Seminar Paper No. 110

INCOME LEVELS AND
THE STRUCTURE OF TRADE

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I.

The income level of world exports of good i is defined by the following index, y_i^x :

$$y_i^x = \sum_j y_j \frac{X_{ij}}{X_{i.}}, \text{ where:}$$

X_{ij} = exports of good i by country j

$X_{i.}$ = world exports of good i

y_j = index of income of country j

The latter term is, in turn, defined as follows:

$$y_j = 100 \frac{Y_j}{Y_u}, \text{ where:}$$

Y_j = per capita GNP of country j ; and

Y_u = U.S. per-capita GNP.

The index is defined, thus, as an average, weighted by the share of each country in world exports of the good, of the income levels of the countries exporting the good. A country's "richness" or "poorness" is defined by its per-capita GNP - still the best possible single measure, despite its various well-known shortcomings (especially in international comparisons). The income level is presented as an index, by showing it as a ratio of the U.S. per capita income - the world's highest at the point (1973) to which the present study is related.¹

1) The division of each country's income level by that of the U.S. serves for convenience of presentation, and is of course entirely immaterial in the present context: each country's income could instead be represented by its absolute level (dollars per year), or divided by any other common number. But the principle of dividing each country's income level by that of the richest country does become significant in a time-series study. Such study is planned as a sequence to the present one.

In this way the highest possible level of the index is 1 - or 100, as it is put here for convenience: this would be the income level of exports of a good exported exclusively by the United States. The lowest boundary of the index is, of course, the index of the income level of the poorest country which conducts any trade. In this study this lowest index is 1.0 (for Laos).

The income level of world imports of good i , designated by y_i^m , is defined in an exactly parallel way; that is, it is defined by the formulation given above, where X_{ij} and X_i are replaced by, respectively, M_{ij} and M_i - country j 's imports and world imports of the good.

The indexes of income levels of exports and imports, classified by the 3-digit SITC into 174 goods,¹ have been calculated for the year 1973.² The results are presented in Table A-1.

Before proceeding to examine the determinants of the income level in trade, a few simple characteristics of the findings of Table 1 may be pointed out.

First, the dispersion of the indexes of income levels is much more substantial in exports than in imports. The range of the index in exports is from 9.7 (in good No. 264 - jute) to 88.3 (in good No. 041 - wheat) - the maximum possible range being, we recall, from 1.0 to 100. In imports, the range is from 12.1 (good No. 046 - wheat meal or flour),

1) The SITC contains 175 goods. But for commodity No. 688 - uranium and thorium - the required data are not available. The omission of a single good is practically immaterial for the following analysis.

2) To shift from the index as it is presented here to an expression of the income level in absolute terms (in U.S. dollars), the index shown (taken as a fraction of 100) should be multiplied by 6,200 - the level of U.S. per-capita GNP in 1973.

to 80.1 (good No. 683 - nickel).¹ The weighted averages of the indexes are 61.8 for exports, and 58.3 for imports. The coefficient of variation - the ratio of the standard deviation to the mean - is .29 in exports, and .20 in imports.

It might be expected that the extreme cases, both high and low, of income levels of exports would be associated with a high degree of country concentration of these exports: with very few rich countries exporting the high-income good, and similarly very few poor countries exporting the low-income good. This, of course, is immediately evident for the two most extreme cases - wheat being exported primarily by one country, the U.S., the world's richest, and jute being exported predominantly by Bangladesh, one of the world's poorest. But it is also true as a general rule. Thus, if we take the 10 goods with the highest income level in exports,² the (unweighted) average coefficient of country concentration of these exports³ is found to be 54.7 - in comparison with an average of 37.3 for all exports. The average for the 10 goods with

1) Interestingly enough, practically the same good (wheat, or wheat flour) which is exported by the richest countries, is imported by the poorest; and it is a purely agricultural product! As we shall see later, this polarization of income levels in exports and imports is not clearly evident in general.

2) These are, in a descending order of income level: (041) - wheat; (734) - aircraft; (515) - radioactive materials; (321) - coal; (282) - iron and steel scrap; (044) - maize; (531) - synthetic dyes; (251) - pulp and waste paper; (411) - animal oils and fats; and (726) - electric-medical equipment:

3) This is the Gini-Hirschman coefficient of concentration (for 1973), defined for any good i as

$$\sqrt{\sum_j \left(\frac{X_{ij}}{X_{i.}} \right)^2}$$

where X_{ij} are exports of good i by country j , and $X_{i.}$ are total world exports of the good.

the lowest income levels¹ is 46.4; in this group, it is not as high as in the former because some of the goods with the lowest income levels, such as sugar, coffee, or cocoa, are exported by several low-income countries.

It is interesting to note that as a general rule, a positive association exists between the income level of exports of a good and the degree of country-concentration of these exports. The Spearman rank-correlation coefficient between the two series is .38; this should be considered quite high, particularly in view of the fact, just noted, that the extremely low-income goods have a higher than average level of country concentration.² In imports, the association is even stronger: the rank-correlation coefficient of the income level and the country-concentration of imports is .66. We thus see that the higher the income level of exports and imports of a good, the more tend these exports and imports to be concentrated in a small number of countries.

When goods are aggregated into large categories, the dispersion among the aggregates should naturally be substantially smaller than among individual goods. When the major categories of the SITC are used (9 categories, 0 to 8), the dispersion becomes indeed surprisingly small. This may be seen from columns (1) and (3) of Table 1. It appears that the (unweighted) average income levels for these categories range only from 53.2 (for category 3 - mineral fuels) to 73.8 (for category 7 - machinery and transport equipment); whereas the range for imports is between 49.3 (category 4 - animal and vegetable oils and fats) and 65.0

1) These are, in an ascending order of income level: (264) - jute; (074) - tea; (071) - coffee; (075) - spices; (072) - cocoa; (687) - tin; (261) - silk; (244) - cork; (331) - crude petroleum; and (061) - sugar.

2) Excluding the afore-mentioned group of the 10 goods with the lowest income level of exports, the rank correlation rises to .49.

TABLE 1 Levels, Dispersion and Association of Exports and Imports,
by Major Categories

Category	y_i^x		y_i^m		Spearman Rank Correlation Coefficient of y_i^x and y_i^m
	Mean Coefficient of Variation		Mean Coefficient of Variation		
	(1)	(2)	(3)	(4)	(5)
0 Food and live animals	55.4	.39	53.7	.28	-.418
1 Beverages and tobacco	61.7	.09	56.8	.18	
2 Crude materials, inedible	53.2	.38	57.4	.17	.151
3 Mineral fuels, lubricants	53.2	.52	64.1	.12	
4 Animal and vegetable oils	56.3	.43	49.3	.16	
5 Chemicals	64.4	.29	49.8	.20	.159
6 Manufactured goods, by material	61.4	.19	58.6	.15	-.238
7 Machinery and transport equipment	73.8	.08	54.0	.19	-.098
8 Miscellaneous manufactured articles	63.2	.18	65.0	.15	-.534
All goods	59.0	.29	56.7	.20	-.232

(category 8 - miscellaneous manufactured articles). This low dispersion among categories must imply a high degree of dispersion within each category; this may in fact be seen from columns (2) and (4), respectively for exports and imports. It appears, indeed, that in the case of exports the degree of dispersion within each group is in the majority of categories higher than for the total of individual goods; only two categories - 1 and 7 - appear to be relatively homogeneous. This indicates, thus, that the category to which a good belongs is not one of the characteristics which participate in determining the income level of the good's exports or imports - an indication which is not inconsistent with the findings which will be presented later on in the investigation. The only clear-cut exception to this rule, for the export trade, is category 7 - machinery and transport equipment. In this category both the average income level is substantially above all the rest; and, as has just been noted, the dispersion within the category is particularly low. This is thus the only major category of goods which may be clearly designated a high-income category of exports.

II.

Conventional, factor-proportions theory of the determinants of trade patterns would lead us to the following expectation: a country with an abundance of certain factors will export goods intensive in these factors; and import goods intensive in the other factors. In a world of two factors, labor and capital, the result is obvious. A country with an abundance of capital (relative to labor) is a rich country, and this country will export to its poor partner capital-intensive goods. A country, on the other hand, abundant in labor is a poor country; and it, in turn, will export (to its rich partner) the other, labor-intensive goods. Hence, the income level of the exports of a certain good, and

the income level of its imports, should be radically different. Even if the factor-proportions theory is viewed less crudely - with more factors admitted, or when factors such as technological innovations etc. are introduced - the expected result remains basically unchanged, namely: that in general, the higher the income level of the exports of a good, the lower should be the income level of its imports - and vice versa.

A product-differentiation, demand-determined theory, on the other hand, such as that suggested by Burenstam-Linder,¹ would lead to the opposite expectation. By this theory, countries of a similar income level trade mainly among themselves, in a range of goods which are inherently quite similar but are somewhat differentiated. Thus, rich countries export and import (by trade among themselves) one class of goods; whereas poor countries export and import another class of goods. Hence, a good whose income level is high in exports may be expected also to have a high level of income in imports; whereas a low income level in exports would be associated with a low level in imports.

We thus have clearly conflicting expectations from the two sets of theories; and we may test the expectations against the actual findings, by the use of rank-correlation coefficients. The factor-proportions pattern would lead to a high negative rank correlation of the series of income levels of exports and imports; whereas the Linder theory would lead to a high positive rank-correlation. The rank-correlation coefficients are presented in Table 1, column (5).

