SERIE RESEARCH MEMORANDA

GSTP TARIFF REDUCTION AND ITS EFFECTS
ON SOUTH-SOUTH TRADE IN MANUFACTURES

H. Linnemann
H. Verbruggen

Researchmemorandum 1988-44 oktober 1988

VRIJE UNIVERSITEIT
FACULTEIT DER ECONOMISCHE WETENSCHAPPEN
EN ECONOMETRIE
AMSTERDAM

GSTP TARIFF REDUCTION AND ITS EFFECTS ON SOUTH-SOUTH TRADE IN MANUFACTURES

Hans Linnemann and Harmen Verbruggen*

IDPAD
New Delhi/The Hague

Economic and Social Institute
Free University
P.O. Box 7161
1007 MC Amsterdam

October 1988

This study forms part of the research project Prospects for Trade in Manufactures Among Developing Countries. The research project is financed by the Indo-Dutch Programme on Alternatives in Development (IDPAD), New Delhi/The Hague.

* The authors are indebted to Jan Bade for computational assistance and substantive comments.

GSTP Tariff Reduction and Its Effects on South-South Trade in Manufactures

CONTENTS PAGE

ABSTRACT

Using a gravity model with the import tariff on manufactures as an explanatory variable at the import side as well as at the export side, the impact of tariffs on trade in manufactures is analyzed for a sample of 39 LDC importers. Next, the consequences of a GSTP for manufactures are estimated by lowering for intra-LDC trade the initial LDC import tariffs. The short-term effects on South-South trade in manufactures are found to be relatively modest only, and the long-term effects considerably larger. A linear tariff cut by some 10 to 20 percent has a limited trade-expanding effect, and a more substantial lowering would be called for to make the laborious GSTP negotiating processes pay off. In the approach followed here, the extent of trade diversion from DC suppliers to LDC suppliers does not strongly affect South-South trade expansion.

1. Introduction

After many years of discussions and negotiations, an "Agreement on a Global System of Trade Preferences (GSTP) among Developing Countries" was concluded among 48 member-countries of the Group of 77 on 13 April 1988 at Belgrade, Yugoslavia. Virtually all major developing countries, in terms of their international trade volume, are signatories of the Agreement - with the exception of China (willing to enter, but not a member of the Group of 77), Hong Kong, Taiwan, Saudi Arabia and Kuwait. Ratification by 15 signatories will bring the Agreement into force.

A principal element of the Agreement is the mutual reduction of all Trade Control Measures (TCMs) affecting trade between the member-countries. Enhancing mutual trade in manufactured products is often seen as being of particular importance, in view of such factors as (a) the long-term market prospects for manufactures as compared to those for primary commodities, (b) the economies of scale to be gained in manufacturing output, rather than in primary production, (c) the development and transfer of technology and skills in the manufacturing sector, and (d) the strong dependence of most developing countries thus far on manufactured products supplied by the industrialized countries.

This paper tries to estimate the impact of a GSTP on the level of trade in manufactures between the countries of the South. In doing so, it is assumed that all countries of the South (at least all those included in the sample of developing countries used in this paper) will become member-countries of the GSTP; China, however, is not (yet) considered to be a GSTP-member. Also, possible special and preferential measures in favour of the least-developed member-countries are not taken into account; although such measures are envisaged in principle under the Agreement, the present analysis deals with all developing countries on an equal footing.

In analysing the trade-stimulating impact on South-South trade of a lowering of TCMs between developing countries, the first step is to determine to what extent existing TCMs actually restrain mutual trade. The approach adopted here is discussed in section 2 of the paper; tariff levels are taken to be representative of the total level of

protection through TCMs, and the gravity equation is introduced as the tool to be used in assessing the trade-restraining effect of these tariffs. Section 3 describes the data set and the estimation procedure followed in determining the parameter values of the gravity equation containing tariff levels. The regression results obtained are used in section 4 to simulate the effects of a (preferential) lowering of the initial tariff levels of the countries of the South, for a 20 or 50 percent linear tariff reduction. The difficult issue of trade creation versus trade diversion is dealt with by distinguishing between the two extreme cases of no trade diversion at all and maximum trade diversion from industrial-country imports to imports from the South. Also, a distinction is made between short-term and long-term effects. Section 5 gives a summary and conclusions.

