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An Investigation into the Export Expansion Hypothesis with Respect to Economic Development in Less Developed Countries

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The present study updates and redirects the earlier research of Alfred Maizels who analyzed past trends and relationships among developing countries in the Overseas Sterling area. As before the basic model used is the "Ex-ante" model developed by Hollis Chenery and Alan Strout.

The results support the "Export Expansion" hypothesis which emphasizes the importance of exports as a source of savings and a catalyst for economic development. Gross Domestic Product, Non-export Gross Domestic Product, and exports are used to explain savings in twelve less developed and rapidly developing countries.

I. Introduction

Beset by population pressures, massive shortages of consumer goods, and uncontrolled inflation, less developed countries (LDCs) face relatively few policy options for achieving stable real growth in output. The two development strategies receiving the greatest amount of attention are import substituting industrialization (ISI) and export expansion (EE) involving manufactured goods.

From a political standpoint, the ISI option which involves substituting domestic output for imports, is attractive since the immediate result is an increase in employment with a corresponding rise in national incomes. On

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the negative side, the approach entails rising costs due to the loss of economies of scale in small national markets and the capital intensive nature of the products involved. In the long run, it is generally assumed that the domestic resource cost of saving foreign exchange via import substitution will exceed the domestic resource cost of obtaining foreign exchange by exports. The advantage of the latter method over the former is expected to increase over time.

The dramatic success of numerous countries pursuing export-oriented economic gowth along with the failure of a considerable number of countries pursuing ISI strategies has given momentum to programs involving trade and specialization along comparative advantage lines. The success stories of Taiwan, South Korea, and Hong Kong are based largely on export-oriented development strategies.

Korea's growth over the past 30 years has been called one of the century's economic miracles. When Korea joined the International Monetary Fund in 1955, it had a per capita gross national product (current dollars) of $65; in 1988, its per capita GNP was over $6,000. Each of the six five-year plans had as a development strategy the improvement of the balance of payments and the promotion of a balanced growth of both the export and industrial sectors (MacManus, 1990). Economic development in Taiwan was also based on a balanced program of internal industrialization and export expansion. Unfortunately, economic development data for Taiwan is not available so the country cannot be included in the study.

The objective of this study is to examine the EE hypothesis by a careful examination of a fundamental assumption which states that exports and gross domestic savings are positively related and to test the stability of coefficients over different time periods. The time periods used are: (a) 1960-72 and (b) 1973-87.

II. The Theoretical Background

A. Chenery and Strout Model

The theoretical framework which forms th basis of the investigation was established by Chenery and Strout (1966) in a model which recognized only two resource limits: skills and savings. The model, called the "investment limited growth version," is founded on four assumptions. The first, "the capacity limit," is based on the Harrod-Domar assumption that a specified amount of capital is needed to increase output. For convenience, they assume a linear capital-output function.

The second limit, "the limit on the ability to invest," is necessary to reflect the view that absorptive capacity for additional investment in any period is limited by the supply of complementary inputs which will increase as a result of the development process.

The next assumption sets a savings limit which is designed to include both the marginal propensity to save and the government's ability to increase savings by changes in the tax structure and other incentives.

The last assumption reflects the widespread practice in developing countries of summing up the principal goal of development as a given annual rate of increase in GNP.

Implicit in the discussion is the belief that development tends to create situations which at various points of time are characterized by a plentiful supply of all but a few of the factors required for continual development. When growth is thus limited by a bottleneck, there is underutilization of other factors. A possible answer is foreign aid which can break the bottleneck.

Much of the investigation is centered on the existence of an "ex-ante" saving-investment gap and an "ex-ante" import-export gap. A specific savings rate is derived as necessary to achieve the targeted growth rate, and a fixed relationship between import levels and growth of imports is required. A savings gap arises when the domestic savings rate is below the level needed to permit the investment necessary to achieve the target when imports are adequate. Foreign aid is needed to cover the savings gap and allow the target to be obtained.