It appears that when all commodities are included, the rank-correlation coefficient, $-.232$, is negative, but quite small. The sign would indicate a vindication of the conventional factor-proportions expectation. But the fact that the correlation is weak suggests that both forces - the forces indicated by both sets of theories - are working, with varying strength or weight in the case of each good.

1) S.B. Linder (1961).

It may be worthwhile, therefore, to see whether the rank-correlation coefficients would be different when ranking is done within each class of goods separately. This is also shown in column (5), for the major categories (the 1-digit) in the SITC classification (categories 1, 3 and 4 are omitted because there are only 4 goods in each). In a very rough way this classification system orders and ranks classes by the level of fabrication - the value added in manufacturing, and the level of sophistication. It appears that the signs of the rank-correlation coefficients do indeed vary among major classes, but the coefficients themselves are again mostly rather small. In two categories - the first (0) and the last (8) - they are quite substantial ($-.418$ and $-.534$, respectively); and here, they are again negative in both cases. That is, within each of these categories it may be stated more strongly that the higher the income level of a good in exports, the lower it tends to be in imports - the result expected by conventional theory.¹

Since the argument for similarity of exports and imports of a country is intimately associated with the hypothesis that high-income countries tend to both export and import goods of a highly heterogeneous nature, one further test has been conducted. A measure of the degree of product differentiation - which will be mentioned later - is available for 120 out of the total of 174 goods. These have been divided into 3 groups of 40 goods each, according to the degree of product differentiation - group 1 including the goods with the highest measure of differentiation, and group 3 - those with the lowest differentiation. According to the hypothesis tested - Linder's - it is mainly in group 1 that a positive association of the income level of exports and imports should be expected.

1) This is also true for categories (7) and (8) together - these two sharing among them most highly-fabricated goods. The export-import rank correlation for this combined group is $-.490$.

In fact, the rank-correlation coefficients within each of these 3 groups are as follows: $-.222$ in group 1; $-.392$ in group 2; and $-.317$ in group 3 (for the 120 goods as a whole, it is $-.234$). Thus, although the negative association of the income levels of exports and imports is somewhat weaker for goods in group 1 than for the rest, it is negative - in contrast to the hypothesis postulated, and in accordance with the predictions of "conventional" theory.

It has been noted earlier that the average income levels do not differ radically among the major categories. In addition, it should be pointed out now that inasmuch as such differences do exist, they do not reveal any clear-cut order. It might have been expected, intuitively, that the higher the level of fabrication, the higher will be the share of high-income countries in exports of the good; and of low-income countries in its imports. That is, that the income level of exports should increase as one moves from category (0) to category (8), and the income level of imports should fall. In fact, if such an order appears at all, it would seem to be a very weak one. A simple explanation of the determination of the income levels by degree of fabrication would thus seem to be rejected outright. But this brings us to the attempt to explain the determination of income levels, to which we now turn.

III.

A high-income export good is, by definition, exported by high-income countries. What would a highly developed, high-income country be expected to export?

One such expectation - the most obvious - has already been noted. A high-income country is, almost invariably, a country with an abundance of physical capital; hence, it may be expected to export capital-intensive goods.

A rich country is - again, almost invariably - abundant in human capital as well; hence, it may be expected that such countries will export goods intensive in human capital. These two factors, physical and human capital, may be considered as two components of one aggregate - the total size of an economy's capital - with attention given only to the total. Recent evidence suggests, however, that the two are not close substitutes, and should therefore better be treated as separate factors.¹

A closely related attribute is the abundance of human skills, which may be expected in highly developed countries. The correlation of an "average" level of skills in a country and the size of its human capital will undoubtedly be very high. Yet, the two are not entirely identical by definition; separate hypotheses are found in the literature with regard to the effect of a "skill ratio".² Hence, if data are available, the "skill" factor may better be treated separately from human capital.

Another explanation of the nature of the exports of a highly developed country, popular in various versions in recent years, lies in technological aspects - the "technology gap" or "product cycle" explanations of trade patterns. The rich country is expected, by these hypotheses, to export primarily goods in which the embodied technology is the result of new, recent innovations. A corollary - in the "product cycle" version - is that each such "good" would be highly heterogenous, whereas standardized goods would be exported by lower-income countries. The heterogeneity, or diversification, attribute is stressed by the Linder theory: this expects both exports and imports of a rich country to be of highly heterogenous goods, as a result of the greater variations in demand introduced by high income.

1) See W.H. Branson and N. Monoyios (1977).

2) The main reference here is, of course, the series of studies by D.B. Keesing - such as (1965) or (1971).

The testing of such hypotheses has now become readily feasible, due to the well-known work of Hufbauer.¹ In this work, the attributes of each good are quantified. Beside estimates relating to the possible determinants of trade mentioned above (excluding human capital, which is not incorporated in Hufbauer's study), Hufbauer also provides estimates of the wage level in the production of each good. This might be regarded as a proxy estimate of human capital, or of the level of skills; but it is designed to test directly Kravis' hypothesis,² that the export industries of rich countries are high wage-level industries. In addition, Hufbauer introduces a measure of scale economies: since a rich country tends, due to its very richness, also to be a large economy in the relevant sense (that is, in terms of total income, or total demand), it may be expected to have an advantage in industries where scale economies are positive and large (in the relevant range of production). This assumes, of course, less than perfect mobility of goods (in the full sense - including, for instance, perfect information) in world trade. Still another characteristic estimated by Hufbauer is the degree to which a good is sold to final consumers - rather than being an intermediary in the production of other goods. This is intended to test the contention that less-developed economies tend to export intermediary goods; whereas highly-developed economies tend to produce and export goods which are required mainly by final consumers, the production of which presumably tends to be more sophisticated.

We shall thus test the following attributes of goods as possible explanatory variables of the income level of exports of the good; unless otherwise specified, the estimates of the variables are taken from

1) G. Hufbauer (1970).

2) I.B. Kravis (1956).

the Hufbauer study.¹

X_1 = physical-capital/labor ratio

X_2 = human-capital/labor ratio²

X_3 = a measure of skill ratio

X_4 = wage level

X_5 = a measure of economies of scale

X_6 = ratio of sales to final consumers

X_7 = a "first-trade date", as a measure of recentness of technological innovation (in this study, the later the date, the higher is this index);

X_8 = degree of dispersion of unit prices of the good, as a measure of product differentiation³

1) The data appear in Hufbauer (1970), Table A-2, pp. 212-220; and their construction is explained in the following notes to the table (221-223), as well as in a few places in Hufbauer's text.

Despite the great amount of work and great ingenuity invested in the construction of these data, they are obviously imperfect, and once in a while based, inevitably, on assumptions of an arbitrary nature. Yet, I believe that it is, by and large, a body of data sufficiently accurate for a purpose such as the present one - the test of general hypotheses - especially when the number of observations (i.e., goods) is as large as in the present case.

One specific argument that has been levelled against Hufbauer's series is that they are based on data of the U.S. alone (except in one instance, in which they draw on Japanese data). This, of course, might be a serious problem for some purposes. But, again, for a purpose such as the present one reliance on U.S. data would not be damaging, as Hufbauer himself pointed out, unless factor intensity reversals are common; and most available studies suggest that they are not.

2) Estimates of the human-capital/labor ratio have been provided by W. Branson, from the worksheets to Branson and Monoyios, op. cit. These estimates refer to 1967; Hufbauer's estimates are based on data for various years in the 1960's.

3) Although explanations and details are provided in the source, and will not be repeated here, one point concerning this measure should probably be indicated: Hufbauer's estimates, like those of the present study, are provided for "goods" classified by the 3-digit SITC; but the measures of price dispersion for each such "good" are averages of measures of dispersion of "goods" classified by the 7-digit SITC. This, of course, lends these measures greater credibility.

The discussion thus far has referred to exports. For imports we have, again, two alternative hypotheses. "Conventional" theories would lead to the expectation that a variable which contributes to a high income level of the exports of the good should make an opposite contribution - to a low income level - in imports. The Linder hypothesis, on the other hand, of exchange of basically similar goods, should lead to the expectation that a contribution of a variable to a high income level of exports should do the same for the income level of imports.

Of the total of 174 goods altogether, Hufbauer's study provides data for 120: a sample of 19 goods¹ (out of a total of 73) which belong to the

SITC major (1-digit) categories 0-4 (where most of the value added is derived from natural resources or from non-manufacturing activity); and all (101) goods which belong to categories 5-8 - roughly, the semi-manufactured and manufactured goods. Human-capital data (from the Branson-Monoyios study) are available only for the latter group (of 101 goods).

I have therefore run three multiple regressions: 1. A regression for all (120) goods for which Hufbauer's data are available, where the explanatory variables exclude X_2 (human capital); 2. The same regression, with same data, but only for the (101) goods in categories 5-8; and 3. A regression covering again only the latter group (of 101 goods), but in which human capital is added to the explanatory variables.² Regressions 4-6 perform, similarly, the respective tests for imports. The results are summarized in Table 2.