All this refers to total trade in manufactures, for the countries included in the sample. Due to resource contraints, an intended application at a lower level of product aggregation (differentiating between, say, four or five main product groups) could not be realized as yet.

2. Estimating the impact of TCMs on the level of trade

Since the introduction of statistical techniques in applied economic analysis in the 1930s, the area of international trade relations has been one of the fields most intensively studied with the help of econometric methods. There is, e.g., a vast literature analyzing relationships involving prices and quantities of goods traded internationally, both at the level of individual commodities and at the level of aggregates such as total imports and exports. Empirical studies have stimulated further theoretical and methodological work, and vice versa.

Analysis of the impact of TCMs forms part of this body of knowledge. Empirical analysis of TCMs has focussed in particular on the effects of import tariffs, including other TCMs that can be translated in terms of tariff charges. The impact of those TCMs that cannot readily be expressed in a tariff equivalent is often much more difficult to assess

empirically[1] - except in such straightforward cases as, e.g., outright prohibition of exports or imports. Due to the wide array of TCMs other than tariff charges (see Verbruggen, 1988), the uncertainty about the extent or degree of their actual application, and occasionally indeed the near-ignorance about the kind of effects to be expected from their use, tariff levels may perforce have to be used as a pars pro toto or even as indicative of the level of NTBs as well. The present study also will adhere to this approach; thus, tariff levels are taken to be indicative of the overall intensity of a country's TCMs, and a lowering of these levels is assumed to lead to an increase in trade as if import tariffs were the only TCM restricting imports. In the words of Erzan, Laird and Yeats (1986, p. 3), this approach "implies that any non-tariff measures facing these imports will be relaxed to an extent that allows the full trade effects of the tariff [lowering] to be achieved. A further related assumption is that other barriers to expanding imports, such as balance-of-payment or currency constraints, are also relaxed".

Taking the tariff levels as the point of departure for an analysis of the impact of trade impediments on the level of foreign trade, the question arises what methodology to use in assessing this impact. In earlier studies of trade flows as related to tariff structure, preferential trading arrangements, customs unions, and the like, a variety of approaches has been followed. According to Karsenty and Laird (1986), four main approaches may be distinguished:

(a) constant market share analysis, for specific products or in the aggregate;
(b) partial equilibrium studies, based on import demand functions for specific disaggregated products;
(c) gravity models, used to determine aggregate trade flows;
(d) computable general equilibriumn models for (highly) aggregated products and industries.

Each of the four approaches has its stronger and weaker points. From a theoretical point of view, the latter approach is the most ambitious and satisfactory one; it is also the most exacting one in terms of the

---

1 See e.g. Deardorff and Stern (1985).

data, time, and effort involved.[1] Apart from this, the choice of method will be influenced by the particulars of the problem on hand, and possibly by the availability of data.

In this paper, a gravity model will be used to estimate the impact of tariffs on the level of trade. Reasons for this choice were (a) the need to deal with total trade in manufactures (in particular between developing countries), thus necessitating a high level of aggregation over products, and (b) the availability of tariff (and NTB) data for one 'year' only, prompting a cross-section analysis over countries. The gains of using this convenient approach are obtained at a price, however; in its usual formulation, the gravity model is not convincingly based on received theory and "its use for policy is severely hampered by its "unidentified" properties".[2] Because of its present use in a comparative-statics context, these drawbacks of the gravity equation may not be too serious; further discussion of this issue follows below. It should be noted here already that the use of the gravity model implies that direct trade effects only will be quantified; indirect effects via a trade-growth relationship are not taken into account in this setting.

The gravity equation describes the trade flow between exporting and importing country as resulting from the combined effect of three sets of factors:

(a) variables representing the supply side or export potential,
(b) variables representing the demand side or import potential, and
(c) variables affecting the intensity of trade between the two (potential) trade partners.