A trade gap appears when, with adequate savings, the flow of imports is below the required level. Again, aid breaks the bottleneck and allows the target to be reached. Export earnings are generated by foreign demand while import expansion and product development are limited by productive capacity in combination with institutional restraints. Due to the bottlenecks, if the trade gap is larger than the savings gap, savings is wasted since productive factors released from consumer goods production cannot be used to create capital goods or exports (Bruton, 1969).

The foreign capital inflow into a capital importing country plays a dual role in that it both fills the gap between the imports the country requires for its development and the earnings it derives from exports while at the same time it supplements the supply of domestic savings needed to finance the required level of investments. Ex-post, the variables adjust from the ex-ante inequality, and the national income accounts show an equality between the trade and the savings gaps.

Contrary to the simplified Chenery-Strout model, it is misleading to assume that the two ex-ante gaps are generated independently of one another. Variations in exports could result in associated variations in domestic savings if the propensity to save is higher in the export sector than elsewhere or if government savings rely heavily on foreign trade as was true in the United States for most of the 19th century (Maizels, 1968).

B. The Maizels-Lee Hypothesis and Its Testing

In Keynesian terms, savings in the current period (S_t) is directly related to income in the same period (Y_t). In testable form, the relationship is:

$$(1) \qquad S_t = a + bY_t + \mu_t$$

with a stable income-saving relationship established. Frequent testing has shown, however, that savings at any level vary substantially from one period to another, evidence that savings moves independently of income so that a better model specification is needed.

Maizels attempted to introduce exports as an additional variable to improve the predictive ability of the model. Exports are assumed to be exogenous.

The exports of primary producing LDCs depend heavily on foreign demand conditions, but are not affected significantly by changes in domestic output due to the existence of low price and income elasticities of foreign demand for imports. Nevertheless, increased exports may influence domestic income and savings from three sources: (1) more efficient resource allocation induced by increased trade opportunities, (2) the foreign trade multiplier effect, and (3) a long list of "educative" effects which occur as the economic structure evolves along international lines.

Maizels' principal concern was with the "indirect effects" of exports on savings which ultimately would cause the aggregate savings schedule to shift to the right. He expected that gross domestic savings in primary exporting countries would shift by so much in response to export changes that they would be more closely related to exports than to GDP (Lee, 1971). The rightward shift of the savings schedule permits an equilibrium level of investment sufficient to permit the targeted rate of growth to be realized given a capital-output ratio. Aid is no longer necessary to cover the savings gap.

To test his hypothesis relating exports to savings, Maizels used Equation (1) and Equation (2) which is given below fitting both equations to

data for 11 LDCs:

$$(2) \qquad S_t = d + e(Y_t - X_t) + f(X_t) + \mu_t$$

where S = Gross Domestic Savings, Y_t = Gross Domestic Product defined as the value attributable to factor services rendered to resident producers of a given country before depreciation expense. It equals domestic consumption plus gross domestic investment plus net exports of goods and services. Net factor payments abroad including interest and dividends on foreign investments are excluded from GDP. The export variable, X_t, is measured in constant prices while μ_t is a stochastic variable. His expectation was that Equation (2) would produce a large R^2 value for each country than Equation (1) and that the regression coefficient of exports would not only be statistically significant, but would also be higher than that of nonexport GDP $(Y_t - X_t)$.

The empirical testing indicated that exports were a statistically significant factor in explaining savings behavior in those countries. An expanded version was developed by Lee who studied 28 countries — LDCs and industrialized nations and also found exports to be a significant regressor.

At low levels of income, consumption would logically exceed income so that the savings function should have a negative constant term. Such a result was anticipated by Johnson and Chu (1968) who studied developed and undeveloped countries.

Their results were disappointing in that they obtained a positive intercept for 13 of the 44 countries forcing them to conclude that for these countries, the savings schedule did not rise linearly or exponentially with GDP, but might be independent of current income.