1) These goods are: (013) - canned, prepared meat; (032) canned, prepared fish; (046) wheat meal or flour; (047) non-wheat meal or flour; (048) cereal preparations; (053) preserved fruits; (055) preserved vegetables; (061) sugar; (062) sugar preparations; (091) margarine, shortening; (111) non-alcoholic beverages; (112) alcoholic beverages; (122) tobacco manufactures; (231) crude synthetic rubber; (242) rough wood; (251) pulp and waste paper; (266) regenerated synthetic fibers; (332) petroleum products; and (421) fixed vegetable oils, soft.

2) In this regression, the data for (physical) capital/labor ratio were also taken from the Branson-Monoyios study.

TABLE 2 Explanatory Variables of Income Levels: Correlation Coefficients

Equation No.	Adjusted R ²	Partial Correlation Coefficient (r) of							
		X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
<u>Exports</u>									
1.	<u>.382</u>	-.096		.084	<u>.349</u>	-.108	<u>.128</u>	<u>.328</u>	<u>.169</u>
2.	<u>.462</u>	-.093		<u>.311</u>	<u>.204</u>	<u>.363</u>	-. <u>.313</u>	<u>.199</u>	<u>.374</u>
3.	<u>.392</u>	-.061	<u>.093</u>	<u>.236</u>	<u>.239</u>	.024	-. <u>.085</u>	<u>.217</u>	<u>.306</u>
<u>Imports</u>									
4.	.048	-.001		-. <u>.130</u>	-. <u>.079</u>	-.151	.036	.014	.012
5.	<u>.178</u>	.063		-. <u>.318</u>	.036	-. <u>.193</u>	<u>.201</u>	-. <u>.024</u>	.060
6.	<u>.193</u>	-.175	.065	-. <u>.320</u>	-.051	-. <u>.168</u>	<u>.219</u>	-. <u>.064</u>	-.001

Underlined figures are significant at the 5% level.

The performed tests seem, from Table 2, to yield the following findings:

- a. When all (120) goods are tested, all variables together provide a modest part of the explanation of the determination of the income level of exports; and none at all for imports. The adjusted R^2 is .382 for exports, and nil (and, of course, insignificant) for imports.
- b. As might be expected, the performance improves substantially when only the (101) goods in the categories 5-8 are included: the adjusted R^2 rises then to .462 in exports, and to .178 in imports (the latter being this time significant at the 5 % level). The fact that the exclusion of only 19 goods improves the explanation to this extent suggests that if these goods are an approximately representative sample of all goods in the categories 0-4, inclusion of these (had the data been available) would probably have reduced the explanation to nil, for exports as well as for imports. It also suggests, on the other hand, that had the removal of the effect of natural resources been done more thoroughly than by just excluding goods in the categories 0-4 (that is, primarily, if a finer classification and selection of goods for coverage had been made), the variables under consideration would have yielded together a substantially better explanation of the income level of trade.
- c. Partial correlation coefficients show that in general, each variable separately performs better in explaining exports than in explaining imports - as has been seen before to be true for all explanatory variables together. This applies (again - as it was for the aggregate) particularly when all 120 goods - including, that is, those of the 0-4 group - are tested.
- d. The most surprising finding, from the partial correlation coefficients, is the poor showing of X_1 - the (physical) capital/labor ratio. Intuitively, again, this variable might have been expected to provide the most obvious

explanation: rich countries might first and most be expected to export capital-intensive goods. In fact, we see, this characteristic of the good - its capital intensity - contributes practically nothing to the determination of the income level of trade.¹

e. The human-capital variable (X_2) appears, too - again, quite surprisingly - to contribute little: its partial correlation coefficient in exports is significant, and is of the "right" sign; but it is rather low. In imports it is not significant (at the 5 per cent level). Its addition to the list of explanatory variables lowers somewhat the R^2 of the regression as a whole (from .462 to .392) in exports; and leaves it practically unchanged for imports.²

f. Five variables, out of those tested, seem to contribute to the determination of the income level of exports (and - less clearly, as is implied by our former observations - of imports): the level of skill (X_3); the wage level (X_4); the ratio of sales to final consumers (X_6); the "newness" of the good - as measured by "first-trade date" (X_7); the degree of heterogeneity of the good (X_8); and, somewhat less clearly, the degree of economies of scale (X_5). Of these, all but one - X_6 - influence the income level of exports in the hypothesized direction; namely, they contribute to its increase. The degree to which the good is destined to final consumers (X_6)

1) Moreover, most of the coefficients for X_1 appear with the "wrong" sign. But this should probably be disregarded in view of the fact that the coefficients are not significant at the 5% level.

2) The relevance of these comparisons may be somewhat impaired, though, by the fact that in regressions (3) and (6) the (physical) capital/labor ratio is estimated by a different set of data than in (2) and (5).

It might be thought that the poor showing of the human-capital variable may be due to its (probably) being highly correlated with other explanatory variables, which "get the credit"; this might be true particularly in relation to the variable of skills. To test this possibility, I have eliminated the latter variable - X_3 (this is not shown in Table 3). This leaves the multiple-correlation coefficient for exports practically unchanged, and lowers somewhat this coefficient for imports. More important, however: the partial correlation coefficients of the human-capital variable are still very low - for exports, the coefficient is even lower (.041) than when the skill variable is included!

operates, on the other hand, in the opposite direction: the higher this degree, the lower the income level of exports, and the higher the income level of imports.

g. Whenever the significant (at the 5 per cent level) pairs of coefficients for exports and imports are matched (i.e., the partial-correlation coefficients of X_1 in regressions 1 and 4, 2 and 5, 3 and 6 - eight such pairs altogether), their signs are in opposite directions. That is: when a variable contributes to a high income level of exports, it also contributes to a low income level of imports. This agrees with the expectations of "conventional" theory, in contrast to those of Linder's theory. It also agrees with the results of the rank correlations that have been observed in Table 1. There, it may again be noticed that among the categories 5 to 8, in three (6, 7, 8) the rank correlation coefficients of the income levels of exports and imports are negative, within each category; and only in one category, 5 (containing 16 goods, out of the total of 101 in categories 5-8) is the rank correlation positive.

In this connection, the degree of heterogeneity of a good - variable X_8 - deserves special attention, since the contention of the Linder theory is intimately connected with this measure: it is contended that high-income countries will trade with each other in the same range of goods, each "good" being more heterogeneous than in trade of lower-income countries. Hence, a positive correlation of the income levels of exports and imports should be expected particularly when goods are highly heterogeneous.

Table 2 shows positive signs (and relatively substantial levels) of the partial correlation coefficients for this variable, X_8 , in the export regressions 2 and 3, which are the relevant ones for the present purpose;

and insignificant results in imports. No conclusion can thus be drawn from the matching of the export and import coefficients for this variable (except, perhaps, that the absence of significant correlation coefficients in imports with opposite signs to exports, whereas such opposite coefficients are found for some other variables, may give some slight support to the Linder contention). This finding is in agreement, thus, with the conclusions indicated earlier by the rank-correlation analysis of the income levels of exports and imports.

IV.

Having at our disposal the index of income level of trade of each good, we may now move back to the trade of a country, and inquire about the income level of the goods traded by the country: does the country trade in high income level goods, or in low-level goods? We shall confine this inquiry to the export side, and conduct it by using an index of the income level of the country's exports. This index, y_j^x , is defined as:

$$y_j^x = \sum_i \frac{X_{ij}}{X_{\cdot j}} y_i^x, \text{ where}$$

X_{ij} = exports of good i by country j ;

$X_{\cdot j}$ = total exports of country j ; and

y_i^x = index of income level of exports of good i .

The index of income level of exports is presented, for 108 countries, in column (2) of Table A-2.

1) An attempt to analyze similarly the imports of countries has proved to be rather fruitless, due to the fact that the indexes of income level of imports are remarkably similar among countries.

The income level of exports of a country must by definition be, on average for all countries, simply the country's level of per-capita income. For individual countries, however, there is no need for this equality to hold: some countries may be expected to export "above" their income level, that is, to have an index of the income level of exports higher than their per-capita income levels; whereas other countries may be expected to export "below" their income levels.

Column (1) of Table A-2 presents the per-capita income level of each country. A comparison of these levels with those presented in column (2) shows immediately that almost all countries export "above" their income levels. The exceptions are, partly, a few oddities such as oil-exporting and Soviet-Bloc countries, to which further reference will be made later. Mainly, however, the group of countries which export "below" their income levels consists of the top high-income countries (whose shares in total exports, it should be recalled, are very high). These are, (in alphabetical order): Australia, Belgium-Luxembourg, Canada, Denmark, France, Germany, Netherlands, Norway, Sweden, Switzerland, and the United States. The income level at which a country turns from exporting "above" to exporting "below" appears to be around 60 (as percentage of U.S. per-capita income).

Upon reflection, however, it would appear that this finding of "above" and "below" exporting countries represents merely a technical attribute, rather than any phenomenon of substance in world exports. A rich country shares its exports with other countries, which on average may be expected to be poorer than the country involved. The index of income level of the goods which the country exports may therefore be expected to be lower than the country's own income level; and the opposite must hold for a relatively poor country. This may

easily be visualized by considering the two extreme cases. Take, on the one hand, the U.S. - the highest-income country. Assuming that each of the goods exported by the U.S. is also exported, to some extent at least, by other countries (which are, by definition of the case, poorer than the U.S.), each of the goods exported by the U.S. will have an index of income level of exports lower than 100; and so will inevitably be the index of income level of the U.S. exports, which is the weighted average of the indexes of individual goods. And the opposite must be true, in the same way, for a country such as Laos, Cambodia, Mali, Rwanda, or Upper Volta - the countries which appear to have the lowest per-capita income levels (just one per-cent of the U.S.' level).

