Commodity composition of trade in manufactures, and south-south trade potential

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1988

SERIE RESEARCH MEMORANDA

COMMODITY COMPOSITION OF TRADE IN
MANUFACTURES, AND SOUTH-SOUTH TRADE POTENTIAL

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Researchmemorandum 1988-6 Feb. '88

VRIJE UNIVERSITEIT
FACULTEIT DER ECONOMISCHE WETENSCHAPPEN
EN ECONOMETRIE
AMSTERDAM

Commodity Composition of Trade in Manufactures, and South-South Trade Potential

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1. Introduction

In this paper an attempt is made to determine to what extent the commodity composition of manufactured exports of developing countries corresponds with the commodity composition of the imports of manufactures of these countries. The underlying notion is a very simple one: if LDC manufactured exports would consist of products in, say, SITC Sections 5 and 6 only, and if their imports of manufactures would be in Sections 7 and 8 only, the existing structure of trade would preclude any South-South trade in manufactures. Obviously, this is a static analysis, as the commodity composition of trade may change - and is in fact meant to change - over time. However, as such changes cannot be achieved overnight it is of some interest to see to what extent, for a particular period, LDC exports of manufactures match LDC imports of manufactures because the extent of matching is likely to be one of the determining factors of the intensity of trade between countries, also in the immediate future.

Below we will first introduce two statistical measures for the correspondence between export and import composition, and show their relevance in explaining existing levels of trade between countries in a cross-section analysis. Then these measures will be used to compute a (manufactured goods) trade potential index which shows the relative strength of individual LDCs as suppliers of manufactures to other LDCs. Next, it is analyzed to what extent manufactures exported by LDCs compete with, or can be substituted for, developed countries' manufactured exports to LDCs. The concluding section summarizes the main findings, and points out the limitations of the present approach.

2. Measures of export-import similarity, and their role in explaining the level of trade between countries

In an earlier paper (Linnemann and Van Beers, 1987), the authors introduced two alternative measures for the degree of commodity correspondence between the exports of a country and the imports of another country. One of these measures, labelled COS , was developed originally in Linnemann (1966); the other one, called EIS , is patterned after the Finger-Kreinin (1979) export-similarity index. If the subscripts i, j and k refer to exporting country, importing country and commodity class, respectively, the two measures are defined as

$$COS_{ij} = \frac{\sum_k E_{ik} \cdot M_{jk}}{\sqrt{\sum_k E_{ik}^2 \cdot \sum_k M_{jk}^2}}$$

and

$$EIS_{ij} = \sum_k \min \left(\frac{E_{ik}}{\sum_k E_{ik}} , \frac{M_{jk}}{\sum_k M_{jk}} \right)$$

in which

E_{ik} = exports of country i in commodity class k
M_{jk} = imports of country j in commodity class k
k = commodity class 1,...,n

Both measures vary between zero (no similarity or correspondence at all) and unity (perfect similarity). The measure COS is the cosine of the angle between the vector of country i exports and the vector of country j imports in an n-dimensional commodity space. The measure EIS is the sum over all commodity classes of the share of commodity class k in country i exports or in country j imports - whichever of these two shares is the lower, so that only the 'overlap' counts. Both measures are sensitive to the level of aggregation; increasing the number of commodity classes n will tend to lower the numerical value of the measures. Application of the two measures to the same data set

will as a rule lead to numerical results that are close to each other- except when trade shows a high commodity concentration, in which case COS yields higher numerical values than EIS due to non-linear properties of the former.

A measure of export-import similarity may be interpreted as a variable reflecting the expected intensity of a bilateral trade flow from exporting country i to importing country j . To be sure, the commodity composition of exports and imports of manufactures, on which the analysis in this paper is focussed, is only one of the determinants of the intensity of trade between a pair of countries. The term 'intensity' is used to indicate that the analysis abstracts from the economic size of trade partners as reflected in the total volume or value of their (manufactured) exports and imports; the latter are seen as scale factors with which the 'intensity' has to be multiplied in order to arrive at observed or potential trade flow magnitudes.

The intensity of trade, thus defined, depends not only on the degree of similarity, or correspondence, between the export structure of the supplying country and the import structure of the importing country. Other determinants are the geographical distance between the trade partners (as a proxy for transport costs and facility of communication in general), the level of import tariffs and other barriers to trade, the existence or not of preferential trading or payment arrangements, political factors favouring or obstructing trade (boycott), and the like. Among all these factors, the role of the degree of similarity in trade structure is a limited yet obvious one: without any commodity correspondence no trade will take place, and with perfect correspondence trade possibilities abound.

To determine empirically the relevance of the two measures of export-import similarity for an explanation of actual trade flow levels, a gravity equation has been estimated both without and with a similarity measure as an (additional) explanatory variable. For this purpose use could be made of a detailed UNCTAD trade data set available on tape for 1980 and covering a limited but sufficient number of developing

countries. Data on the export structure of a number of developed countries were taken from the U.N. Commodity Trade Statistics for that year. As importers, 34 developing countries are included; as exporters, the same 34 developing countries plus 13 OECD countries. The actual trade flows to be explained are the flows recorded as imports of the 34 developing countries. For all but seven of them the import data were reported according to the SITC Revision 2 code; for Brazil, Egypt, Kuwait, Somalia, Sudan, Tanzania and Venezuela the reported Revision 1 data had to be converted into the Revision 2 format. The commodity classification adopted was that of the SITC three-digit level. For this exercise, manufactured exports and imports were defined as all products in SITC Sections 5-9. The Sections 5-8 have together 151 three-digit positions; the six three-digit positions of Section 9 have been aggregated into one, bringing the total number of commodity classes in the data set to 152.

