Technical Report

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD

No. WP-61

To

Chairman (Research)
IIMA

Technical Report

Title of the report . IMPACT OF EXPORT FLUCTUATIONS ON INCOME: A CROSS-COUNTRY ANALYSIS

Name of the author . . . . . C. Rangarajan

Under which area do you like to be classified? . Economics

ABSTRACT (within 250 words)

Enclosed.

Please indicate restrictions if any that the author wishes to place upon this note . . . . . No.

Date : July 17, 1975.

Signature of the author

A B S T R A C T

The degree of export fluctuations and its impact on in-come have been subject to a number of investigations. A major bone of contention has been whether developing countries experience a greater degree of fluctuation in exports than developed countries, and whether such fluctuations affect the growth-rate of developing countries. This study examines this contention by constructing comparable econometric models for 11 countries, including both developing and developed countries. From these models it seeks to derive the export-income multiplier which can throw light on the question as to which countries are affected more than others by export fluctuations.

The study shows that the long-run multiplier relating to both income and investment are generally larger for developing countries than for developed countries. In addition, for each country the dynamic multipliers have been used to derive the income path which is attributable to changes in exports as they actually occurred. The income path has been derived on the assumption that "real" exports grow at a constant rate every year. A comparison of these two simulated income series definitely shows that an ~~ex~~increase in the instability of exports leads to an increase in the instability of income in every country. However, the impact of instability in exports on income growth rate is not in the same degree in all countries. In the case of only five countries, there is a decline in growth rate when there is an increase in instability of exports, even though a cross country regression shows that in general countries with higher instability in exports have on the average a lower growth rate.

IMPACT OF EXPORT FLUCTUATIONS ON INCOME - A CROSS COUNTRY ANALYSIS

by

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T.R.No. 61
December 1974

Indian Institute of Management
Ahmedabad

IMPACT OF EXPORT FLUCTUATIONS ON INCOME-A CROSS COUNTRY ANALYSIS

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INTRODUCTION

The degree of export fluctuations and its impact on income have been the subject of a number of investigations. A major bone of contention has been whether developing countries experience a greater degree of fluctuation in exports than developed countries and also whether such fluctuations affect the growth rate of developing countries. In this paper we address ourselves to the second issue of the impact of export fluctuations on the income particularly of the developing countries. For this purpose we construct comparable econometric models for a number of countries - mostly developing but some developed - and derive from these models the export - income multiplier which can throw light on the question which countries are affected more by export fluctuations. We find the procedure of using cross country regressions adopted by a number of writers for studying this issue as defective. In section I, we discuss the findings of some of the earlier writers on the issue of the impact of export fluctuations on income. In section II, we outline the theoretical model employed and develop the method used for bringing out the impact on income of changes in exports. In section III, we present the econometric models estimated and the findings that emerge from them. Section IV gives our conclusions.

I. Previous Studies

A long held view on the fluctuations in exports earnings is that they constitute an impediment to the economic growth of underdeveloped countries. The reasons for holding such a view are not difficult to see. Fluctuations in export earnings affect the ability to import of these countries. Since imported capital goods constitute an important segment of fixed capital formation of these countries, fluctuations in the ability to import will have an impact on income levels by affecting investment. This is perhaps the major explanation for linking income fluctuations with export fluctuations. There are of course other reasons as well. Since

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exports are a component of national income, fluctuations in them directly affect national income. Also a given change in exports will lead to a higher degree of fluctuations in income if exports constitute a high proportion of national income. Further if the export sector of the community has a higher propensity to save than other sectors, export fluctuations can affect capital formation by affecting the total volume of savings.

On the question of the impact of export fluctuations on income, a study that has attracted much attention because of its unorthodox conclusion has been the one done by Macbean [4]. While agreeing that the arguments presented for finding a close link between expor fluctuations and income fluctuations of developing countries are "inherently reasonable" and "intutively appealing", Macbean came to the conclusion that the statistical evidence collected by him "appears to contradict the consensus that export fluctuations inflic significant damage on the stability and growth of the average under-developed country". [4, 32]. In reaching this conclusion, Macbean conducted two types of statistical studies. First, he took a sample of 35 countries and related their indices of instability in national income with indices of instability in export proceeds. Such a comparison showed no evidence of association between the magnitude of fluctuations in income and of fluctuations in exports. The correlation coefficient between the two series was almost zero. Nor did he find a close correlation between the magnitude of fluctuations in investment and in the importing power of exports. Second, he tried to study the relationship between the rate ofgrowth output of underdeveloped countries and the instability of importing power of exports. For this purpose he took a sample of 22 under-developed countries and regressed the rate of growth of output on the instability of importing power of exports, rate of growth of importing power, ratio of foreign trade to income and change in reserves of foreign exchange and gold. He found the coefficient for the instability variable insignificant, though the coefficient for the rate of growth of import power was significant. Also a similar multiple regression showed that the rate of growth of investment was not significantly influenced by fluctuations in the instability of importing power.