To overcome this technical difficulty, and arrive at comparisons which may reveal any substance, a (linear) regression of the index of income level of exports of countries on the countries' level of per-capita income was run. The inference of this procedure is that a country may be said to export at its income level if the index of income level of its exports is similar to what would be expected from this regression. Likewise, a country would be judged to be exporting "above" or "below" its income if its index of income level of exports is, respectively, higher or lower than the expected value. The regression fitted is:

$$\bar{y}_j^x = 38.11 + .287 y_j \quad , \text{ where}$$

$\bar{y}_j^x$ = expected income level of country j's exports; and

y_j = per-capita income level of country j (in percentage of U.S. income)

R^2 is .368, and the result is significant at practically any desired level. The values of the income level of exports expected from this regression are presented in column (3) of Table A-2.

A comparison of columns (2) and (3) of this Table would show, naturally, that the actual and expected indexes of income level are never precisely equal; and the decision as to what is a "large" or a "small" deviation of the two from each other is a rather arbitrary matter. I have selected one standard deviation of the distribution as a dividing line, and termed a country as one which trades "above" if its actual income level of exports is higher than its expected value by more than one standard deviation, or as trading "below" if its actual income index is lower than its expected value by more than the standard deviation. These countries are listed in Table 3 .

It appears that the large majority of the countries listed in Table 3 share one common attribute - whether they trade "above" or "below": these are mostly relatively poor countries. Such countries tend, by and large, to be relatively specialized in their exports; to have, that is, a high measure of commodity concentration of their exports. In such instances chance plays a heavier role. If the few goods in which the country specializes happen to be high-income goods, the country will have a relatively high index of income level of its exports and will hence appear to be trading "above"; and the opposite would be true if the very limited list of the country's exports happens to consist of goods exported largely by relatively low-income countries.

Two groups of countries seem, from Table 3 , to share other specific attributes. One consists of the oil-exporting countries: all oil countries covered in the data - Iran, Libya, Saudi Arabia and Venezuela - appear on the list of countries which export "below". This phenomenon is explained rather simply. Oil appears to be a good exported primarily by low-income countries. At the same time, some of the oil-exporting countries are made relatively rich, in per-capita

TABLE 3 : Countries with Deviating Indexes of Income Level of Exports

Exporting "Above" Income			Exporting "Below" Income		
Country	Per Capita Income (in percentage of U.S.)	$y_j^x - \bar{y}_j^x$ standard deviation	Country	Per Capita Income (in percentage of U.S.)	$y_j^x - \bar{y}_j^x$ standard deviation
Afghanistan	1.5	1.11	Bulgaria	25.6	- 1.33
Argentina	26.5	1.44	Cameroon	4.0	- 1.17
Austria	56.6	1.46	Colombia	7.1	- 1.43
Czechoslovakia	46.3	1.18	Cuba	8.7	- 1.19
French Guiana	1.8	1.03	Dominican Rep.	8.4	- 1.13
Korea	6.5	1.18	Germany, Dem. Rep.	48.4	- 1.30
Laos	1.0	2.04	Ghana	4.8	- 1.05
Lebanon	15.2	1.52	Hungary	29.8	- 3.65
Mali	1.1	1.36	Iran	14.0	- 1.50
Mauritania	3.2	1.02	Ivory Coast	6.1	- 1.55
Niger	1.6	1.80	Libya	56.9	- 3.05
Pakistan	1.9	1.00	Malaysia	9.2	- 1.01
Paraguay	6.6	1.13	Papua-N. Guinea	6.6	- 1.59
Senegal	4.5	1.03	Rwanda	1.1	- 1.77
Somalia	1.3	1.32	Saudi Arabia	26.0	- 2.46
Upper Volta	1.1	1.63	Sri Lanka	1.9	- 2.08
Uruguay	15.3	1.04	Togo	2.9	- 1.05
Yugoslavia	16.3	1.11	Uganda	2.4	- 2.01
			Venezuela	26.3	- 1.62

income terms, by the very export of oil: Libya and Saudi-Arabia are most obvious examples, beside other countries and territories which are not included in the study. This leads to the appearance of such countries as exporting "below" their income level.¹ Also, the exporting of oil is done primarily by rather similar countries, having roughly the same (low) range of per-capita income (with the exception of the small-population exporters of oil). Since in each of these countries oil is the major export good, total exports of such countries tend to have a low income index, and thus to deviate from the values expected from a regression whose results were determined by the fact that low-income countries mostly share their exports with higher-income countries.

The other group which may be distinguished is that of Soviet-Bloc countries. Of the six countries in this Bloc covered in this study, five appear in the list in Table 3 (the sixth, Poland, has an index of income level exceeding its expected value by .64 standard deviations). Of these five, Czechoslovakia appears to be trading "above"; whereas the four others - Bulgaria, Cuba, East Germany, and Hungary, the latter by a very wide margin - seem to be trading "below". The number of observations here is small, and the appearance they give may be a result of accident. Yet, the assertion often made that the trade structure in the Soviet Bloc leads its peripheral countries to specialize in goods normally exported by low-income countries may find some support in these observations.

1) It should be recalled that the study's data refer to the year 1973, only at the end of which has the oil price risen dramatically. At present-day prices, oil-exporting countries would appear, as a whole, to be relatively richer: and the income level of exports of oil would not be nearly as low as the level recorded in 1973.

Is there a consistent difference between exporters "above" and "below" their income levels in the success of their export performance? This question seems to be of some significance. Assertions are often made that a high rate of increase of exports of a country, particularly a less-developed one, requires, inter alia, specialization in "advanced" goods; and this would imply an export structure which yields a relatively high index of income level.

A casual look at Table 3 does not seem to disclose any systematic difference, in export performance, between the countries exporting "above" and those exporting "below" their income level. On the other hand, some positive indication is yielded by observation of the group of countries whose average export growth in the last two decades has been most rapid. This group would include Greece, Hong Kong, Israel, Japan, Jordan, Korea (South), Portugal, and Yugoslavia (data for Taiwan, a country with another remarkable export performance, are not available in this study). It appears, from Table A-2, that countries in this group predominantly export "above" - Israel being the only exception, and Greece being a borderline case. Thus, some support may be claimed for the above-mentioned assertion, of the benefit in export performance derived from specialization in relatively high-income goods; but the evidence is too sporadic to yield, on this issue, more than a suggestive indication.

V.

The study has been addressed, until now, to the per-capita income level of the structure of trade. It will now be somewhat extended by observing also the total income of exporters and importers. Similarly to the per-capita index, the index of total income of

exports of a good, Y_j^x , is defined as:

$$Y_i^x = \sum_j Y_j \frac{X_{ij}}{X_{i\cdot}},$$

where Y_j stands for country j 's total G.N.P. (relative to the US G.N.P.), and X_{ij} and $X_{i\cdot}$, as before, are country j 's and the world's exports of good i . Similarly, Y_i^m will be a measure of the total income level of imports of good i . The values of these indexes are presented in Table A-3. Averages for the major categories are shown in columns(1) and (2) of Table 4.

By and large, the indexes of total-income level reveal the same pattern as those of per-capita income levels - as witnessed, for instance, by comparisons of the appropriate columns in Table 4 and Table 1. Some of the results seem to be indicated even more strongly by the total-income indexes; in particular, the high income level of exports of commodities in category 7 - machinery and transport equipment. Column (3) of Table 4 presents the correlation coefficients of export and import income levels, within each category and for all goods. These coefficients appear to be negative, by and large - again, an indication which comes out stronger than that which follows from column (5) of Table 1. That is: goods tend to be traded more between large (by total-income yardstick) and small countries than among similar countries.

The similarity of indications yielded by total-income and per-capita income measures is of course not surprising. A country's level of total income is the result, by definition, of its level of per-capita income and its size, in terms of population. The measures of total income of the trade structure may thus be expected to reflect,

TABLE 4: Total-Income Levels and Association of Exports and Imports,
by Major Categories

Category	<u>Average for Category</u>		Spearman Rank Correlation Coefficients of Y_i^x and Y_i^m (3)
	Y_i^x (1)	Y_i^m (2)	
0 Food and live animals	20.2	19.3	-.658
1 Beverages and tobacco	24.1	19.0	
2 Crude materials, inedible	20.8	20.9	-.363
3 Mineral fuels, lubricants	16.6	28.5	
4 Animal and vegetable oils	27.1	15.5	
5 Chemicals	27.5	16.2	.241
6 Manufactured goods, by material	19.1	22.0	-.402
7 Machinery and transport equipment	31.9	19.3	-.310
8 Miscellaneous manufactured articles	23.1	25.5	-.426
All goods			-.361

first, the effect of the level of per-capita income. But they should also reflect, in comparison with the measures of per-capita income level, the added impact of the size of the economy. A small-sized economy may be expected to manifest a different production pattern and to specialize, partly at least, in a different range of goods than would a large country with a similar level of per-capita income. In particular, it is usually expected that large economies have advantage, and will tend to specialize, in industries in which economies of scale are particularly pronounced. The aircraft industry, or that of railroad equipment, are often mentioned as obvious examples.¹

The particularly high total-income level of the exports of machinery and transport equipment may be an indication, indeed, of the added impact of scale economies on the pattern of specialization. A simple regression of the index of total income level of exports on Hufbauer's measure of scale economies which has been used in the earlier analysis, for the commodities for which this measure is available, yields a correlation coefficient (r) of .257; in imports, the correlation coefficient is -.300. Both coefficients are significant and of the expected sign. This might conceivably be, however, due to the positive correlation which exists between scale economies and the level of per-capita income level of exports, and the negative correlation in imports. A multiple regression of the total-income measure on the per-capita measure of the income level and on the

1) Analyses of this issue may be found in various contributions in E.A.G. Robinson (1960), particularly that of Simon Kuznets. See also Chenery and Taylor (1968).

measure of economies of scale yields the following partial-correlation coefficients: In exports, the coefficient of the two income measures is .650, and the coefficient of correlation with economies of scale is .146 (not significant at the 5 % level; $R^2 = .425$); in imports the two coefficients are, respectively, .787 and -.210 ($R^2 = .797$). The expected relationship of the total-income level of trade flows to economies of scale is thus still borne out, particularly in the pattern of imports.

