stability of the input coefficients. The rapid economic growth linked to the bulk of investment done in the last decade has reached a transitional stage. And the changing technological coefficients are the most powerful indicators of economic development -- this is especially true in the developing economies. For the moment there is not empirical evidence of changes in the technological coefficients, but it is my feeling that this transition period, characterized by the lack of implementation of new industrial and development projects is an indication of this already mentioned stability of the technical coefficients in the region. In connection with this, it can be stated that the changes in coefficients reflect with good precision the trend, rate, and level of the technological progress linked to the development of the region's economy. The region's economy is not of the type called highly underdeveloped in which the degree of inter-dependence among the productive sectors is very low and in which we consequently have a rather empty matrix. This fact and the transition period to which we have referred so often are providing the right time to start the input-output research program in the region. This proposed research based on qualitative and quantitative knowledge of the

different industries of the region will permit us to estimate the input coefficients.

The introduction of input-output, as a very consistent accounting framework, will help enormously to fill the gaps in data gathering and in the processing of the data. Input-output, which by definition is the separation of the many factors that contribute to output, is confronted with the imperative need to measure the change that affects the basic input structure of the economy. The analysis of total output change is more meaningful if the effort is put in the analysis of the changes of intermediate requirements -- input coefficients -- that we now know are not constant.

This non-constancy of input coefficients is the indicator of technological change, but in order to measure this change we have to start with some input coefficients that are stable. As we said before the transition period of the Central America Common Market is providing the right time to map the stable input structure of the economy.

Input-output analysis will be useful in the context of the Central America regional integration as soon as we start looking at the economic performance of the Common Market through the media of input coefficients. In this

regard the input-output technique specifies the need to have two different kinds of analysis for the coefficients.

i) The endogenous analysis, which is necessary to achieve internal consistency of the table. This will provide the stability of the input-coefficients at a particular period of time -- the base year.

ii) The exogenous analysis, which is necessary to investigate changes of input coefficients due to many factors, where the most important is the change over time of the input coefficients of the economy -- technological changes. Another factor contributing to changes in the coefficients is the alteration in the product mix.

The estimation of the changing coefficients is an indispensable condition needed for the consistent economic planning of the Central American Common Market. The complete understanding in economic terms of the underlying causes of coefficient changes can hopefully help us to project these changes. And this is essential for the application of input-output techniques for use in economic forecasts.

V. Final Conclusions

The main purpose of this paper, which proposes the introduction of input-output techniques to study the regional economic integration of the Central America Common Market, is the strong belief that this powerful analytical tool can give some insight into the highly desirable goal of achieving sustained economic growth in the region for the benefit of the whole population.

Although the technique of input-output is based on rather strong and sometimes a not very convincing set of assumptions, it has proved its efficacy when used as a complementary adjunct to the planning process, especially for undertaking disaggregated planning analysis.

The two models -- static and dynamic -- presented in Chapter III are the most common models in use for planning purposes in many developing economies. Of course there are an incredible number of data problems and the construction of a Central America input-output is a major statistical enterprise in which the array of complications must be faced. It can be done. We mentioned the many problems that arise with the possible solutions. We also discussed the benefits that can be derived with the introduction of input-output techniques, in which the

crucial question for the survival of the Common Market is the need to find a common understandable and simple base, to harmonize tariffs, protectionism, and trade regulations. This common base can be provided by the input-output table.

The ideal of the regional integration with the emphasis on balanced economic growth for the region requires us to up-date on a more realistic basis the regime of integration industries. In order to have an evaluation of the impact in the implementation of this proposed revitalized regime of integration industries, not only at the regional level but also at each particular national level, it is essential to introduce input-output techniques.

The input-output techniques will permit us to find the patterns of final growth, with special consideration to the capital goods bottleneck, which in the context of the whole economy of the region is urgent to anticipate.

The costs involved in this kind of research are not negligible and they must be taken into consideration. Other considerations are the availability of computational facilities. For this aspect Central America has even

excess capacity. But my own judgement is that the input-output techniques can provide many answers to which economic variables are conditioning the economic growth and which variables are likely to give more impetus to this economic growth.

> The mere existence of an elaborate projection, will not, of course bring about economic growth. Much political acumen and drive, much sweat and tears goes into the actual realization even of the best conceived developmental plan. Progress, however, will be faster along a road well mapped in advance and the costs of progress in terms of labor, capital and human sacrifice considerably less.*

*Vassily Leontief, Input-output Economics, page 67, New York: Oxford University Press, 1961.

FOOTNOTES

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