As part of a larger study, Maizels [5] studied the relation-ship between exports and growth rate of ten Commonwealth countries. In particular his focus was on the reaction of investment in fixed capital assets to changes in the capacity to import. This relation-ship was assumed to work through two sub-relationships: changes in the capacity to import affected the volume of imported capital goods and changes in these in turn influenced the levels of invest-ment. Maizels estimated these two separate relationships only for Australia and India. For the rest of the countries, he estimated a direct relationship between fixed capital investment and capacity to

import. From the estimated regressions, he computed the 'investment elasticity'. Of the ten countries studied, six had elasticities ranging from 0.7 and 1.0. Australia had the highest elasticity of 1.4, if Federation of Rhodesia and Nysaland was excluded as a special case. Maizels did not study directly the effect of export fluctuations on growth rate.

Benton F. Massel, Scott Pearson and James B. Fitch [7] examined with the help of data drawn from 11 Latin American countries the impact of changes in foreign exchange availability on the three variables - imports, investments and GNP. They postulated that different sources of foreign exchange might have different impact. So they divided foreign exchange receipts into three categories - exports, net private capital inflows and net public capital inflows - and included each separately in the regression equations. Their finding was: "Our results confirm that annual changes in foreign exchange receipts have significant short run effects on imports, investment and gross national product .... In terms of overall impact ...., private capital inflows have the greatest impact on all the three indicators of development". [7, 212]. These conclusions contradict those arrived at by Benjamin Cohen [1] in an earlier study. Using a cross section model, Cohen concluded that an extra dollar of export earnings contributed as much, if not more than an extra dollar of foreign capital to development. There have been other studies which have also found a close relationship between changes in exports and changes in income. Such a conclusion would normally imply fluctuations in export result in fluctuations in income. These studies do not, however, address themselves directly to the question whether fluctuations in exports have an independent effect on growth rate.

II. Methodology of Investigation

Country Models Versus Cross Country Regressions

Most of the studies reported earlier have used cross country regressions to investigate the relationship between exports and income. Some of these studies can be criticised for reaching the conclusions they did even within the framework adopted by them. But the central issue in trying to understand the relationship between exports and income is the proper methodology for investigating the problem. As Maizels in a review of Macbean's book [6] pointed out, a cross section study implies there is a single relationship between export earnings and income so that all observed points fall on a single curve. Given the considerable differences in the way in which the different economies are organized, it would be surprising if such a single relationship existed between income and exports for all countries. If the impact of exports on income varies from country to country, a cross country regression may show no relationship in spite

of the fact that a strong relationship exists when each country is considered separately. Thus the conclusions reached on the basis of cross country regressions must be deemed to be suspect. Also relating the instability index in income with instability index in exports throws no light on whether export fluctuations lead to fluctuations in income. Fluctuations in income are caused by a wide variety factors and fluctuations in exports is only one - and in the case of some countries a relatively minor one - among them. For a correct understanding of the problem one must isolate from the total fluctuations in income those due to exports alone and then compare them with export variations. Taking these two criticisms into account we proceed to study the problem in the following way. We construct for each of the countries that is being studied an econometric model. From such a model we derive the export - income and export - investment multipliers. Since lagged variables are involved, we need to derive the dynamic multipliers. These multipliers would show how serious export fluctuations are for each country. Taking the past changes in export proceeds as given, we simulate for each country the impact of these changes on income. Next we assume that exports have been growing at a steady rate for each country and derive what the income would have been in such a situation. We then compare these two derived income series to find out the effect of export fluctuations. A comparison of the growth rates of these two simulated incomes will show the impact of export fluctuations on growth. The econometric model employed for the computation of multipliers and for the purposes of simulation is described below.

The Model Specification

The model which we used makes explicit three important ways in which exports might influence gross national product and investment. By being a part of aggregate demand, exports will have the usual Keynesian type multiplier effect. By contributing to the availability of foreign exchange reserves, it facilitates imports and the import of capital goods will contribute to increased investment. Exports might affect aggregate demand through its effects on money supply, since trade surplus and capital inflow lead to an increase in money supply, broadly defined.