APPENDIX A: Dispersion of the Income-Level Indexes of Individual Goods

The index of the income level of a trade flow which has been used in this study all along is, of course, a weighted mean of the income levels of the (geographic) components of such flow - where, for instance in exports, the X_{ij}/X_i is the weight assigned to the exports of each country j . It may be asked, however, what the dispersion of this series (of X_{ij}/X_i) is around its mean. The lower this dispersion - the more, that is, are exports concentrated indeed in countries whose income level is close to the weighted mean - the more can the latter be said to be an indication of the income level of the "typical" country which exports that good; the higher this dispersion, the less meaningful it becomes to conceive of such "typical" country.

The levels of dispersion of the export and import series of each individual good are presented in Table A-4. It would be completely arbitrary to suggest a cut-off point, in which the weighted average becomes non-representative, and I shall not attempt it here. Instead, a few generalizations will be offered.

It would be noticed that most measures of dispersion are quite close to each other - particularly in imports, but by and large also in exports. Thus, the degree of "representativeness" of the index of income level used here is rather similar for most goods.

Insomuch as differences in the levels of dispersion do exist, it is difficult to distinguish any common attributes of the goods in which dispersion levels are particularly high or particularly low.

Specifically, average dispersion levels for the major categories of commodities (not shown here) do not reveal any substantial differences among these categories. It may be mentioned, though, that the lowest dispersion level in exports is found in category 7 - machinery and transport equipment. This is consistent with the finding, mentioned earlier in the study, that the variation among goods, in their indexes of income levels, is particularly low in this category.

If we consider indexes of income levels more meaningful, in some way, when the dispersion around the average is small, it may be worthwhile to try and see whether just the "more meaningful" indexes give the same indications, and yield the same inferences, as the rest. In attempting to test this, commodities have been ranked according to their levels of dispersion in exports and imports, separately (starting with the lowest dispersion measure), and the top half (60 out of 120 goods for which the relevant data are available) have been selected to consist of a new population of observations. For this group, the effect on income levels of exports and imports of the various attributes with which these levels are presumed to be connected has been tested by a multiple regression, in the same way which has been done before for all (120) goods. The results, which should be compared with those of Table 2, are presented in Table 5. The test has been carried out only through the regressions equivalent to those which are represented in lines (1) and (4) of Table 2.

TABLE 5: Explanatory Variables of Income Levels: Correlation Coefficients
for a Sub-Group

Dependent Variable: Index of Per-Capita Income Level in	Adjusted R ²	Partial Correlation Coefficients (r) of						
		X ₁	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
Exports (y_i^x)	<u>.455</u>	-.057	.180	<u>.661</u>	.134	.044	.277	.151
Imports (y_i^m)	.074	.129	-.028	-.196	<u>-.266</u>	.035	.199	.116

Underlined figures are significant at the 5 % level.

On the whole, Table 5 would lead to roughly the same conclusions as Table 2. The R²'s are somewhat higher - but not by any substantial margin. The showings of variable X₄ (the wage level) in exports and of X₅ (the measure of scale economies) in imports are of the same sign as in Table 2 but more impressive. In particular, one of the major inferences made earlier is supported again: the physical-capital variable fails to assert itself as influencing the pattern of specialization and trade; it appears again with the "wrong" signs, but its correlation coefficients are not significant.

Appendix B: An Alternative Measure of the Income Level of Trade

The analysis of this study has been conducted all along through the use of a specific index of the income level of exports and imports, namely a weighted average of the income levels of the trading countries - with some regard being paid, in the previous Appendix, to the dispersion around this average. Other, alternative indexes of the income level are conceivable. One such alternative will be presented and discussed in this Appendix.¹

The measure used in this study, we recall, is (say, for exports):

$$y_i^x = \sum_j y_j \frac{X_{ij}}{X_{i.}}, \text{ where:}$$

X_{ij} = exports of good i by country j ;

$X_{i.}$ = world exports of good i ; and

y_j = country j 's per-capita income (as proportion of U.S. income).

Instead, however, of multiplying $X_{ij}/X_{i.}$ (country j 's share in world exports of good i) by y_j (country j 's income level), one could draw a regression of the two, showing their relationship to each other. In such a regression, where y_j is the independent and $X_{ij}/X_{i.}$ the dependent variable, the slope will indicate the tendency of the country's share in exports to change with the country's income level: the larger (algebraically) this slope, the more tends this good to be exported by high-income countries. This could be, then, another measure of the income level of exports; similarly, the slope of a regression of import shares on countries' income levels will indicate

1) This measure has been suggested to me by Alexander Yeats.

the income levels of imports of the various goods.

Such linear regressions have been run for all 173 goods. They have the general form:

$$\frac{X_{ij}}{X_i} = a + by_j ,$$

where the b's yield the measure under consideration (and similarly for imports). The results are presented in Table A-5.

A glance at the Table will show immediately that the slope measures for practically all goods are positive; in the few cases in which they are negative, they are mostly not significantly different from zero.¹ This should come, of course, as no surprise: as a rule, the higher the country's per-capita income, the higher is its total income and, in an even stronger way, its share in world exports and imports; and this should be reflected, as a rule, in each of the goods in which the country trades. The measures of slope presented in Table A-5 do not therefore tell us, by themselves, whether the exports (imports) of a good tend to be concentrated in high-income countries. They could be made, however, to give such indication when compared with an "average" tendency. This average is yielded by a regression of the shares of countries in all goods on the countries' income levels, similar to the regressions for each individual good. The outcome of this procedure is as follows:

1) The significance levels of the negative-sign slopes are as follows:
In exports: good 071-.534; 072-.892; 074-.453; 075-.851; 264-.582;
895-.116. In imports: 046-.880.

$$\frac{X_{.j}}{X_{..}} = -.135 + .049 y_j \quad (R^2 = .396, \text{ and significant at practically any level}); \text{ and}$$

$$\frac{M_{.j}}{M_{..}} = -.0138 + .046 y_j \quad (R^2 = .391, \text{ and significant at practically any level});$$

where

$X_{.j}$, $M_{.j}$ are country j 's total exports and imports of goods; and $X_{..}$, $M_{..}$ are total world exports and imports of goods.

Whether a given slope for an individual good indicates that the good tends to be exported by high-income countries may thus be inferred by comparing this slope with the magnitude .049; in imports, it would be compared with .046.

The sign of such comparisons - that is, the determination of whether a good tends or not to be exported (imported) by high-income countries - seems less important than the size of the slope. Here, one would be inclined to repeat, with this measure, the various experiments, comparisons and tests conducted in the main study by the use of the weighted average as the index of income levels of exports and imports. Such re-experimentation seems, however, to be redundant in view of the very large proximity of the indications yielded by the two alternative measures. The rank correlation coefficient of the slope measure and the weighted-average measure is, in exports, .952 ; and the simple (Pearson) correlation coefficient is .829. In imports, the rank correlation coefficient is .972 ; and the simple correlation coefficient is .939. It thus appears that tests conducted by the use of the slope measure of income level would have yielded roughly the same results and inferences as those that have been presented in the main body of this study.

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Trade data are drawn from issues of the U.N. Yearbook of International Trade Statistics; income data - from issues of the World Bank Atlas.