Note that the gravity equation has been used here only to explain the level of <u>total</u> trade in manufactured products between a pair of countries. Hence, no information is needed or obtained about the individual elements of the trade matrix at the commodity-class level, i.e. about E_{ijk} $(= M_{ijk})$. As the above definitions of COS and EIS show, only total exports of country i in commodity class k (E_{ik}) and total imports of country j in commodity class k (M_{jk}) are needed to compute the value of these measures. By implication, this means that - as observed above - the measures of export-import similarity indicate a trade probability, or an expected intensity of trade, between a pair of countries; a nonzero value of COS_{ij} or EIS_{ij} does not necessarily imply that in actual fact country i does export to country j .

Indicating the total trade flow of manufactures from country i to country j by X^m_{ij} the gravity equation has been specified in its well-established, most simple form (i.e. disregarding several other trade-restricting or trade-promoting factors) as

$$\ln X^m_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln N_i + \alpha_3 \ln Y_j + \alpha_4 \ln N_j + \alpha_5 \ln D_{ij}$$

with

Y = Gross National Product at market prices

N = population size

D_{ij} = geographical distance between country i and country j

The 1980 data for the two country variables were taken from World Bank (1983). Distances between countries were calculated as the shortest sea distance between the countries' major ports according to United States Defense Mapping Agency (1985) plus an estimated hinterland distance in case the latter was greater than 100 nautical miles.

Using all nonzero observations of X^m_{ij}, OLS estimates of the parameters of the gravity equation were obtained, adding in turn COS_{ij} and EIS_{ij} as an additional explanatory variable. This has been done for (A) South-South trade flows only, (B) North-South trade flows only, and (C) all trade flows combined. The number of nonzero observations in these three sets is the following:

	Maximum number of observations	'Zero flows'	Nonzero flows
Set A: South-South	1122	470	652
Set B: North-South	442	5	437
Set C: All trade	1564	475	1089

For the purpose of the present analysis it was judged to be satisfactory to apply an OLS procedure to the nonzero observations, rather than resorting to the more complex estimation techniques needed for a better explanation of the occurrence of 'zero flows' (see, e.g., Bikker (1982)). The OLS results are shown in Table 1. Some comments on these findings are called for.

First, it is striking that a much greater part of the variance in the trade flow observations is explained for the data set B, North-South flows, than for set A, South-South flows. In the latter case, the overall explanation is rather unsatisfactory, which suggests that important explanatory variables (like e.g. regional cooperation, or

Table 1. Estimation results of a gravity-model analysis of bilateral trade in manufactured products; 1980 data.

$$\ln X^{m}_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln N_i + \alpha_3 \ln Y_j + \alpha_4 \ln N_j + \alpha_5 \ln D_{ij} + \alpha_6 \ln COS_{ij} + \alpha_7 \ln EIS_{ij}$$

	α_0	α_1	α_2	α_3	α_4	α_5	α_6	α_7	$\bar{R}^2$
A. South-South trade									
A1	5.11 (3.5)	1.15 (11.7)	-0.22 (2.5)	0.72 (7.9)	-0.10 (1.1)	-1.68 (11.9)			0.36
A2	6.79 (4.7)	0.84 (7.4)	-0.04 (0.4)	0.70 (7.8)	-0.04 (0.5)	-1.62 (11.7)	0.62 (5.1)		0.38
A3	8.81 (6.0)	0.56 (4.6)	0.10 (1.0)	0.71 (8.1)	0.01 (0.1)	-1.63 (12.0)		1.44 (7.6)	0.41
B. North-South trade									
B1	-5.71 (4.6)	1.99 (12.9)	-0.83 (4.5)	1.21 (20.5)	-0.31 (5.5)	-1.00 (8.0)			0.76
B2	-3.74 (3.2)	1.59 (10.4)	-0.57 (3.3)	1.11 (19.7)	-0.23 (4.2)	-0.78 (6.5)	1.66 (7.8)		0.80
B3	-2.29 (1.9)	1.35 (8.5)	-0.35 (2.0)	1.09 (19.6)	-0.22 (4.1)	-0.72 (6.0)		3.58 (8.9)	0:80
C. All trade									
C1	0.65 (0.6)	1.64 (32.5)	-0.48 (7.4)	0.91 (14.7)	-0.17 (2.9)	-1.52 (14.4)			0.61
C2	2.37 (2.3)	1.31 (18.8)	-0.26 (3.7)	0.88 (14.4)	-0.12 (2.1)	-1.46 (14.1)	0.67 (6.7)		0.62
C3	3.83 (3.6)	1.13 (14.7)	-0.15 (2.1)	0.88 (14.7)	-0.10 (1.7)	-1.47 (14.4)		1.36 (8.7)	0.63

Note: Variables are defined in the text. Figures in brackets are t-statistics.

political factors) have been left out or that South-South trade flows are of a more erratic character. The results for the combined set C take an intermediate position.

Second, it should be noted that almost all parameter estimates have the expected sign, and most of them are statistically significant. Only in case A3 do the population variables show the wrong sign, and in set A only once a significant result is obtained for population size. As always in this specification of the gravity equation (see Linnemann (1966), p. 103), intercorrelation between Y and N makes it very difficult to separate the (positive) effect of Y from the (negative) effect of N . As a consequence, the values of $(\alpha_1+\alpha_2)$ and $(\alpha_3+\alpha_4)$ usually show greater stability between the three cases within a set than the results for the individual parameters of Y and N .

Third, the export-push or supply-side variables (Y_i and N_i) carry a greater weight than the import-pull or demand-side variables (Y_j and N_j) . Again, this is no uncommon finding; when both industrialized (high GNP) and developing (low GNP) countries are included in the sample, the prevalence of balance-of-trade deficits among the latter leads to this result. This explanation does not hold, however, for the set A results (cases A1 and A2).