The model consists of an import function, a consumption function, an investment function and some definitional identities including the national income identity.

(1) $C = c_1 Y + c_2 C_{-1} + c_0$

(2) $M = m_1 Y + m_2 E + m_3 KI + m_4 EA_{-1} + m_5 \left|\frac{PE}{PM}\right| + m_6 M_{-1} + m_7$

$$(3)\quad I = b_1 M + b_2 \left[Y - Y_1 \right] + b_3\, MS + b_4\, I_{-1} + b_o$$

$$(4)\quad MS = MS_{-1} + E - M + KI + DD$$

$$(5)\quad EA = EA_{-1} + E - M + KI$$

$$(6)\quad Y = C + I + G + E - M$$

The variables used are as follows:

C = private consumption
I = gross fixed investment
M = imports
MS = money supply at the end of period
EA = stock of foreign assets at the end of the period
G = total government expenditure
E = exports
KI = net capital inflow of the non-banking sector
DD = change in the total credit of the banking system
PE = index of export prices
PM = index of import prices

The variables C, I, M, MS, EA and Y are the endogenous variables. The others are treated as exogenous. The values of the variables with a one year lag are denoted by Y_{-1}, C_{-1}, EA_{-1} etc. In equation (1) the total personal consumption expenditures are treated as a function of GNP. Equation (2) states that the volume of imports is influenced by income, exports, capital inflow, stock of foreign exchange at the beginning and terms of trade. That is, volume of exports, capital inflow and terms of trade are viewed as determining a country's importing capacity currently made available. Thus in many developing countries where foreign exchange bottleneck on imports is quite common, the current changes in the country's capacity to import is likely to be an important determinant of imports. The existing stock of foreign exchange (EA_{-1}) might influence import policies and the larger this stock, the larger is likely to be the volume of imports. Exports as an explanatory variable in the import function also takes into account the requirements of imports in the manufacture of exportable products. Equation (3) is an investment function where gross investment is treated as a function of imports, money supply and change in GNP. The assumption that the level of imports influences domestic investment may be valid for developing countries where the capital goods imports constitute an important

part of investment. Money supply may affect domestic investment through its effects on interest rates and other credit conditions. The accelerator effect is introduced by letting the changes in GNP influence current investment.

The lagged dependent variables in the various functional relations allow for a distributed lag in the impact of various explanatory variables (with geometrically declining lag coefficients).

Equations (4) to (6) are definitional identities. Equation (4) is the money supply identity which states that the change in money supply is equal to change in total domestic credit of the banking system, trade surplus and net capital inflows of the non-banking sector. Equation (5) is the balance of payments identity which states that the change in the stock of foreign assets (capital outflow) is the sum of trade surplus and capital inflows. Equation (6) is the national income identity.

The impact and interim multipliers for this model can be computed as follows: The equation system can be written as

$$(7) \quad X_t = AX_t + BX_{t-1} + FZ_t$$

where X = vector of endogenous variables,
Z_t = vector of exogenous variables

A, B and F are matrices containing estimated parameters. One can rewrite the equation in the reduced form

$$X_t = DX_{t-1} + HZ_t$$

where $D = (I - A)^{-1} B$ and $H = (I - A)^{-1} F$

The system of difference equations implies

$$(8) \quad X_t = HZ_t + DHZ_{t-1} + D^2 HZ_{t-2} \ldots\ldots, +D^n HZ_{t-n} + \ldots.$$

The matrix H contains the impact multipliers. The matrices DH, D^2H,... etc., contain the interim multipliers. Simple algebraic expressions can be obtained for the impact multiplier of exports.

$$(9) \quad \frac{\partial Y_t}{\partial E_t} = \frac{1 + b_3 + m_2 (-1 + b_1 - b_3)}{s - b_2 + m_1 (1-b_1 + b_3)}$$

$$(10) \quad \frac{\partial I_t}{\partial E_t} = \frac{b_2 + m_1 b_1 + b_3 s + m_2 (-b_2 + b_1 s - b_3 s)}{s - b_2 + m_1 (1-b_1 + b_3)}$$

Where $s = 1 - c_1$. It is assumed that $c_2 = 0$ in deriving the expressions

The algebraic expressions for the interim and the long run multipliers are difficult to derive. The dynamic structure of multipliers summarises all the relevant information contained in the model and they can be used for various policy simulations. For instance, given any specififed pattern of export variations, assuming all other exogenous variables undergo no changes, one can derive the change in output implied by the assumed changes in exports. More precisely

$$(11) \quad Y_t - Y_{t-1} = \sum_{n=0}^{\infty} \frac{\partial Y_{t+n}}{\partial E_t} (E_{t-n} - E_{t-n-1})$$

Equation (11) simply states that the changes in income today is a distributed lag function of changes in exports (when all other exogenous variables are assumed constant). The lag coefficients are of course the various dynamic multipliers, given in equation (8).