Table A-1: Indexes of Income Levels of Exports and Imports, by Commodity

SITC Code	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
0	<u>Food and live animals</u>		
001	Live animals	60.85	49.58
011	Meat - fresh, chilled, frozen	58.56	63.64
012	Meat - dried, salted, smoked	74.86	49.58
013	Meat - canned or prepared	58.29	70.88
022	Milk and cream	70.05	34.91
023	Butter	69.11	51.39
024	Cheese and curd	71.69	64.75
25	Eggs	69.43	60.98
031	Fresh fish	46.80	67.73
032	Canned or prepared fish	52.04	62.17
41	Unmilled wheat	88.30	29.95
042	Rice	53.20	16.80
043	Unmilled barley	78.37	56.37
044	Unmilled maize	81.70	51.32
045	Unmilled Cereals, n.e.s.	76.04	54.90
046	Wheat meal or flour	72.24	12.12
047	Non-wheat meal or flour	70.50	39.74
048	Cereal preparations	71.08	49.33
051	Fresh fruit and nuts	30.79	66.65
052	Dried fruit	40.13	54.41
053	Preserved or prepared fruit	43.92	67.74
54	Fresh vegetables	47.50	63.26
055	Preserved or prepared vegetables	44.52	68.10
061	Sugar and honey	24.74	52.16
062	Sugar preparations	61.23	62.10
071	Coffee	11.39	76.82
072	Cocoa	16.80	69.25
073	Chocolate	66.69	67.27
074	Tea	10.12	40.31
075	Spices	13.45	45.60
081	Animal feeding stuff	58.51	59.22
091	Margarine, shortening	68.14	44.51
099	Food preparations, n.e.s.	67.28	47.20

Table A-1 (continued)

SITC	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
1	<u>Beverages and Tobacco</u>		
111	Non-alcoholic beverages, n.e.s.	65.98	55.86
112	Alcoholic beverages	54.30	68.21
121	Tobacco, unmanufactured	54.85	59.73
122	Tobacco manufactures	71.69	43.19
2	<u>Crude materials, inedible, except fuel</u>		
211	Hides and skins	60.74	52.07
212	Fur skins	69.28	70.88
21	Oil seeds, nuts, kernels	73.92	60.52
231	Crude synthetic rubber	29.89	52.99
241	Fuel wood and charcoal	55.73	56.75
242	Rough wood	37.43	53.35
243	Shaped wood	69.56	65.63
244	Raw cork and waste	22.14	53.02
251	Pulp and waste paper	80.83	61.90
261	Silk	19.10	57.45
262	Wool and animal hair	58.31	55.61
263	Cotton	33.64	43.88
264	Jute	9.67	42.84
265	Vegetable fibers, excluding cotton and jute	31.83	55.31
266	Synthetic, regenerated fiber	68.02	46.34
267	Waste of textile fabrics	79.70	38.63
271	Crude fertilizers	32.08	51.65
273	Stone, sand and gravel	63.63	64.61
274	Sulphur	64.36	49.47
275	Natural abrasives	56.60	69.46
276	Other crude minerals	60.18	58.71
281	Iron ore, concentrates	51.46	67.64
282	Iron and steel scrap	84.14	45.62
283	Nonferrous base metal ore, concentrates	39.55	64.76
284	Nonferrous metal scrap	75.33	64.77
285	Silver and platinum ores	59.46	71.94
291	Crude animal materials, n.e.s.	50.57	65.49
292	Crude vegetable materials, n.e.s.	53.42	64.66

Table A-1 (continued)

SITC	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
3	<u>Mineral fuels, lubricants, related materials</u>		
321	Coal, coke, briquettes	85.12	60.39
331	Crude petroleum	23.45	55.48
332	Petroleum products	38.49	67.71
341	Natural gas and manufactures	65.66	72.98
4	<u>Animal and vegetable oils and fats</u>		
411	Animal oils and fats	80.46	44.56
421	Fixed vegetable oils, soft	50.53	41.06
422	Fixed vegetable oils, non-soft	24.91	57.92
431	Processed animal and vegetable oils	69.41	53.62
5	<u>Chemicals</u>		
52	Organic chemicals	75.00	53.49
513	Inorganic elements, oxides, etc.	69.20	56.18
514	Other inorganic elements	71.81	47.81
515	Radioactive and associated elements	86.44	76.90
521	Coal, petroleum etc. chemicals	56.24	57.47
531	Synthetic organic dyestuffs etc.	81.06	45.20
532	Dyes n.e.s., tanning products	49.51	32.54
533	Pigments, prints etc.	71.04	48.22
541	Medical and pharmaceutical products	71.34	41.90
551	Essential oil, perfumes, etc.	61.97	54.13
553	Cosmetics etc.	66.36	49.97
56	Soaps and cleaning preparations	70.94	48.20
561	Manufactured fertilizers	68.26	37.41
571	Explosive and pyrotechnic products	63.86	46.18
581	Plastic materials etc.	73.50	54.58
599	Chemicals n.e.s.	72.78	46.31

Table A-1 (continued)

SITC	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
6	<u>Manufactured goods classified by material</u>		
611	Leather	44.72	62.20
612	Leather manufactures	55.53	65.66
613	Fur skins, tanned or dressed	64.30	65.78
621	Rubber materials	71.81	52.54
629	Rubber articles, n.e.s.	65.61	62.14
631	Veneers, plywood etc.	50.91	67.40
632	Wood manufactures n.e.s.	64.23	72.76
633	Cork manufactures	30.70	65.67
641	Paper and paperboard	76.57	60.40
642	Paper articles	68.92	53.78
651	Textile yarn and thread	56.54	49.46
652	Woven cotton fabrics	47.08	53.48
653	Woven non-cotton fabrics	56.91	55.22
654	Lace, ribbons, tulle, etc.	65.33	53.07
655	Special textile products	68.49	57.23
656	Textile products n.e.s.	40.45	50.04
657	Floor coverings, tapestry etc.	56.16	72.04
661	Cement building products	46.50	51.40
662	Clay building products	62.20	59.88
663	Other non-metal mineral manufactures	71.41	59.99
664	Glass	70.74	61.78
665	Glassware	66.12	55.66
666	Pottery	61.51	68.48
667	Pearls, precious and semi-precious stones	50.52	62.62
671	Pig iron	56.53	68.06
672	Ingots of iron and steel	66.74	40.39
673	Iron and steel shapes	71.23	58.01
674	Universals, plates and sheets of iron and steel	68.05	55.32
675	Hoop and strip of iron and steel	75.18	55.66
676	Rails and other track materials of steel	65.12	28.63
677	Iron and steel wire, excluding rod	71.80	55.61
678	Iron and steel tubes, pipes etc.	70.18	56.08
679	Iron and steel castings, unworked	75.24	48.89
681	Silver, platinum etc.	62.29	72.03
682	Copper	42.96	63.26

Table A-1 (continued)

SITC	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
	Manufactured goods classified by material (cont.)		
683	Nickel	74.22	80.08
684	Aluminium	69.93	60.51
685	Lead	57.62	55.64
686	Zinc	64.47	62.86
687	Tin	19.07	66.89
689	Non-ferrous base metals, n.e.s.	62.79	71.71
691	Structures and parts n.e.s.	68.79	47.52
692	Metal containers	64.40	45.32
693	Non-electric wire products	65.49	60.81
694	Nails, screws etc. of iron, steel or copper	71.06	67.75
695	Tools	74.81	54.01
696	Cutlery	61.71	62.28
697	Base-metal household equipment	58.27	57.25
698	Metal manufactures n.e.s.	69.82	58.60
7	<u>Machinery and transport equipment</u>		
711	Non-electric power machinery	76.86	59.32
712	Agriculture machinery	75.94	50.87
714	Office machines	75.53	64.25
715	Metal-working machinery	77.35	49.71
717	Textile and leather machinery	74.53	41.07
718	Machines for special industries	77.71	42.14
719	Non-electric machines n.e.s.	75.99	49.50
722	Electric-power machinery, switches	74.64	50.00
723	Equipment for distributing electricity	66.38	46.72
724	Telecommunications equipment	67.54	60.72
725	Domestic electric equipment	67.26	61.56
726	Electro-medical, X-ray equipment	80.13	58.89
729	Electric machinery n.e.s.	72.54	57.71
731	Railway vehicles	69.76	29.60
732	Road motor vehicles	76.21	67.81
733	Road non-motor vehicles	66.81	68.86
734	Aircraft	87.17	55.47
735	Ships and boats	66.84	57.38

Table A-1 (concluded)

SITC	Commodity	Income level of Exports (y_i^x)	Income level of Imports (y_i^m)
8	<u>Miscellaneous manufactured articles</u>		
812	Plumbing, heating and lighting fixtures	67.83	58.25
821	Furniture	67.94	72.64
831	Travel goods, handbags	46.24	73.96
841	Clothing, except fur	45.33	73.15
842	Fur clothing	57.41	79.05
851	Footwear	41.12	78.84
861	Scientific Instruments and apparatus	75.12	60.03
862	Photographic and cinematographic supplies	76.79	57.73
863	Developed cinema film	55.67	43.67
864	Watches and clocks	79.68	54.69
891	Musical instruments, recorders, etc.	66.76	68.18
892	Printed matter	67.62	61.26
893	Plastic articles n.e.s.	68.72	67.50
894	Toys, sporting goods etc.	58.40	71.16
895	Office supplies n.e.s.	72.63	49.43
896	Works of art etc.	73.21	71.49
897	Gold and silver ware, jewelry	60.71	67.36
899	Other manufactured goods	56.46	62.06