Fourth, the trade-reducing effect of the distance variables is found to be much stronger for South-South trade than for North-South trade. This suggests that the OECD countries have greater access to and command over 'physical' transport services as well as trade-related information and communication facilities. It may also imply that the greater volume of manufactured exports of OECD countries generates economies of scale in transportation and a relatively lower incidence of transport costs. Gravity-model regressions for trade in primary products (in which area OECD preponderance is absent) show a much smaller difference in α_5 values between South-South and North-South trade.

Fifth, the parameter estimates for α_6 and α_7 show that the measures of export-import similarity both contribute to an explanation of the levels of bilateral trade. The increase in the coefficient of determination is not very substantial, but the parameter values are significantly different from zero. Actually, the primary purpose of running the regressions was to establish (or refute) this significance, as in the subsequent statistical analyses the measures COS and EIS will play a role again. As Table 1 shows, better results are obtained with EIS than with COS . For each of the three data sets the value of α_7 is greater than that of α_6 - an outcome that may partly be due to the relatively larger variance in the COS measure itself. More striking is the difference in parameter values between the A set and the B set. A partial explanation for the higher estimates obtained in latter case is the existence in this data set of some (negative) intercorrelation between the measures of export-import similarity and the distance variable, as is illustrated by the reduced absolute value of α_5 in B2 and B3 as compared to B1.

Summarizing the above discussion, it may be stated that the two measures of export-import similarity COS and EIS have been shown to be useful statistical devices for describing the intensity of trade between countries. As a summary measure of the extent of commodity correspondence between the export structure of country i and the import structure of country j , the two (alternative) variables COS and EIS do contribute to an understanding of the network of international trade flows. In analysing a (limited) set of 1980 trade flows of manufactured products, the significance of such a measure was established using a gravity model in which total export potential $(Y_i^{\alpha_1} N_i^{\alpha_2})$, total import potential $(Y_j^{\alpha_3} N_j^{\alpha_4})$, and distance-related trade resistance (D_{ij}) figured as other explanatory variables. The regression results will be used below in a further analysis of South-South trade potential in manufactures.

3. An index of relative trade potential in manufactured products

Given the existing commodity composition of a country's manufactured exports and the composition of the imports of its actual and potential trade partners, it is not difficult to construct an index of the exporting country's competitive position as a supplier of manufactured products. Although it is basically a static characteristic, the average of a country's COS or EIS values with respect to partner countries does provide some information as to the strength of its market position. An exporting country with a supply vector that matches well with the demand vector of many importers is likely to be in a stronger position (especially if its export structure corresponds well with the import needs of large importers) than an exporter with a poorly matching export structure - see the above regression results.

Before turning to such a trade potential index itself, it is informative to highlight some characteristics of the two sets of COS and EIS values pertaining to the countries included in the sample. This is done in Table 2 which reports the highest and the lowest value of the two measures per exporting country, together with the name of the importing country with which the extreme value occurs. Again, some comments on the findings reported in the table are in order.

The first observation to be made is that of the wider value range, or greater variance, of the COS measure than the EIS measure. The highest and the lowest EIS value per exporting country are less far apart than the corresponding COS values. This is one reason for the lower parameter estimate in Table 1 for the COS variable ($\alpha_6 < \alpha_7$). For the entire sample, the highest values refer to Germany's exports and Italy's imports of manufactures, with $COS_{ij} = 0.927$ and $EIS_{ij} = 0.794$. The lowest scores are obtained for Gabon - a country that has no manufactured exports at all.

Second, for each of the two measures the values pertaining to the OECD countries are generally higher than those of LDC exporters. This is not very surprising as the former group of countries still dominates in

Table 2. Highest and lowest values of the measures of export-import similarity, per exporting country; trade in manufactured products, 1980.

exporting country	COS_{ij} highest		COS_{ij} lowest		EIS_{ij} highest		EIS_{ij} lowest	
Brazil	.759	Australia	.309	India	.652	Australia	.379	India
Colombia	.586	Mauritius	.150	Malaysia	.485	Mauritius	.238	Brazil
Jamaica	.428	Netherlands	.116	Somalia	.352	Ireland	.191	Korea Rep.
Venezuela	.438	Japan	.039	Togo	.314	India	.157	Somalia
Algeria	.147	Japan	.021	Kuwait	.150	Jamaica	.057	Somalia
Cameroon	.338	Japan	.040	Somalia	.324	Togo	.108	Somalia
Cent.Afr.Rep.	.603	U.Kingdom	.001	Morocco, Tanzania	.143	Belgium-L.	.006	Congo, Morocco
Congo	.538	U.Kingdom	.005	Somalia	.145	U.Kingdom	.037	Brazil
Egypt	.501	Mauritius	.032	S. Arabia	.267	Togo	.090	Somalia
Ethiopia	.396	Germany,FR	.009	India	.194	Philippines	.024	India
Gabon	0		0		0		0	
Kenya	.614	Mauritius	.101	Canada	.439	Mauritius	.199	Brazil
Liberia	.870	Philippines	.039	India	.357	Philippines	.096	Brazil
Mauritius	.243	Netherlands	.022	Egypt	.267	Hong Kong	.064	Somalia
Morocco	.563	Jamaica	.039	Somalia	.235	Germany,FR	.099	Somalia
Niger	.669	Togo	.063	India	.363	Togo	.144	India
Somalia	.630	Thailand	.053	Tanzania	.309	Philippines	.091	Sudan
Sudan	.459	Mauritius	.010	Kuwait	.117	Mauritius	.021	Brazil
Tanzania	.308	U.Kingdom	.030	Somalia	.236	Belgium-L.	.095	Brazil
Togo	.576	Mauritius	.030	Brazil	.307	Niger	.125	Brazil
Tunisia	.450	Brazil	.024	Somalia	.242	Jamaica	.105	Somalia
Bangladesh	.182	Sudan	.016	India	.115	Japan	.050	C.Afr.Rep.
Cyprus	.425	Mauritius	.048	Brazil	.332	S.Arabia	.134	India
Hong Kong	.368	Netherlands	.038	India	.330	Germany,FR	.096	India
India	.498	U.Kingdom	.093	Brazil	.419	Hong Kong	.220	Somalia
Indonesia	.234	Japan	.029	Togo	.268	Singapore	.122	Somalia
Korea Rep.	.558	Hong Kong	.197	Liberia	.522	Hong Kong	.274	Brazil
Kuwait	.700	S.Arabia	.190	Korea Rep.	.597	S.Arabia	.256	Japan
Malaysia	.487	Singapore	.017	Somalia	.382	Singapore	.140	Somalia
Philippines	.652	Thailand	.027	Tanzania	.359	Germany, FR	.126	Tanzania
Saudi Arabia	.636	Venezuela	.126	Korea Rep.	.460	Niger	.245	Korea Rep.
Singapore	.718	Philippines	.131	Somalia	.571	Malaysia	.239	Somalia
Sri Lanka	.321	U.Kingdom	.006	Somalia	.213	U.Kingdom	.059	Somalia
Thailand	.389	Japan	.051	Somalia	.402	Hong Kong	.149	Brazil
Australia	.856	Philippines	.146	C.Afr.Rep.	.632	Philippines	.236	Somalia
Belgium-Luxembourg	.816	U.Kingdom	.302	Togo	.692	Italy	.394	Somalia
Canada	.788	U.S.A.	.264	Togo	.619	U.S.A.	.338	Togo
France	.904	Italy	.392	India	.775	Sweden	.451	Somalia
Germany, FR	.927	Italy	.374	India	.794	Italy	.443	Somalia
Ireland	.638	Germany,FR	.154	India	.599	Germany, FR	.270	India
Italy	.816	Sweden	.306	India	.729	Italy	.391	Somalia
Japan	.828	U.S.A.	.253	India	.636	U.S.A.	.398	India