III. Empirical Findings

Estimation of Equations

The system of equations presented in the earlier section provided the basic framework of the models estimated. The total number of countries for which models were estimated were 13 of which 11 were developing countries and two developed countries. For the various countries, the data on the required variables in current currency units were taken from the International Financial Statistics. All the relevant variables of a specific country were deflated by its GDP deflator. The data on GDP in current currency units as well as in real terms were obtained from United Nations Year Book on National Income Accounts. The deflated series were used in estimating the regression equations. The equations explaining consumption, investment and imports were estimated by ordinary least squares. For each behavioural relation, the set of independent variables that led to the highest adjusted R^2 were selected. The estimated equations are presented in the Appendix, and for the sake of convenience some of the estimated coefficients are presented in Table 1.

The estimated coefficients along with the three identities were used to construct the matrices A, B and F of equation (7) and these matrices were used in deriving the impact and interim multipliers in accordance with equation (8). The dynamic multipliers for exports thus derived are presented in Table 2. The columns 1 and 4 of the Table give the impact multipliers which is the immediate effect of an unit increase in exports on income and investment respectively.

The choice of variables in an equation was also guided by whether or not the resulting equation system led to a convergent sequence of dynamic multipliers. The columns 2 and 5 contain the three year multiplier which is the change in the endogenous variable in any given year due to an increase in exports of one unit per annum during the current year and in the two previous years (assuming that exports do not change in other years). The long run multiplier, presented in columns 3 and 6 of Table 2 is the effect on the endogenous variable in any given year if the increase in exports of one unit per annum is maintained indefinitely. In all the countries considered the interim multipliers $\left(\frac{\partial Y_{t+n}}{\partial E_t} \quad n = 1, 2, \ldots\right)$ converged and the long run multiplier was obtained by summing the impact multiplier and the ten consecutive interim multipliers. That is, the additional interim multipliers after ten periods were negligible in magnitude.

In order to isolate the impact on income due to changes in export proceeds alone (all other exogenous influences being held constant), first the change in income was calculated with the help of equation (11) assuming that the magnitude of changes in real exports were those actually observed. A formula similar to equation (11) was used to obtain changes in income which is due to changes in terms of trade alone assuming that the magnitude of changes in terms of trade were those actually observed. By summing these two changes in income, one obtains the change in income which can be interpreted as due to change in export proceeds alone (or rather due to change in capacity to import alone). The changes in income thus obtained, were added to the known level of income in an initial year to derive a simulated income series. Along the same lines, simulated incomes were computed assuming that real exports are growing at a constant rate per annum. For this calculation, the assumed rate of growth of real exports was the actual average annual rate of growth of real exports obtained by regressing the logrithm of real exports on time.

Average annual rate of growth of the two types of simulated incomes, as well as that of other relevant variables are presented in Table 3. All the rates of growth were computed by regressing the logrithm of the variables on time. Indices of instability, were computed for the relevant series and are presented in Table 4. The index of instability used was the one suggested by Coppock [2].

Analysis of Equation

An examination of the estimated equations relating to the developing countries reveals the following:

The import functions show that in all countries except Malaysia, stock of foreign exchange at the beginning of the period has a significant effect on imports. In most of the countries, the immediate impact of exports and of capital inflows on imports are identical. In Columbia exports have a larger effect; in India and Australia capital inflows have a greater impact. Only in five of the countries did terms of trade turn out to have the expected sign in the import function. In all the countries examined, imports have a strong effect on investment, as seen from column 5 of Table 1. In the case of five countries, money supply has a significant impact on investment. The long run propensity to consume out of GNP varies from 50 per cent to 78 per cent as seen from column 4 of Table 1.