TABLE A:2 THE INCOME LEVEL OF EXPORTS OF COUNTRIES

Country	Per-capita G.N.P. (in percentage of U.S.) ($\bar{y}_j$) (1)	Index of Income Level of Exports	
		Actual ($\bar{y}_j^x$) (2)	Expected ($\bar{y}_j^x$) (3)
Afghanistan	1.5	49.6	38.5
Algeria	9.2	32.2	40.7
Angola	7.9	31.5	40.4
Argentina	26.5	60.0	45.7
Australia	70.2	54.9	58.2
Austria	56.6	68.9	54.4
Belgium-Lux.	73.5	58.9	59.2
Bolivia	3.7	36.8	39.2
Brazil	12.3	37.7	41.6
Bulgaria	25.6	32.3	45.5
Burma	1.3	47.6	38.5
Cambodia	1.1	41.3	38.4
Cameroon	4.0	27.7	39.3
Canada	87.9	60.3	63.3
Central African Rep.	2.6	37.0	38.8
Chad	1.3	39.0	38.5
Chile	11.6	45.2	41.4
Colombia	7.1	26.0	40.1
Congo	5.5	42.8	39.7
Costa Rica	11.5	32.6	41.4
Cuba	8.7	28.8	40.6
Czechoslovakia	46.3	63.0	51.4
Denmark	84.0	60.9	62.2
Dominican Rep.	8.4	29.4	40.5
Ecuador	6.1	31.6	39.9
Egypt	4.0	39.0	39.3
El Salvador	5.6	30.0	39.7
Ethiopia	1.5	34.6	38.5
Finland	58.1	64.5	54.8
France	73.2	60.3	59.1
French Guinea	1.8	48.9	38.6
Germany, Fed. Rep.	85.8	63.9	62.7
Germany, Dem. Rep.	48.4	39.1	52.0
Ghana	4.8	29.1	39.5
Greece	30.2	48.2	46.8

Table A-2 (continued)

Country	$\bar{y}_j$ (1)	$\bar{y}_j^x$ (2)	$\bar{y}_j^{-x}$ (3)
Guatemala	8.1	34.7	40.4
Haiti	2.1	32.5	38.7
Honduras	5.2	38.4	39.6
Hong Kong	23.1	50.7	44.7
Hungary	29.8	10.5	46.7
India	1.9	42.7	38.7
Indonesia	2.1	29.2	38.7
Iran	14.0	27.3	42.1
Iraq	13.7	50.7	42.0
Ireland	34.7	53.6	48.1
Israel	48.5	47.1	52.0
Italy	39.5	58.0	49.4
Ivory Coast	6.1	24.5	39.9
Jamaica	16.0	35.8	42.7
Japan	58.5	63.3	54.9
Jordan	5.5	48.9	39.7
Kenia	2.7	32.3	38.9
Korea (South)	6.5	51.6	40.0
Laos	1.0	58.6	38.4
Lebanon	15.2	57.5	42.5
Liberia	5.0	46.8	39.5
Libya	56.9	24.2	54.4
Malawi	1.8	44.5	38.6
Malaysia	9.2	30.7	40.7
Mali	1.1	51.9	38.4
Mauritania	3.2	49.1	39.0
Mexico	14.4	47.9	42.2
Morocco	5.2	39.6	39.6
Mozambique	6.1	41.1	39.9
Netherlands	69.8	56.9	58.1
New Zealand	59.4	57.8	55.1
Nicaragua	8.7	40.4	40.6
Niger	1.6	56.4	38.6
Nigeria	3.4	32.2	39.1
Norway	75.2	60.7	59.7
Pakistan	1.9	48.6	38.7
Panama	14.8	34.6	42.3
Papua - New Guinea	6.6	24.2	40.0
Paraguay	6.6	51.2	40.0
Peru	10.0	47.0	41.0

Table A-2 (concluded)

Country	y_j (1)	$\frac{x}{y_j}$ (2)	$\frac{-x}{y_j}$ (3)
Philippines	4.5	38.2	39.4
Poland	33.7	54.1	47.8
Portugal	22.7	51.5	44.6
Rwanda	1.1	20.9	38.4
Saudi Arabia	26.0	21.2	45.6
Senegal	4.5	49.6	39.4
Sierra Leone	2.6	45.5	38.8
Singapore	29.5	45.8	46.6
Somalia	1.3	51.5	38.5
South Africa	16.9	45.9	43.0
Spain	27.6	51.6	46.0
Sri Lanka	1.9	18.1	38.7
Sudan	2.1	46.4	38.7
Sweden	95.3	65.0	65.5
Switzerland	98.4	65.7	66.3
Syria	6.5	38.8	40.0
Thailand	4.4	41.9	39.4
Tanzania	2.1	30.8	38.7
Togo	2.9	28.5	38.9
Trinidad & Tobago	21.1	36.6	44.2
Tunisia	7.4	42.1	40.2
Turkey	9.7	42.4	40.9
Uganda	2.4	18.9	38.8
U.K.	49.4	59.6	52.3
U.S.A.	100	63.9	66.8
Upper Volta	1.1	54.6	38.4
Uruguay	15.3	52.8	42.5
Venezuela	26.3	29.6	45.7
Yemen	1.6	38.6	38.6
Yemen - Dem. Rep.	1.8	34.3	38.6
Yugoslavia	16.3	53.8	42.8
Zaire	2.3	41.8	38.8
Zambia	6.9	43.7	40.1

Table A-3: Indexes of Total Income Level of Trade

<u>SITC Code</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC Code</u>	<u>Exports</u>	<u>Imports</u>
001	17.2	16.6	211	27.0	17.6
011	10.4	27.1	212	21.5	23.6
012	9.5	13.2	221	64.3	18.1
013	6.0	44.3	231	10.3	23.4
022	12.0	11.4	241	16.6	12.7
023	7.8	13.8	242	28.3	21.6
024	9.7	24.0	243	14.9	33.5
025	11.5	16.5	244	2.5	21.1
031	12.5	42.2	251	19.2	29.4
032	17.7	24.2	261	6.8	27.3
041	61.6	9.0	262	7.9	19.6
042	43.5	2.6	263	28.6	13.4
043	27.7	14.6	264	2.2	12.1
044	69.7	13.4	265	6.1	15.4
045	59.0	17.4	266	26.3	11.3
046	30.6	1.3	267	47.8	9.4
047	37.9	3.0	271	26.7	10.6
048	23.6	15.9	273	15.2	16.3
051	14.3	21.5	274	27.3	14.2
052	22.0	14.0	275	24.3	30.6
053	18.7	21.6	276	19.0	22.9
054	14.9	19.8	281	6.4	32.1
055	11.6	26.5	282	54.5	15.0
061	5.0	32.2	283	7.6	28.1
062	14.4	21.5	284	31.8	20.2
071	4.9	44.3	285	12.5	45.8
072	3.3	31.9	291	13.4	24.5
073	11.5	19.4	292	13.2	21.4
074	3.5	16.0			
075	4.9	23.0	321	44.8	17.4
081	33.2	13.0	331	1.1	24.0
091	24.1	9.5	332	8.9	31.0
099	23.9	12.1	341	11.7	41.5
111	15.4	10.7	411	54.7	13.6
112	12.9	33.9	421	25.5	10.4
121	45.6	21.3	422	9.3	26.4
122	32.4	9.9	431	18.9	11.6

Table A-3 (continued)

<u>SITC Code</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC Code</u>	<u>Exports</u>	<u>Imports</u>
512	31.2	17.0	665	20.9	18.5
513	24.2	23.7	666	20.8	36.6
514	28.5	13.4	667	15.6	24.7
515	64.1	41.8	671	11.9	28.5
521	33.6	15.0	672	20.2	9.4
531	20.5	14.4	673	14.3	21.9
532	14.9	12.7	674	21.4	23.3
533	22.6	9.4	675	22.4	14.9
541	23.9	11.0	676	22.0	6.8
551	21.9	22.6	677	17.2	27.0
553	21.4	12.6	678	26.0	18.2
554	26.0	9.6	679	38.1	13.8
561	26.4	16.9	681	20.5	40.5
571	24.5	17.1	682	11.1	22.1
581	26.6	11.8	683	14.3	47.9
599	29.5	12.5	684	19.7	20.2
			685	12.6	21.7
611	15.9	21.0	686	10.8	36.5
612	15.9	24.7	687	5.2	39.1
613	21.0	16.2	689	22.9	28.6
621	28.1	8.1	691	25.0	9.2
629	22.3	25.6	692	19.6	9.2
631	16.8	31.1	693	17.5	31.0
632	17.1	33.9	694	25.9	34.3
633	5.9	19.4	695	28.5	16.8
641	18.2	27.1	696	21.1	29.8
642	22.4	12.2	697	19.1	21.6
651	16.7	12.7	698	25.4	19.8
652	17.6	18.2			
653	18.4	17.8	711	38.3	24.5
654	16.9	15.9	712	36.6	18.9
655	21.9	16.6	714	41.6	23.6
656	16.7	14.7	715	28.9	14.2
657	14.4	19.4	717	24.2	19.9
661	11.0	19.6	718	36.3	11.6
662	20.9	15.9	719	32.1	13.8
663	23.0	15.5	722	31.1	14.2
664	24.4	20.7	723	23.9	15.9

Table A-3 (concluded)

<u>SITC Code</u>	<u>Exports</u>	<u>Imports</u>
724	27.3	29.9
725	22.1	17.9
726	31.0	23.3
729	35.1	22.1
731	32.7	7.5
732	30.7	32.1
733	23.4	30.1
734	69.7	19.4
735	19.9	7.8
<hr/>		
812	19.7	15.6
821	15.3	23.9
831	14.7	38.2
841	11.0	29.8
842	13.1	21.4
851	10.0	43.5
861	35.0	20.3
862	38.1	18.0
863	30.9	16.3
864	13.6	24.7
891	29.3	35.1
892	25.6	16.2
893	23.0	23.6
894	24.8	35.3
895	31.2	13.6
896	40.3	39.0
897	22.4	26.0
899	18.3	28.9