Netherlands	.741	France	.253	Somalia	.716	France	.317	Somalia
Portugal	.496	Hong Kong	.188	Somalia	.510	Hong Kong	.276	Somalia
Sweden	.764	Australia	.316	Togo	.668	France	.406	Somalia
U. Kingdom	.843	Belgium-L.	.299	Togo	.720	Australia	.347	Somalia
United States	.762	Australia, Canada	.283	Togo	.716	Canada	.329	Somalia

world trade in manufactures, leading for that very reason to a 'favourable' structure of exports. It has been shown earlier (Linnemann and Van Beers, 1987) that the measures of export-import similarity for trade in manufactures tend to increase with increasing per capita income of (one or both) of the trade partners.[1] Within the group of OECD countries, the less industrialized countries Ireland and Portugal show lower values than the others. Within the group of LDC exporters (having more diverse economic structures), this tendency would seem to be less pronounced though not absent; below more will have to be said about the LDC results.

Third, a comparison of the COS and EIS columns in Table 2 shows that the extreme values per exporter are not necessarily obtained with the same trade partners in both cases. Excluding Gabon, there are 46 'best' and 'worst' trade partners; in 19 out of these 46 cases the 'best' partner is the same according to both measures, and exactly the same score is reached for the 'worst' partner. This illustrates the difference in statistical properties between the two measures (cf. Section 2), but it does not allow us to say which of the two is the most appropriate one.

Fourth, it is tempting to judge the 'realism' of the findings of Table 2 on the basis of one's knowledge about the international economy. Obviously this would be possible only for countries having a rather clear 'profile' as exporter and importer of manufactures; also, it would be easier to do so for the highest scores than for the lowest values, as the latter are more accidental in character. Especially for

[1] This is presumably due to the correlation between the level of per capita income and the share of manufacturing in both production and demand, although the link with trade in manufactures is a complex one; see Van Dijck (1987).

rather insignificant exporters of manufactured products (such as the African countries) it is impossible to say whether or not the findings are in line with what could be expected beforehand. Excluding these very small exporters, in quite a few cases reported in the table the findings are at least not very surprising or running counter to what common wisdom would lead one to expect.

Focussing now on the developing countries in the sample, a trade potential index (TPI) for exports of manufactures has been computed as a weighted average of the values of the trade similarity measure for each exporting country. This has been done for COS as well as for EIS as measure, using the import potential of the trade partner $(Y_j^{\alpha_3} N_j^{\alpha_4})$ - rather than its actual imports that might be policy-distorted - as weight.

This choice of weights implies that a favourable or unfavourable geographic location of a country, as reflected in the distance variable D_{ij}, is not taken into account; the index thus yields an indication of the total (i.e. the sample's) size of the manufactured exports market given a country's commodity composition of exports. It is, moreover, a relative index showing a country's stronger or weaker position as compared to the other developing countries in the sample. For exporting country i the trade potential index is defined as

$$TPI_i = \frac{\sum_{j \neq i} Y_j^{\alpha_3} N_j^{\alpha_4} COS_{ij}^{\alpha_6}}{\frac{1}{n} \sum_i \sum_{j \neq i} Y_j^{\alpha_3} N_j^{\alpha_4} COS_{ij}^{\alpha_6}} \cdot 100$$

and

$$TPI_i = \frac{\sum_{j \neq i} Y_j^{\alpha_3} N_j^{\alpha_4} EIS_{ij}^{\alpha_7}}{\frac{1}{n} \sum_i \sum_{j \neq i} Y_j^{\alpha_3} N_j^{\alpha_4} EIS_{ij}^{\alpha_7}} \cdot 100$$

respectively, with i, j = 1,...,n. The value of the index has been

computed for South-South trade in manufactures (j = 1,...,34) as well as for South-South plus South-North trade (j = 1,...,47); for the first set, the parameters used are those obtained for A2 and A3, respectively (see Table 1), while for the second set of trade flows the parameters of C2 respectively C3 are taken. The results in the latter case are hardly affected by the choice of the C parameters; using the A parameters instead did not substantially change the outcome. The numerical results are given in Table 3.