Export Multipliers

The impact and interim multipliers of exports on income (GNP) and investment contain the basic information needed to analyse the impact of export fluctuations. The impact of a particular time path of export variations on the change in income will depend upon the specific set of dynamic multipliers. Both the sizes of the multipliers as well as their pattern over time will be relevant. As can be seen from Table 2 the total income-export multipliers for the developed countries are in the region of 2 where as for most of the developing countries (9 out of 11), the multipliers are much higher than 2. The total investment-export multipliers are always higher in the case of developing countries as compared with developed countries. In most of the developing countries the long run multipliers or the three year multipliers of exports are higher than the impact multipliers. The pattern is reversed for Ghana, Australia and Argentina in the case of income multiplier and for Australia, Ceylon and Ghana in the case of investment multiplier.

Export Fluctuations and Economic Growth

The impact of export fluctuations on economic growth can be analysed by comparing the two simulated income series, one based on the actual changes in the export proceeds and the other based on a steady percentage increase in real exports. When the volume of exports grows steadily at a constant annual rate of growth, the resulting export proceeds exhibits much less instability than actual export proceeds. Thus the simulated income series computed under the assumption of steady growth in real exports corresponds to the situation where there is a lower amount of instability in export proceeds than in the actual situation. It is seen from Table 4 that in the case of all countries the simulated income due to the actual changes in export proceeds alone exhibits a greater degree of instability than the simulated income due to export changes at a constant percentage rate per annum. Thus it is fair to conclude that a reduction in the instability of exports leads to a reduction in the instability of income. Similarly an analysis of growth rates

of simulated income should reveal whether a reduction in the instability of export proceeds might lead to a higher rate of growth in income. An examination of the rates of growth of simulated incomes presented in Table 3 shows that in five of the countries examined the rate of growth in simulated incomes when exports grow steadily is greater than the rate of growth in simulated incomes when exports fluctuated as in the sample period. In Australia, Brazil, Ceylon, Ghana, India and Phillippines a steady change in exports leads to a reduction in the average growth rate of income. In case of Ghana and Ceylon there is a decline in income, when exports move steadily. This is due to the fact that in these countries real exports declined over the sample period and a steady decline is far less preferable than a decline with fluctuations. In the latter case, occasional increases in real exports have a positive effect on income which might offset the negative effects due to decreases in exports. In the case of India the difference in the growth rates between the two income series is negligible. Australia and Brazil are really the exceptions where one observes a clear reduction in the rate of growth in income where there is a lessening of the instability in exports.

We had pointed out earlier that cross country regressions to find out the relationship between growth rate in income and export instability are inappropriate. While not deviating from this basic position, we would like to point out that even if such regressions are estimated, the appropriate dependent variable is not the growth rate in observed income but the growth rate in income attributable to changes in export proceeds alone. Using the data for eleven countries, we estimated the following two equations.

$$RA = \underset{(1.8477)}{4.5485} - \underset{(-.029)}{.00439RE} - \underset{(-.031)}{.085131E}$$

$$R^2 = .0109$$

$$RS = \underset{(3.557)}{4.5045} + \underset{(2.694)}{.2482RE} - \underset{(2.596)}{3.6094IE}$$

$$R^2 = .4780$$

RA = Rate of growth in actual real GNP

RS = Rate of growth in simulated real GNP using actual changes in exports and terms of trade.

RE = Rate of growth in export proceeds.

IE = Instability in export proceeds.

When the rate of growth in simulated GNP due to changes in export proceeds alone was used as the dependent variable, one notices that

the rate of growth of export proceeds has a significant positive effect on income while the instability in export proceeds has a significant negative effect on income. But if we use the rate of growth in actual GNP as the dependent variable, no significant relationship is found between exports and income. The results of these regressions may appear to contradict our earlier results that in the case of some countries growth rate increased when there was a higher instability in exports. The regression equations bring out at best the average relationship among the countries whereas our country by country study indicates what would happen to each country given a set of structural relationships. That is, what the regression maintains is that in general the countries with higher instability in exports have on the average a lower growth rate. But it does not follow that in the case of every country a reduction in the instability of exports will lead to a higher growth rate.

IV. Conclusions

This study is an attempt to understand the relationship between income growth and export fluctuations. To avoid the pitfalls of cross country regressions, separate econometric models were estimated for eleven developing countries. From these models the export-income multipliers and the export-investment multipliers were derived for all the countries. It was found that the long run multipliers relating to both income and investment were generally larger for developing countries as compared with developed countries. In addition for each country the dynamic multipliers were used to derive the income path which is attributable to the changes in exports as they actually occured. Also the income path was derived assuming that real exports grew at a constant rate each year. A comparison of these two simulated income series definitely shows that for each country an increase in the instability of exports leads to an increase in the instability of income. However, the impact of instability in exports on income growth rate is not in the same direction in all countries. In the case of only five countries, there is a decline in growth rate when there is an increase in instability of exports, even though a cross country regression shows that in general, countries with higher instability in exports have on the average a lower growth rate.