Model specification was not carefully considered in any of the previous studies. It is clear that additional savings can be used to increase export capacity with a consequent multiplier effect on income. A Chow test was needed to measure the stability of the coefficients over time, but this is lacking in the previous studies. The effect of technological change might be reflected in the constant term which might also represent the effect of omitted variables in the model. A test for the linearity of the regression should also be included and the logged and the unlogged values should be tested in the regression analysis.

III. The Model to be Tested

A. The Basic Equations

The equations used in the present study are modified versions of those used by Maizels. In log form, the equations are as follows:

$$(1A) \quad \ln S_t = \alpha + \beta \ln Y_t + \mu_t$$

$$(2A) \quad \ln S_t = \alpha + \beta \ln(Y_t - X_t) + \gamma \ln X_t + \mu_t$$

where $\ln S_t$ = the log of savings at time t, $\ln Y_t$ = the log of Gross Domestic Product at time t, $\ln X$= the log of exports at time t, $\ln(Y_t - X_t)$ = the log of nonexport GDP (NxGDP), and μ_t = the stochastic error term.

This study, in contrast with other investigations, considers only less developed countries. The data is from *International Financial Statistics* and covers the period 1960-1987, an interval which includes wide ranging oil price movements, supply variations in oil, and a massive disruption in traditional trade channels.

Logically, the investigation could be divided into two parts with the first component comprising the years 1960-1972 representing the years prior to OPEC, and the second component, the years 1973-1987, when enormous dollar balances were transferred to the oil producing nations only to be recycled as dollar loans to nonoil producing LDCs. The trade deficits faced by these third world countries resulted in massive capital inflows, spiralling inflation, and political unrest. Real savings were negative for the period.

Followng Keynes, savings are hypothesized to vary directly with GDP in linear fashion in the early stages of economic development. As GDP continues to rise over long periods of time, savings may rise at an increasing rate.

The relationship between savings and exports is more complex. Maizels hypothesizes two a priori reasons for believing that domestic savings in many primary exporting countries would fluctuate with changes in the volume of exports. The first reason was that the propensity to save might be higher in the export sector than in other sectors and second, that movements in exports would cause significant movements in government revenues (with taxes on foreign trade yielding large sums) and these factors would in turn influence the level of government investment (Maizels, p. 93).

Both equations will be checked for specification errors.

B. The Empirical Results

Tables 1 and 2 give the regression results for Equations (1) and (2).

Table 1

SUMMARY OF REGRESSION RESULTS OF EQUATION 1

$$\ln S_t = \alpha + \beta \ln Y_t + \mu_t$$

Country	Time Period	Intercept	Coefficient of lnGDP	R^2	F-Value	D.W.
Burma	1960-1986	-28.898 (2.069)	3.111** (0.201)	.901	239.189	0.524
Costa Rica	1960-1987	-32.138 (2.778)	3.492** (0.271)	.858	165.027	0.219
Dominican Republic	1960-1985	-20.073 (0.535)	2.586*** (0.064)	.984	1623.162	1.382
El Salvador	1960-1987	-23.148 (2.639)	2.829** (0.298)	.766	89.660	0.149
Ecuador	1960-1986	-17.305 (0.806)	2.999** (0.117)	.961	650.648	0.387
Guatemala	1960-1986	-20.084 (9.922)	2.519** (0.107)	.954	544.678	0.543
India	1960-1986	-18.966 (0.513)	3.384*** (0.073)	.987	2123.283	1.176
Republic of Korea	1961-1988	-2.258 (.547)	1.094*** (.056)	.990	3470.000	2.081
Pakistan	1960-1987	-12.797 (0.602)	2.979** (0.115)	.960	662.380	0.357
Sri Lanka	1960-1985	-29.072 (2.067)	3.060** (0.193)	.909	251.359	0.617
Thailand	1960-1987	-8.723 (0.246)	2.110*** (0.040)	.990	2696.585	0.485
Zaire	1960-1985	-80.225 (11.178)	8.479** (1.161)	.676	53.262	0.383

* Significant at 90 percent significance level.
** Significant at 95 percent significance level.
*** Significant at 99 percent significance level.
Values in the parenthesis are the standard errors of the corresponding independent variables.