A first comment on this table concerns the systematic difference between the results with COS and those with EIS . Although the COS variable itself has a greater variance than EIS , in Table 3 the EIS-based index shows the larger variance. This is due to the much higher exponent of EIS as compared to that of COS . Given the somewhat better fit of the gravity equation when using EIS (cf. Table 1), the index based on the latter variable is probably also the better of the two.

It is interesting to see the (sometimes large) differences between the exporting countries. Of all countries in the sample, Brazil shows the 'strongest' commodity composition of its manufactured exports. Other strong countries are Singapore, Korea Rep., Kuwait and Saudi Arabia.[1] It is remarkable that Hong Kong does not figure prominently in the list; its export structure in manufactures would seem to be clearly weaker than that of India, for instance. In Africa, Kenya has a better-than-average position, but most African countries show a low trade potential in manufactures in terms of the commodity composition of their exports. For Asia the results are on the whole much better but show considerable variation between the countries concerned, while the same holds for the (few) Latin American countries.

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[1] It has always to be borne in mind that the exports in question may constitute a (very) small fraction only of a country's total exports; in the present context, it is the composition of the manufactured exports that matters. Note also that these five 'strongest' countries have (had) quite different industrialization and trade regimes.

Grouping the sample countries according to continent or region, and taking simple arithmetic averages of the country results, the following picture emerges (the number of countries is indicated in brackets; Cyprus is not included in any of the groups).

Average	in South-South trade		in South-South + South-North trade	
TPI value	with COS	with EIS	with COS	with EIS
Latin America (4)	148.6	190.6	138.1	177.0
North Africa (4)	91.7	54.0	70.9	52.2
Other Africa (13)	78.2	57.0	81.9	57.1
Asia excl. Middle East (10)	94.9	112.4	106.0	126.2
Kuwait + S. Arabia	185.3	225.9	167.3	186.0

Comparing these average values for South-South trade only with those for 'all' trade, an interesting fact comes to the fore. Only for Asia (excl. Middle East) the trade potential index increases when South-North trade is also taken into account; for Other Africa the results are hardly affected, but for the three remaining regions the commodity correspondence is on average better with other LDCs than with the OECD countries. In other words, the Asian manufactured exports would seem to be stronger oriented towards OECD import markets than the exports of other LDCs. As Table 3 shows, the EIS-based TPI of Hong Kong, the Philippines and Thailand increases by nearly 40 percentage points when South-North trade potential is taken into account as well; for India this increase amounts to almost 14 percentage points.

It is somewhat surprising to find that, in terms of the commodity composition of exports of manufactures, the countries of North Africa are in a position that is as weak as that of Other Africa. In spite of the generally higher levels of overall development and manufacturing production in North Africa, the commodity structure of its manufactured exports does not seem to be stronger than that of Africa South of the Sahara.

Table 3. Index of relative trade potential in manufactured products, per exporting country, 1980.

exporting country	in South-South trade		in South-South + South-North trade	
	with COS	with EIS	with COS	with EIS
Brazil	199.0	312.7	205.7	314.6
Colombia	145.7	139.8	139.8	176.8
Jamaica	148.2	133.9	117.4	118.6
Venezuela	101.4	138.2	89.4	98.3
Algeria	57.4	32.9	48.7	23.4
Cameroon	90.7	87.1	82.2	75.5
Centr. African Rep.	47.4	9.7	78.2	17.0
Congo	53.4	18.0	69.8	19.4
Egypt	82.6	49.2	69.8	51.1
Ethiopia	62.2	22.1	101.6	43.6
Gabon	0	0	0	0
Kenya	136.8	145.6	99.8	126.6
Liberia	115.2	95.7	146.1	95.4
Mauritius	57.6	40.2	73.8	59.0
Morocco	101.2	55.7	77.0	65.8
Niger	114.4	106.0	90.4	92.8
Somalia	112.2	61.5	137.7	68.9
Sudan	63.9	11.0	60.0	23.1
Tanzania	66.2	52.8	74.0	57.8
Togo	95.9	91.8	50.7	63.7
Tunisia	125.5	78.2	88.3	68.6
Bangladesh	45.6	21.0	44.5	25.7
Cyprus	104.0	104.1	105.4	106.6
Hong Kong	85.2	78.5	107.7	117.1
India	101.7	145.8	117.1	159.5
Indonesia	69.4	69.0	68.4	76.3
Korea Rep.	167.8	206.2	150.3	200.4
Kuwait	198.9	249.9	165.5	183.9
Malaysia	80.2	111.5	83.8	117.8
Philippines	76.6	77.9	128.4	117.5
Saudi-Arabia	171.6	201.8	169.1	188.1
Singapore	166.2	280.4	169.4	263.0
Sri Lanka	53.1	34.4	78.6	47.6
Thailand	102.8	99.4	111.8	136.5

In interpreting the above findings one has to bear in mind that the results are obviously influenced by the country coverage of the sample. The Latin American continent is represented in the sample by four countries only, and important trading countries of that region are not included. As regards Asia (excl. the Middle East), the missing of China, Taiwan and Pakistan is a serious drawback. The countries of West Asia or the Middle East are also largely absent from the sample. The fact that so many countries are not covered in the analysis implies not only that they do not appear in Table 3 (or in the above regional averages), but also that the numerical results for the countries that are included are affected. If, for instance, Brazil's manufactured exports would be strongly oriented towards the import needs of, say, Argentina and Mexico, the value of its TPI might well have been even higher than in Table 3. Likewise, Hong Kong's score may be affected by the absence of China and Taiwan from the analysis. A wider country coverage would thus improve the robustness of the analysis.