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Table 1: SOME ESTIMATED PARAMETERS

Country	m_2	m_3	m_4	$\frac{c_1}{1-c_2}$	$b_1/1-b_4$
Argentina	.6871	.6871	.7099	.6730	.6115
Australia	0	.5674	.5971	.5760	1.0100
Brazil	.9097	.9883	.1880	.6287	.8430
Ceylon	.6854	.6854	.6427	.7720	1.090
Chile	.5099	.5099	.1610	.6386	1.0010
Columbia	.8296	.6448	.6740	.7730	.8920
Ghana	.3996	.3996	.4557	.7080	.8760
India	.6312	1.1614	.3217	.6780	.8348
Malaysia	.6175	.3809	0	.4900	1.1400
Mexico	.5801	.5329	.4302	.7450	1.0462
Philippines	.8895	.8220	.7365	.6530	1.0430

Table 2: IMPORT AND TOTAL MULTIPLIERS

Country	$\frac{\partial Y}{\partial E}$			$\frac{\partial I}{\partial E}$		
	Impact	3 Year	Total	Impact	3 Year	Total
Argentina	2.3003	1.6975	1.8764	.4393	.7084	.6137
Australia	4.1399	1.7335	2.3926	1.1599	.5706	1.0141
Brazil	1.7537	2.2460	2.2750	.5608	.7743	.8333
Ceylon	2.6118	3.3673	3.4228	1.4458	1.0013	.7806
Chile	1.6423	2.1916	2.7336	.3039	.6489	.9817
Columbia	.8898	1.9513	3.6606	.3826	.7749	.8877
Ghana	5.3278	2.4780	2.9985	.9483	.5434	.8742
India	2.0306	2.5861	2.6117	.6288	1.0051	.8353
Malaysia	.5149	.8394	1.6302	.1107	.3023	.7815
Mexico	2.9474	4.5734	5.2382	.7985	1.2029	1.3593
Philippines	.8236	1.9567	3.7499	.4235	.9447	1.3407
Britain[1]	3.3322	2.5992	2.1109	.9004	.7312	.3292
Canada[1]	1.8557	2.0971	1.9279	.8454	.7905	.2635
U.S.A.[2]	1.9900	2.08	2.13	.200	.34	.28

[1] Based on the equations presented in the Appendix.

[2] Derived from estimates provided by Klein and Evans [3].

Table 3 : RATES OF GROWTH

(percentage per annum)

Country	Real GNP	Simulated GNP 1	Simulated GNP 2	Real exports	Export Proceeds
Argentina	3.1297	.6443	.9340	4.1747	34.994
Australia	4.8459	1.9873	1.2354	4.5286	7.3483
Brazil	5.4918	1.3849	.9225	6.5594	45.5180
Ceylon	4.3855	.7777	- 0.2110	- 0.9755	.7299
Chile	2.8531	2.9908	3.0062	7.6715	38.3097
Columbia	4.4554	1.4670	1.8950	1.6755	13.6795
Ghana	1.1427	.5928	- 3.8949	- 4.3740	4.7211
India	3.9031	.3235	.2874	1.9323	5.7584
Malaysia	6.3564	3.2710	2.4792	4.7180	6.4282
Mexico	6.0034	1.2448	1.8451	1.5059	5.7270
Philippines	4.8950	3.7172	3.4651	8.6875	13.6728

Simulated GNP 1: Simulated income with actual changes in real exports and terms of trade.

Simulated GNP 2: Simulated income with steady growth in real exports and actual changes in terms of trade.

Table 4: INDEX OF INSTABILITY*

Country	Real GNP	Simulated GNP 1	Simulated GNP 2	Real Exports	Export Proceeds
Argentina	1.0466	1.0559	1.0014	1.2548	3.4415
Australia	1.0214	1.0960	1.0063	1.0969	1.2502
Brazil	1.0215	1.0415	1.0010	1.2837	4.0311
Ceylon	1.0293	1.0456	1.0035	1.0648	1.0632
Chile	1.0790	1.0258	1.0064	1.0996	2.9241
Ghana	1.0089	1.2383	1.0011	1.3086	1.2566
India	1.0384	1.0132	1.0012	1.0883	1.3088
Malaysia	1.0148	1.0326	1.0034	1.1366	1.1867
Mexico	1.0191	1.0274	1.0005	1.0535	1.2470
Philippines	1.0467	1.0218	1.0054	1.0950	1.7102

*Given the series X_t, the index of instability is computed by the formula:

$$\text{Antilog} \sqrt{\frac{\Sigma \left[\log (X_t/X_{t-1}) - \log (X_t/X_{t-1})\right]^2}{n-1}}$$

where n is the number of observations.