Table A-4: Measure of Dispersion (σ) of Income Levels of Exports
and Imports

<u>SITC</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC</u>	<u>Exports</u>	<u>Imports</u>
001	26.47	24.37	111	16.69	27.28
011	24.24	23.05	112	23.60	23.32
012	20.12	15.01	121	42.20	24.78
013	26.43	25.97	122	25.95	26.12
022	14.80	27.89	211	27.92	23.14
023	13.37	22.14	212	25.27	21.06
024	15.50	23.39	221	37.33	19.10
025	16.51	25.77	231	31.31	28.03
031	32.27	25.66	241	36.54	23.06
032	29.35	24.07	242	43.32	18.07
041	18.96	26.15	243	28.91	23.44
042	42.34	22.05	244	11.96	29.64
043	18.08	27.34	251	20.82	25.45
044	30.49	20.92	261	25.16	13.03
045	31.97	18.73	262	20.49	19.74
046	22.98	21.83	263	41.09	26.60
047	33.97	29.21	264	18.67	27.45
048	18.66	27.58	265	33.23	22.29
051	29.77	22.04	266	20.07	27.98
052	35.14	24.30	267	22.31	26.89
053	29.99	19.96	271	41.84	22.76
054	31.31	23.24	273	23.34	20.39
055	26.53	22.65	274	35.43	27.25
061	27.63	31.51	275	36.61	23.97
062	20.82	25.08	276	30.21	23.60
071	18.27	22.32	281	36.61	18.98
072	24.74	22.67	282	18.62	23.39
073	20.09	19.08	283	37.87	21.93
074	19.69	28.37	284	21.56	23.30
075	22.50	33.61	285	36.78	24.08
081	34.73	22.09	291	28.87	22.15
091	23.85	22.30	292	27.08	22.54
099	22.97	26.23	321	14.86	17.95

Table A-4 (continued)

<u>SITC</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC</u>	<u>Exports</u>	<u>Imports</u>
331	22.64	26.28	651	27.09	27.35
332	29.47	24.36	652	33.32	24.24
341	26.86	24.73	653	25.27	25.55
411	24.76	27.66	654	25.08	25.53
421	35.62	27.73	655	21.71	24.63
422	31.01	27.20	656	34.96	27.09
431	21.93	23.58	657	27.62	18.15
512	20.19	26.95	661	27.18	30.03
513	21.10	26.19	662	22.32	23.83
514	21.25	27.14	663	20.27	22.57
515	20.30	19.81	664	19.62	24.00
521	38.59	24.56	665	22.09	26.15
531	19.66	27.75	666	18.37	25.46
532	31.94	28.40	667	26.64	23.40
533	19.16	26.84	671	29.83	22.57
541	23.14	27.07	672	16.02	28.22
551	29.55	26.12	673	19.64	26.05
553	20.96	27.02	674	17.80	29.37
554	23.07	24.79	675	15.58	26.95
561	25.05	33.63	676	27.43	31.62
571	26.59	29.07	677	16.94	29.43
581	18.25	23.29	678	20.23	26.63
599	20.58	26.67	679	25.65	31.28
611	31.60	24.55	681	27.61	23.37
612	24.36	23.48	682	35.56	22.90
613	25.57	23.28	683	20.74	25.21
621	21.04	24.00	684	23.94	22.61
629	20.92	24.94	685	29.54	24.65
631	32.26	21.35	686	27.59	30.28
632	27.48	21.06	687	24.38	25.21
633	20.11	22.35	689	30.81	21.44
641	18.23	24.85	691	21.18	28.86
642	20.67	24.63	692	20.38	26.82

Table A-4 (concluded)

<u>SITC</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC</u>	<u>Exports</u>	<u>Imports</u>
693	18.78	27.10	864	24.39	30.07
694	21.00	24.22	891	20.14	24.89
695	22.02	25.99	892	23.47	22.36
696	22.98	25.37	893	22.80	20.47
697	24.54	25.54	894	27.42	22.37
698	21.52	24.15	895	69.74	25.39
711	21.53	25.97	896	26.59	22.31
712	21.61	29.49	897	27.94	25.79
714	23.21	23.06	899	27.19	25.07
715	20.03	28.29			
717	20.72	31.99			
718	20.09	28.50			
719	20.57	27.04			
722	20.89	26.95			
723	23.30	28.76			
724	22.27	27.18			
725	22.25	22.53			
726	16.56	26.93			
729	24.39	26.46			
731	24.96	29.89			
732	18.81	23.58			
733	21.61	23.59			
734	20.34	26.66			
735	17.74	22.58			
812	23.34	23.06			
821	22.76	17.78			
831	26.91	21.91			
841	27.15	19.71			
842	29.90	18.41			
851	22.11	18.42			
861	20.35	24.62			
862	19.83	25.07			
863	32.07	31.27			

TABLE A-5: An Alternative Measure of Income Levels

(* indicates values which are not significant at the 5 % level)

<u>SITC</u>	<u>Slope measure (b) in:</u>		<u>SITC</u>	<u>Slope measure (b) in:</u>	
	<u>Exports</u>	<u>Imports</u>		<u>Exports</u>	<u>Imports</u>
001	.056	.042	111	.060	.054
011	.053	.060	112	.048	.067
012	.074	.041 *	121	.049	.056
013	.052	.070	122	.071	.037
022	.067	.027			
023	.066	.045	211	.059	.045
024	.069	.062	212	.066	.068
025	.067	.058	221	.073	.056
031	.042	.065	231	.015*	.047
032	.046	.060	241	.048	.052
041	.091	.019	242	.027	.046
042	.046	.004 *	243	.067	.063
043	.078	.051	244	.005*	.047
044	.082	.044	251	.083	.058
045	.075	.048	261	.	.050
046	.070	-.001 *	262	.052	.049
047	.068	.032	263	.021*	.035
048	.069	.046	264	-.012*	.034
051	.021	.064	265	.017*	.049
052	.028*	.050	266	.065	.040
053	.036	.066	267	.080	.031
054	.040	.061	271	.018*	.046
055	.035	.067	273	.060	.062
061	.012*	.048	274	.061	.043
062	.057	.061	275	.050	.067
071	-.068*	.077	276	.056	.056
072	-.002*	.067	281	.043	.064
073	.063	.065	282	.086	.036
074	-.010*	.032	283	.032	.060
075	-.002*	.040	284	.075	.061
081	.055	.055	285	.054	.069
091	.065	.038	291	.047	.063
099	.065	.043	292	.048	.063

TABLE A-5 (continued)

<u>SITC</u>	<u>Slope measure (b) in:</u>		<u>SITC</u>		
	<u>Exports</u>	<u>Imports</u>		<u>Exports</u>	<u>Imports</u>
321	.087	.055	641	.076	.059
331	.009*	.051	642	.067	.052
332	.032	.068	651	.051	.045
341	.062	.071	652	.040	.050
			653	.051	.052
411	.082	.037	654	.061	.049
421	.043	.034	655	.066	.055
422	.010*	.054	656	.035	.047
431	.067	.050	657	.043	.071
			661	.040	.048
512	.074	.049	662	.057	.058
513	.068	.054	663	.069	.058
514	.070	.045	664	.068	.060
515	.089	.076	665	.063	.053
521	.055	.054	666	.056	.068
531	.081	.040	667	.042	.057
532	.041	.025	671	.051	.066
533	.069	.045	672	.063	.032
541	.070	.038	673	.057	.056
551	.059	.051	674	.065	.053
553	.064	.047	675	.074	.052
554	.069	.045	676	.061	.018
561	.066	.030	677	.070	.054
571	.060	.044	678	.068	.054
581	.072	.052	679	.074	.044
599	.072	.042	681	.058	.070
			682	.033	.060
611	.036	.058	683	.072	.080
612	.050	.064	684	.069	.058
613	.061	.062	685	.051	.050
621	.070	.050	686	.060	.060
629	.062	.061	687	.	.064
631	.045	.065	689	.059	.070
632	.061	.073			
633	.015*	.064			

Table A-5 (concluded)

<u>Slope Measure (b) in:</u>					
<u>SITC</u>	<u>Exports</u>	<u>Imports</u>	<u>SITC</u>	<u>Exports</u>	<u>Imports</u>
691	.066	.044	812	.065	.056
692	.062	.042	821	.065	.072
693	.062	.060	831	.038	.074
694	.069	.068	841	.039	.073
695	.074	.052	842	.052	.079
696	.057	.061	851	.032	.080
697	.054	.055	861	.074	.058
698	.068	.058	862	.076	.055
711	.076	.057	863	.049	.039
712	.075	.048	864	.080	.051
714	.075	.062	891	.063	.067
715	.077	.044	892	.065	.059
717	.073	.035	893	.066	.067
718	.078	.038	894	.053	.071
719	.075	.046	895	-.054*	.046
722	.074	.047	896	.071	.069
723	.063	.044	897	.056	.067
724	.064	.059	899	.050	.060
725	.064	.060			
726	.080	.056			
729	.071	.055			
731	.067	.022			
732	.075	.068			
733	.063	.069			
734	.090	.052			
735	.063	.053			