4. Could South replace its imports from North by imports from South?

In the context of the plans to stimulate South-South trade, an important question is to what extent suppliers from the South could provide the commodities presently being supplied by the North. Although the measures of export-import similarity give an essentially static picture of trade possibilities, they do illustrate the trade potential given the existing commodity composition of manufactured exports and as such highlight also the feasibility of reaching high levels of manufactured products trade in the immediate future.

Surveying the sets of COS and EIS values this time per importing developing country, the most noteworthy feature is the high level of correspondence with the commodity composition of manufactured exports of most OECD countries. For virtually all developing countries in the sample, the best fit of the import vector of manufactures is with the export vector of an OECD country. For the measure EIS , this holds without exception. There are 34 developing countries in the sample; selecting for each importing country the two highest EIS values, one finds 30 times Germany and 28 times France as the exporting country involved. None of these 2 x 34 highest observations involves a developing country as exporter. Among the developing countries, Brazil shows the best fit to the import structure in no less than 27 out of the possible 33 cases.

Using the measure COS , a somewhat more diversified picture emerges. Again, among the OECD exporters France (25 times out of 68) and Germany (21 times) are often found to have an export structure that matches very well with the commodity composition of the developing country's imports. Also, Brazil is again most frequently the best-fitting supplier of manufactures among the Third-World exporters (16 times out of 33). However, with COS there are a number of cases in which a developing country figures as one of the two best-fitting exporters. These cases are listed below:

importing LDC	exporting LDC and rank of COS value
Egypt	Kuwait 1
Ethiopia	Kuwait 1, Saudi Arabia 2
Liberia	Kuwait 2
Mauritius	Kenya 1
Tanzania	Brazil 2
Togo	Niger 1
Hong Kong	Colombia 1
Malaysia	Singapore 1
Philippines	Liberia 1
Sri Lanka	Kuwait 1

The fact that Kuwait appears four times in the above list is explained by the development in that country of industries processing its mineral resources of crude oil and gas, the products of which command a large market. It should be recalled that a strong commodity composition of manufactured exports does not necessarily imply that these manufactured products constitute a large share in a country's total exports - see the case of Kuwait. Some other cases in the above list of 'exceptions' would seem to reflect in part the proximity of the trade partners, the most obvious instance being Singapore-Malaysia.

Notwithstanding these COS-based exceptions, the dominating position of the OECD countries as suppliers of manufactured export products is borne out by both sets of trade similarity measures. As this heavy reliance of Third-World countries on Northern exporters for their supply of manufactured products is at the core of the whole issue of raising South-South trade in manufactures, some further analysis of the possibilities for future substitution is warranted. For this purpose, the two measures of export-import similarity have been recomputed using this time as import vectors of LDCs only those manufactured products that originate from the Northern market-economy countries (i.e. OECD plus some smaller countries; for a list see Appendix 1). Thus, the new measures $COSSUB_{ij}$ and $EISSUB_{ij}$ indicate the degree of similarity between a developing country's commodity structure of total manufactured exports (the same as before) and another developing

country's commodity structure of manufactured imports originating from the North (excluding the CMEA countries). It was impossible to repeat the cumbersome and time-consuming process of converting the SITC Revision 1 import data into SITC Revision 2 data for the seven countries not reporting according to the latter format; hence, these seven countries are not included in the sample of importing LDCs in this additional analysis, so that 33 - 7 = 26 importing countries remain. (Note that as exporting country these seven LDCs remain included, as the export structure is the same as before).

By and large, the sets of COSSUB and EISSUB values do not differ strongly from the original sets of COS and EIS , respectively. This is understandable, as an LDC's import of manufactures from the North (on which COSSUB and EISSUB are based) also constitutes as a rule the larger part of the total imports of manufactures (which is at the base of COS and EIS) of that LDC. An impression of the overall possibility to substitute manufactured imports originating from the South for manufactured imports presently originating from the North is obtained by computing the (unweighted) arithmetic average of each of the measures per importing country. The resulting averages are shown in Table 4.

The values reported in the table indicate that, on average, the possibilities to substitute Third-World manufactured products for those originating from the North are rather modest only - given the existing commodity composition of trade. Both measures do not reach an average value of 0.2 for most of the importing countries, indicating a low level of commodity correspondence between exports and imports. The fact that the averages of Table 4 show little variation between the countries points to a similarity in the structure of manufactured products imported by the various Southern countries from the North. The 'best' import structure, from the point of view of Southern export potential of manufactures, would seem to be that of Mauritius, Tunisia and Cyprus, but even for these countries the averages of the two measures of similarity are not very high. The overall conclusion from the figures of Table 4 has to be that, on the basis of the existing

Table 4. Arithmetic averages of the measures of export-import from North similarity, per importing country; trade in manufactured products, 1980.

importing country	average $COSSUB_{ij}$	average $EISSUB_{ij}$
Colombia	.143	.175
Jamaica	.158	.193
Algeria	.157	.193
Cameroon	.170	.196
Centr. African Rep.	.153	.206
Congo	.141	.199
Ethiopia	.150	.191
Gabon	.154	.210
Kenya	.141	.186
Liberia	.118	.198
Mauritius	.248	.231
Morocco	.154	.187
Niger	.176	.205
Togo	.164	.209
Tunisia	.214	.227
Bangladesh	.134	.173
Cyprus	.203	.232
Hong Kong	.201	.216
India	.155	.163
Indonesia	.137	.176
Korea Rep.	.127	.166
Malaysia	.138	.190
Philippines	.187	.200
Saudi Arabia	.161	.205
Singapore	.160	.197
Sri Lanka	.161	.194
Thailand	.197	.195

Note: unweighted arithmetic averages over 33 LDC exporters.

trade structure, the scope for trade diversion in manufactured products from Northern to Southern suppliers is clearly limited, and about the same for all (importing) countries in the sample.