ARGENTINA (1050-69)

$$C_t = 68.18 + .6730\ Y_t \qquad \bar{R}^2 = .986$$
$$(2.042)\quad (34.24) \qquad DW = 1.41$$

$$I_t = 154.4 + .6115\ M_t + .0610\ MS_t$$
$$(6.041)\quad (3.575)\quad (4.629)$$

$$\bar{R}^2 = .779 \qquad DW = 1.81$$

$$M_t = \underset{(.799)}{10.17} + \underset{(7.454)}{.6871}\ E_t + KI_t + .7099\ EA_{t-1}$$

$$+ .2895\ M_{t-1}$$

$$\bar{R}^2 = .918 \qquad DW = 1.65$$

BRAZIL (1950-65)

$$C_t = 179.178 + .6287\ Y_t$$
$$(5.715)\quad (50.706)$$

$$\bar{R}^2 = .995 \qquad DW = 2.559$$

$$I_t = \underset{(1.823)}{11.907} + .6165\ M_t + .2694\ I_{t-1} + 78.583\ T$$

$$\bar{R}^2 = .913 \qquad DW = 1.96$$

CEYLON (1956-1970)

$$C_t = -159.8 + .617Y_t + .2006\ C_{t-1}$$
$$(-.816)\quad (4.905)\quad (1.098)$$

$$\bar{R}^2 = .986 \qquad DW = 2.09$$

$$M_t = -1646.34 + .2911\ Y_t + .6854\ (E_t + KI_t)$$
$$(-1.883) \quad (3.460) \quad (3.256)$$
$$+ .6427\ EA_{t-1} + 678.56\ \frac{PE}{PM}$$
$$(3.185) \quad (1.896)$$
$$\bar{R}^2 = .796 \quad DW = 2.235$$

$$I_t = -1372.0 + 1.090\ M_t + .2918\ MS_t$$
$$(3.774) \quad (3.368)$$
$$\bar{R}^2 = .768 \quad DW = 1.87$$

CHILE (1955-69)

$$C_t = 1162.0 + .6386\ Y_t$$
$$(2.298) \quad (11.02)$$
$$\bar{R}^2 = .903 \quad DW = .94$$

$$M_t = -486.995 + .1220\ Y_t + .5099\ (E_t + KI_t)$$
$$(-2.630) \quad (5.639) \quad (6.795)$$
$$+ .1610\ EA_{t-1} + 133.513\ \frac{PE}{PM}$$
$$(1.709) \quad (1.106)$$
$$\bar{R}^2 = .982 \quad DW = 2.2$$

$$I_t = -32.54 + .401\ M_t + .0117\ (Y_t - Y_{t-1})$$
$$(-.324) \quad (2.078) \quad (.189)$$
$$+ .599\ I_{t-1}$$
$$(3.128)$$
$$\bar{R}^2 = .942 \quad DW = 1.51$$

COLUMBIA (1950-68)

$$C_t = .1816 + .4428\ Y_t + .4278\ C_{t-1}$$
$$(.412)\quad (2.732)\quad (1.888)$$

$$\bar{R}^2 = .993 \qquad DW = 1.563$$

$$M_t = -.8489 + .0642\ Y_t + .8296\ E_t + .6448 I_t$$
$$(-1.7823)\quad (2.672)\quad (4.112)$$

$$+ .6740\ EA_{t-1}$$

$$\bar{R}^2 = .936 \qquad DW = 2.488$$

$$I_t = .1865 + .4211\ M_t + .0809\ MS_t + .5279\ I_{t-1}$$
$$(.271)\quad (2.538)\quad (1.267)\quad (2.335)$$

$$\bar{R}^2 = .956 \qquad DW = 1.212$$

GHANA (1959-68)

$$C_t = 58.67 + .7080\ Y_t$$
$$(1.754)\quad (28.19)$$

$$\bar{R}^2 = .9851 \qquad DW = 2.07$$

$$M_t = 268.6 + .4556\ EA_{t-1} + .3926\ E_t + KI_t$$
$$(3.63)\quad (3.892)\quad (1.809)$$