The coefficients were generally significant most often at the one percent level. The adjusted R^2 value was generally high and the regression was significant in every instance. For Equation 1, the Durbin Watson statistic indicated the existence of positive serial correlation in the residuals. We conclude that the sampling variances of the regression coefficients which we computed underestimated the true variance. No indica-

Table 2

SUMMARY OF REGRESSION RESULTS OF EQUATION 2

$$\ln S_t = \alpha + \beta \ln(Y_t - X_t) + \gamma \ln X_t + \mu_t$$

Country	Time Period	Intercept	Coefficient of NxGDP	Coefficient of X	R^2	F-Value	D.W.
Burma	1960-1986	-21.975 (2.548)	2.310*** (0.274)	0.503** (0.138)	.933	184.602	1.041
Costa Rica	1960-1987	-4.099 (1.358)	0.424* (0.145)	0.847*** (0.036)	.993	1967.243	1.022
Dominican Republic	1960-1985	-18.641 (2.552)	2.395*** (0.337)	0.101NS (0.174)	.984	788.032	1.317
El Salvador	1960-1987	-0.626 1.901	-0.000NS (0.233)	1.007*** (0.073)	.970	449.868	1.443
Ecuador	1960-1986	-7.151 1.589	1.224** (0.279)	0.597** (0.090)	.985	874.157	1.122
Guatemala	1960-1986	-7.254 (2.404)	0.887* (0.304)	0.656** (0.118)	.979	606.184	1.345
India	1960-1986	-7.902 2.111	1.866** (0.289)	0.429** (0.080)	.994	2232.27	1.111
Republic of Korea	1961-1988	-0.8126 (.4092)	0.5763*** (0.1028)	0.4545*** (0.0705)	.996	2738.386	1.869
Pakistan	1960-1987	-3.205 2.63	1.395** (0.447)	0.501** (0.135)	.973	500.780	0.687
Sri Lanka	1960-1985	-5.277 4.112	0.463NS (0.442)	0.975** (0.159)	.963	332.320	1.412
Thailand	1960-1987	-7.517 1.532	1.921*** (0.241)	0.090NS (0.112)	.990	1335.80	0.876
Zaire	1960-1985	-21.914 2.675	2.244*** (0.282)	0.846*** (0.027)	.990	1344.63	1.876

* Significant at 90 percent significance level.
** Significant at 95 percent significance level.
*** Significant at 99 percent significance level.
Values in the parenthesis are the standard errors of the corresponding independent variables and intercepts.

tion of collinearity among the regressors was found for any country, and a plot of the data did not give any evidence of nonlinearity. The intercept was uniformly negative and was consistently statistically significantly negative, reinforcing the hypothesized linear relationship between savings and income.

The period of the study, 1960-1987, was subdivided in two component time periods: 1960-1972 and 1973-1987. A separation of this sort was needed in order to study the impact of the oil price increase engineered by OPEC in the years 1973-1974 and 1978-79. The effect of the change in the price of oil on the primary goods exporting countries was devastating since the industrialized nations were unable to maintain past growth rates or employment levels because of higher energy costs. The result was a sharp decline in export revenues for the twelve nations in the study. It might be anticipated that the degree of association between exports and savings would be less significant during the years 1973-1980. A negative merchandise trade balance would be indicative of falling savings. Political instability was found in many of these developing nations and this condition would result in capital outflows for purposes of safekeeping of financial assets. Such outflows would be expected in El Salvador, the Dominican Republic, Sir Lanka, and Burma, as well as India and Pakistan to a lesser extent.