The limited substitution possiblities that do exist would benefit Southern exporters of manufactures rather unevenly. This can be seen at once when the averages of COSSUB and EISSUB are calculated per exporting country. The results are given in Table 5, together with a column showing for each exporter the percentage of three-digit SITC commodity classes with nonzero export values. The purpose of mentioning the latter data is explained below.

The average values of the two measures, as reported in Table 5, give an indication of the strength (as regards of the commodity composition of exports) of the listed LDC exporters as competitors of the North on Southern import markets. The picture closely resembles that of Table 3 (columns for South-South trade): the best chances to replace Northern suppliers have Brazil, Kuwait, Saudi Arabia, Singapore and Korea - more or less in that order. A next-best group consists of such countries as Colombia, India, Kenya and Jamaica. The weakest positions would seem to be those of some five countries in Africa South of the Sahara, and Bangladesh; marginally better but still very weak positions take Algeria, Mauritius and Sri Lanka.

As the last column of Table 5 reveals, a high score in terms of the similarity measures is associated, as a rule, with a strongly diversified export package, whereas a low score goes hand in hand with a much less diversified package. Compare the percentage nonzero exports at the three-digit level for the five strongest and the five weakest LDC exporters of manufactured products:

	percentage nonzero exports		percentage nonzero exports
Brazil	99	Centr.Afr.Rep.	14
Kuwait	78	Congo	45
Saudi Arabia	98	Ethiopia	13
Singapore	100	Sudan	13
Korea Rep.	99	Bangladesh	39

Table 5. Arithmetic averages of the measures of export-import from North similarity, per exporting country; trade in manufactured products, 1980.

exporting country	average $COSSUB_{ij}$	average $EISSUB_{ij}$	percentage nonzero 3-digit exports
Brazil	.541	.514	99
Colombia	.279	.330	91
Jamaica	.265	.264	65
Venezuela	.122	.247	91
Algeria	.046	.087	36
Cameroon	.104	.192	84
Centr. African Rep.	.060	.029	14
Congo	.055	.057	45
Egypt	.123	.131	51
Ethiopia	.074	.061	13
Gabon	0	0	0
Kenya	.234	.294	93
Liberia	.213	.219	49
Mauritius	.052	.099	46
Morocco	.112	.122	72
Niger	.216	.235	58
Somalia	.163	.138	16
Sudan	.086	.047	13
Tanzania	.073	.133	48
Togo	.112	.199	63
Tunisia	.151	.159	89
Bangladesh	.035	.068	39
Cyprus	.145	.215	86
Hong Kong	.110	.174	86
India	.188	.304	98
Indonesia	.067	.151	80
Korea Rep.	.320	.340	99
Kuwait	.453	.410	78
Malaysia	.090	.220	99
Philippines	.107	.165	86
Saudi Arabia	.415	.373	98
Singapore	.312	.419	100
Sri Lanka	.047	.093	76
Thailand	.151	.207	95

Note: unweighted arithmetic averages over 26 or 27 LDC importers.

In the first column, Kuwait does not fit in properly, and Congo is out of line with the other countries in the second column. Yet the overall pattern of association indicated above is clearly present, in particular in the case of the EISSUB measure. Also, its presence can be easily explained: given the generally diversified and mutually not too different import structures of LDCs, exporting countries offering a diversified package score best (again, in particular when using EISSUB).

Attention is drawn to this association between the measure(s) of similarity and the number of nonzero export flows, as the latter variable has been used in other studies to explain in cross-section analyses the export performance of LDCs in manufactured products. Using six explanatory variables in trying to explain the value of manufactured exports of 37 LDCs to 11 industrialized countries, Mahfuzur Rahman (1973) found the number of export flows at the three-digit SITC level to be the only (highly) significant variable. His analyses were repeated and confirmed by UNIDO (1974). These earlier research findings give indirect support for the use of the export-import similarity measures as a tool for analysis in estimating trade potential in manufactured products.

5. Limitations of the analysis, and summary of the findings

In interpreting the findings of the present analysis, the inherent characteristics and limitations of the approach have to be kept in mind. Most of them have been mentioned already in the text:

(a) the degree of similarity in the commodity composition of exports and imports of manufactured products is only one of the factors determining the intensity of trade in manufactures between a pair of trade partners;

(b) various ways of measuring the degree of similarity are conceivable, two of which have been used here as alternatives;

(c) they refer to expected, rather than actual, intensity of trade;

(d) the measures are essentially of a static nature, and reflect a situation of the past;

(e) the export vector and the import vector used in computing the value of the measures are not fully independent, unless the so-called 'small-country assumption' is justified; only in the measures COSSUB and EISSUB the underlying vectors are fully independent;

(f) the measures are computed using the three-digit SITC commodity classification; at this level of disaggregation, many commodity classes may still consist of quite different products;[1]

(g) statistical recording of products may not be done consistently in all countries; especially the frequent use of the 900 codes by some countries (i.a. The Philippines) introduces a bias;

(h) some products falling within SITC 5-9 are often not considered to be manufactured products in the proper sense;

(i) the statistical analyses are based on a sample of countries that is not truly representative for the Third World or the South at large; several important trading countries in Asia are not included in the sample, and Latin America in particular is underrepresented.

In spite of these undesirable limitations, enough 'substance' remains not only to demonstrate the usefulness of an analysis along the lines

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[1] For a discussion of the influence of the aggregation level, see Kellman and Schroder (1983).

of this paper but also to arrive at several tentative conclusions concerning the possibilities of expanding South-South trade in manufactures. Although the paper is focussed on the role of the commodity composition of trade in explaining the world trade network, the first conclusion to be drawn from the analysis is of a more general nature. The Table 1 results show that the pattern of trade in manufactures between Southern countries deviates more strongly from the 'normal' or 'standard' pattern of trade, according to a gravity-model approach, than the North-South trade flows do. In the latter case, the coefficient of determination is twice as large as that for South-South trade flows. Apparently, other factors then the 'standard' explanatory variables used here play an important part in determining actual South-South trade.