$$\bar{R}^2 = .843 \qquad DW = 1.96$$

INDIA (1950-68)

$$C_t = 11.20 + .5087\ Y_t + .2507\ C_{t-1}$$
$$(2.498)\quad (6.318)\quad (1.768)$$

$$\bar{R}^2 = .991 \qquad DW = 1.78$$

$$M_t = -2.7795 + .6312\ E_t + 1.1614\ KI_t$$
$$\quad (-.905) \quad (3.108) \quad (3.521)$$
$$+.3217\ EA_{t-1} + 3.0050\ \frac{PE}{PM} + .3633\ M_{t-1}$$
$$(2.759) \qquad (1.206) \qquad (3.521)$$

$$\bar{R}^2 = .971 \qquad DW = 1.664$$

$$I_t = 7.899 + .835\ M_t + .276\ MS_t$$
$$(3.567)\ (3.173) \quad (7.511)$$

$$\bar{R}^2 = .967 \qquad DW = 1.709$$

MALAYSIA (1955-68)

$$C_t = 423.2080 + .2265\ Y_t + .5452\ C_{t-1}$$
$$(2.101) \quad (1.403) \quad (2.128)$$

$$\bar{R}^2 = .989 \qquad DW = 1.850$$

$$M_t = -332.342 + .6175\ E_t + .3809\ KI_t + .1845\ Y_t$$
$$(-1.653) \quad (5.209) \quad (3.951) \quad (3.066)$$

$$\bar{R}^2 = .987 \qquad DW = 2.470$$

$$I_t = 16.499 + .1554\ M_t + .8630\ I_{t-1} - 60.340\ T^*$$
$$(.159) \quad (1.964) \quad (5.391) \quad (-2.314)$$

$$\bar{R}^2 = .9897 \qquad DW = 1.93$$

MEXICO (1950-68)

$$C_t = 8.787 + .6008\ Y_t + .1886\ C_{t-1}$$
$$(4.863) \quad (7.499) \quad (1.619)$$

$$\bar{R}^2 = .998 \quad DW = 1.287$$

$$M_t = 4.874 + .0141\ Y_t + .5639\ (E_t + KI_t) + .4352\ EA_{t-1}$$
$$(4.007)\quad (1.554)\quad (6.128)$$
$$\bar{R}^2 = .964 \qquad DW = .90$$

$$I_t = 6.151 + 1.046\ M_t + .391\ MS_t$$
$$(-1.444)\quad (3.822)\quad (4.970)$$
$$\bar{R}^2 = .9689 \qquad DW = .904$$

PHILLIPPINES (1950-70)

$$C_t = 1.608 + .3887\ Y_t + .4051\ C_{t-1}$$
$$(5.155)\quad (5.373)\quad (3.579)$$
$$\bar{R}^2 = .993 \qquad DW = 1.96$$

$$I_t = -.206 + 4603\ M_t + .6551\ I_{t-1}$$
$$(-1.416)\quad (2.816)\quad (4.245)$$
$$\bar{R}^2 = .972 \qquad DW = 2.70$$

$$M_t = -.6610 + .0797\ Y_t + .8544\ (E_t + KI_t) = .7459\ EA_{t-1}$$
$$(-1.300)\quad (2.412)\quad (7.046)\qquad\qquad (2.971)$$
$$+ .2957\ \frac{PE}{PM}$$
$$(.442)$$
$$\bar{R}^2 = .983 \qquad DW = 1.87$$

AUSTRALIA (1951-70)

$$C_t = 1.1066 + .5760\ Y_t$$
$$(5.484)\quad (43.286)$$
$$\bar{R}^2 = .993 \qquad DW = 1.500$$

$$M_t = .7957 + .5674\ KI_t + .5971\ EA_{t-1} + .1066\ Y_t$$
$$(.923)\quad (2.797)\quad (1.933)\qquad (2.947)$$
$$+ .2596\ \frac{PE}{PM}$$
$$(.5177)$$
$$\bar{R}^2 = .9410 \qquad DW = 1.374$$

$$I_t = -.0891 + .5089\ M_t + .2304\ (Y_t - Y_{t-1}) + .4983\ I_{t-1}$$
$$\qquad\quad (.455) \qquad (4.102) \qquad (2.988) \qquad\qquad (3.304)$$
$$+ .0460\ T$$
$$(1.812)$$

$$\bar{R}^2 = .994 \qquad DW = 1.868$$