Evidence that Equation (2) consistently outperformed Equation (1) will be taken to reinforce Maizels' hypothesis and to support the claim of those who believe that a program of export expansion is superior to one of import substitution industrialization.

It is evident that Gross Domestic Product is an effective regressor since the coefficient is significant for each country at the 95% level. The coefficient of determination for Equation (1) ranged from .676 to .984. This result is not surprising since it is in conformity with orthodox economic theory. It is clear that the income and product account data for these countries can be relied upon to a degree greater than is generally imagined. The intercept term is negative in all cases, and this contradicts the results of earlier investigators. It lends support to Maizels' hypothesis, however.

Equation (2), where nonexport GNP replaced Gross Domestic Product, gave slightly superior results for EL Salvador, Ecuador, India, and Zaire, but was slightly less favorable for the other nations. The export variable was not statistically significant for Thailand or the Dominican Republic. It was highly significant for the other nations. While less significant than GDP in explaining the variation in savings, exports appear to be an important element in planning for economic growth in underdeveloped countries. For Korea, the coefficients for nonexport GDP and for exports were very close, indicative perhaps of balanced industrial development and export growth.

Positive serial correlation was found for Burma, Costa Rica, Pakistan, and India, although no problem was discovered for the other countries.

Major structural changes occurred in the above countries which may explain in part the statistical difficulties.

The Chow test for the stability of the regression coefficients with the results for the various countries is included in the Appendix (Table A1).

The F statistic used in the test:

$$\frac{RRSS-URSS/K}{URSS/(n_1 + n_2-2K)}$$

where RRSS is the restricted residual sums of squares, URSS is the unrestricted residual sums of squares, K is the number of parameters including the intercept, n_1 is the number of observations in the first time period, and n_2 is the number of observations in the second time period. The significance levels are 95 and 99 percent.

For Costa Rica, Guatemala, Ecuador, Sri Lanka, and Thailand, the calculated Chow F value for both equations indicated a significant difference between the component time periods at the one percent level. Structural change had occurred across time periods and we rejected the null hypothesis of no difference.

The calculated F value for Equation (1) for Pakistan and India were significant at 5% while the calculated values for Equation (2) were not significant at that level. For Zaire and Korea, the null hypothesis was rejected at one percent for Equation (1), but was accepted for Equation (2). In Zaire, political difficulties were a destabilizing factor which held back economic growth. In Korea, actual economic growth exceeded planned growth for most of the period with the exception of 1977-1981 when actual grwoth of 5.5% fell below planned growth of 9.2 percent. No economic shocks caused significant changes between time periods. Balanced economic development and export growth moved together.

The results for Equation 2 were superior to those of Equation 1 in that specification errors were infrequent in the second equation.

In order to discover a predictable or consistent relationship between savings and exports, we divided the former by the latter for each country for each year in the study. The results were striking.

For Pakistan, the savings/exports ratio was 1.459 percent in 1960 and 1.1897 percent in 1987. For India, the same years the ratios were 2.769 percent and 3.4148 percent. For Thailand, the percentages were .8085 and .7332 percent. For the other countries, the percentages were very small and will not be included.