As regards the explanatory variables which relate to the intensity of trade (i.e. distance, and measure of commodity correspondence), it is striking that the distance factor has a higher parameter value and the measure of commodity correspondence a lower parameter value for South-South trade than for North-South trade. The finding that the trade-reducing effect of increasing geographical distance is stronger for South-South trade than for North-South trade may be attributed to a variety of reasons. Southern trade information and communication facilities will be less developed; shipping costs may be relatively high due to the limited volume of trade and infrequent sailings and connections to more remote destinations; liner conferences may favour trade involving a Northern country over that between Southern countries; etc.. The lower parameter value of the commodity-correspondence measure for South-South trade cannot immediately be explained in economic terms; as observed above already, the overall explanation of South-South flows is much less satisfactory than that of North-South flows - although in the first case, too, the role of the trade similarity measures is found to be statistically significant.

Sections 3 and 4 of the paper are focussed entirely on the computed values of the two measures of export-import similarity for the 34 developing countries in the sample. These values allow a ranking of the

countries as to their relative strength as exporters of manufactured products in the base year of the analysis (1980), from the point of view of the type of commodities involved in international trade in manufactures. As destinations, three different markets for the developing-country exporters are distinguished: (a) the import markets of manufactures of both OECD and developing countries; (b) the import markets of developing countries, (c) the imports of developing countries presently originating from all developed market economy countries. Obviously, (b) is included in (a), and (c) is included in (b). Using the similarity measure EIS as the criterion for the ranking, the ten strongest exporters and the five weakest exporters of manufactures (in terms of the commodity composition of exports) are found to be those listed in Table 6.

As the table shows, the ranking is hardly affected by the definition of the import market: nine out of the ten strongest countries are the same in the three cases distinguished, with only minor changes in the ranking order. At the lower end of the list, a similar situation exists. Thus, a country's relative strength or weakness in its commodity composition of manufactured exports is, by and large, the same for the different market segments. However, as noted in Section 3 already, a number of (East-) Asian countries is somewhat more oriented towards OECD markets than the 'average' developing country; in Table 6 this is only poorly reflected (Thailand does not figure in the (b) and (c) lists, and Korea Rep. loses its third position).

In view of their present (= 1980) commodity composition of exports, the strongest countries in the sample stand to gain most from any measures to preferentially promote South-South trade. This is most clearly so for Brazil, which is according to its commodity pattern of exports in a stronger competitive position than such OECD countries as Ireland and Portugal, and perhaps even Australia and Canada (cf. Table 2). Remarkably strong is also the position of Kuwait and Saudi Arabia; it should be remembered, however, that for these countries (and Venezuela) all manufactured products together constitute only a very small part

Table 6. Ranking of the 10 strongest and the 5 weakest exporters in the sample, in terms of the structure of exports (EIS measure), 1980.

	(a) on OECD and Southern import markets	(b) on Southern import markets	(c) on Southern import markets of OECD products
A.	Ten strongest		
	Brazil	Brazil	Brazil
	Singapore	Singapore	Singapore
	Korea Rep.	Kuwait	Kuwait
	Saudi Arabia	Korea Rep.	Saudi Arabia
	Kuwait	Saudi Arabia	Korea Rep.
	Colombia	India	Colombia
	India	Kenya	India
	Thailand	Colombia	Kenya
	Kenya	Venezuela	Jamaica
	Jamaica	Jamaica	Venezuela
B.	Five weakest		
	Algeria	Bangladesh	Ethiopia
	Sudan	Congo	Congo
	Congo	Sudan	Sudan
	Centr.Afr.Rep.	Centr.Afr.Rep.	Centr.Afr.Rep.
	Gabon	Gabon	Gabon

Note: (a) and (b) from Table 3, weighted averages
(c) from Table 5, unweighted averages.

(say, 10 percent) of their total export value. The African countries (except Kenya, and to a lesser extent Liberia and Niger) cannot expect to gain much in the near future of improved prospects for South-South trade. In Asia (excl. the Middle East) Singapore, Korea Rep. and India are the strongest among the sample countries. China and Taiwan are not included in the sample, but might well have been among the exporters with a strong composition of manufactured products. Had it been possible to include them, the not-so-good position of Hong Kong would have been most probably a stronger one.

On the basis of the above analysis it is overwhelmingly clear that across-the-board reductions of manufactured trade barriers between the countries of the South would benefit, in the short and medium term,

individual Southern exporters quite unequally. The longer the time perspective is, however, the lower the relevance of the present analysis. This is also true for the conclusion that must be drawn from the point of view of the Southern countries as importers of manufactured products: as Table 4 has shown, all developing countries would seem to be in the same position as regards the short-term impossibility to replace a large part of their imports of manufactures from the North by similar imports from the South. The limited scope for such substitution and consequent trade diversion can only be increased gradually and over a longer time span; in the short run the actual possibilities are not very impressive.

Appendix 1

Northern market-economy countries (countries market with x appear individually as trading countries in the sample).

OECD countries:	Non-OECD countries:
x Australia	Gibraltar
Austria	Israel
x Belgium-Luxembourg	Liechtenstein
x Canada	Malta
Denmark	Monaco
Finland	South Africa
x France	Yugoslavia
x Germany, Fed.Rep.	
Greece	
Iceland	
x Ireland	
x Italy	
x Japan	
x Netherlands	
New Zealand	
Norway	
x Portugal	
Spain	
x Sweden	
Switzerland	
x United Kingdom	
x United States	

Note: Turkey, although an OECD member country, is considered to form part of the South.

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