Table A1

CHOW TEST RESULTS FOR EQUATION I AND EQUATION II FOR STABILITY OF COEFFICIENTS IN EACH COUNTRY

Country	Equation I		Equation II	
Burma	Calculated F Value	5.885***	Calculated F Value	4.673
	Critical F Value	5.66^{a}-3.42^{b}	Critical F Value	4.87^{a}-3.07^{b}
Costa Rica	Calculated F Value	19.794***	Calculated F Value	8.783***
	Critical F Value	5.61^{a}-3.40^{b}	Critical F Value	4.82^{a}-3.05^{b}
Dominican Republic	Calculated F Value	2.137	Calculated F Value	1.933
	Critical F Value	5.72^{a}-3.44^{b}	Critical F Value	4.94^{a}-3.10^{b}
Ecuador	Calculated F Value	20.215***	Calculated F Value	6.439***
	Critical F Value	5.66^{a}-3.42^{b}	Critical F Value	4.87^{a}-3.07^{b}
El Salvador	Calculated F Value	9.452***	Calculated F Value	.418
	Critical F Value	5.61^{a}-3.40^{b}	Critical F Value	4.82^{a}-3.05^{b}
Guatemala	Calculated F Value	19.471***	Calculated F Value	5.966***
	Critical F Value	5.66^{a}-3.42^{b}	Critical F Value	4.87^{a}-3.07^{b}
India	Calculated F Value	3.477**	Calculated F Value	.558
	Critical F Value	5.66^{a}-3.42^{b}	Critical F Value	4.87^{a}-3.07^{b}
Republic of Korea	Calculated F Value	4.210**	Calculated F Value	0.1721
	Critical F Value	5.61^{a}-3.40^{b}	Critical F Value	4.31^{a}-2.82^{b}
Pakistan	Calculated F Value	3.484**	Calculated F Value	.597
	Critical F Value	5.61^{a}-3.40^{b}	Critical F Value	4.82^{a}-3.05^{b}
Sri Lanka	Calculated F Value	10.022	Calculated F Value	6.438***
	Critical F Value	5.72^{a}-3.44^{b}	Critical F Value	4.94^{a}-3.10^{b}
Thailand	Calculated F Value	7.846***	Calculated F Value	5.244***
	Critical F Value	5.61^{a}-3.40^{b}	Critical F Value	4.82^{a}-3.05^{b}
Zaire	Calculated F Value	6.255**	Calculated F Value	2.238
	Critical F Value	5.72^{a}-3.44^{b}	Critical F Value	4.94^{a}-3.10^{b}

Notes: a = Critical F Value for each equation in each country is given for .01 significance level.

b = Critical F Value for each equation in each country is given for .05 significance level.

** = Significant at .05 significance level.

*** = Significant at .01 significance level.

The general conclusion drawn is a fundamental change in the savings habits of these selected underdeveloped countries occurring around 1973. Foreign aid replaced the savings which had been generated by exports and a significant decline in the income variables is to be noted. Real incomes fell more rapidly than nominal incomes due to the impact of inflation. Foreign indebtedness rose exponentially with U.S. banks representing a primary source of funds. Ironically, a large part of the funds channeled to these countries via bank loans were "petro dollars" deposited by OPEC members in money center banks.

IV. Conclusions

Maizels' analysis which considered past and projected rates of growth of selected countries in the Overseas Sterling area from 1950-1962 found a definite relationship between exports and foreign capital inflows on the one hand and the rate of growth in the real product on the other. The relationship, he noted, was a changing one and the change could be very substantial in any country over a period of years. The narrow commodity specialization of many of the various countries covered by the study was a significant force on export performance. He concluded that there was little doubt that a considerable number of the less developed nations require substantial, even drastic, shifts in the commodity pattern of their export sectors away from commodities with poor growth prospects if they are to achieve a higher and sustained rate of economic growth in the future.

Export earnings and capital flows were the main determinants which establish the capacity to import. The burden for future development was upon the export sector since net capital inflows into the LDCs showed no incentive to rise since 1961.

The present investigation did not consider capital movements, but placed the sources of savings on exports, Gross Domestic Product, and nonexport GDP.

Our results support Maizels in that the export variable was consistently significant at both levels although the coefficient was smaller than that for NxGDP in Equation (2).

The most effective explanatory variable was GDP which is not surprising in that the greater part of a nation's savings must be generated internally.

We conclude that a broader export base is necessary for further savings growth to occur via the export route. Economic development based on central planning with a focus on the promotion of international trade and political stability necessary to promote overseas capital investment is the most appropriate policy.

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