As the present analysis focusses on the impact of TCMs on trade in manufactures, the following have been selected as explanatory variables in the gravity equation:

(1) the value added of the manufacturing sector in the exporting

---

1 See e.g. Whalley (1985) and Srinivasan and Whalley (1986).

2 Anderson (1979), p. 106. Trade theory on which to base the gravity equation is discussed also in Bergstrand (1985) and in Helpman and Krugman (1985). Merkies and Van der Meer (1988) discuss the relation between the gravity model and the extended Armington model.

country, representing the supply potential;

(2) the value of GNP of the importing country, representing demand potential;

(3) and (4) population size of the exporting and the importing country, respectively. Note that population size is to be seen here as a proxy for the economies of scale in manufacturing production that can be realized in the home market; the larger the population size is, the lower the need to realize economies of scale through export production (for the exporting country), and the greater the chances of realizing in domestic production the required economies of scale (for the importing country);

(5) for the importing country, the level of TCMs affecting its imports of manufactured products. Obviously, a higher level of TCMs may be expected to lead to a lower level of manufactured imports. Some reflection on the effects of these 'artificial' trade impediments, however, makes us aware of an additional consequence: a high level of TCMs not only reduces imports, but increases at the same time the domestic-market orientation of production and hence (most probably) reduces exports. This line of reasoning induced the incorporation of an additional variable:

(6) for the exporting country, the level of TCMs affecting its imports of manufactured products. Hence, the variable indicating the level of TCMs - which is in this study in fact the level of import tariffs, as a pars pro toto - appears twice in the gravity equation, both at the import side and at the export side. In terms of the three sets of trade-determining factors referred to above, the TCM variable at the export side is to be seen as belonging to set (a), i.e. as a factor reducing a country's export potential. While a lowering of the level of TCMs is likely to raise the level of imports in the short run already, the corresponding effects at the export side may take a much longer time to materialize as they require a change in market orientation and probably even a certain restructuring of manufacturing production;

(7) the geographical distance between the trade partners, as indicative of the level of transport costs, ease of business communication, familiarity with market conditions, and the like.

Summarizing, the impact of TCMs on the level of trade in manufactures will be estimated using a gravity equation of the below structure:

$$X^m_{ij} = f\ (V^m_i,\ N_i,\ T^e_i,\ Y_j,\ N_j,\ T^m_j,\ D_{ij})$$

with

X^m = value of the (bilateral) trade flow of manufactures

V^m = value added of the manufacturing sector

Y = GNP

N = population size

T^e, T^m = level of import tariffs (initially and ultimately $T^e = T^m$; their 'time path' may be different, however)

D = geographical distance

i = subscript exporting country

j = subscript importing country.

Other explanatory variables might have been added, in particular dummy variables indicating the existence or not of a common border, of a common language, of preferential trade arrangements, etc. However, earlier studies using a gravity-model approach have shown such factors to be of limited importance only. Omitting them (to the extent that they would actually exist in the sample of trade flows on which the empirical study will be based) may somewhat reduce the overall level of 'explanation' of the trade flows observed, but will not introduce a bias in the estimated parameter values.

Once a set of reliable estimates of the parameter values of the gravity equation is obtained, the next step is to lower the level of import tariffs T^m for those trade flows that originate in LDCs, in order to assess the potential trade-stimulating consequences of preferential trade between LDCs. The short-run or initial effect will originate at the import side: an LDC will import more from other LDCs when for South-South trade the artificial trade impediments in the form of tariffs have been lowered. At the same time, LDCs will export more to LDCs. A complicating factor in this exercise in comparative statics is that both trade creation and trade diversion will occur, as import tariffs on manufactured goods originating from DCs are not lowered. These two effects cannot be properly distinguished in the present approach; a not altogether satisfactory but yet acceptable solution for

this problem is discussed in section 4.

In addition to the short-run effect on South-South trade of a lower price on the domestic market of manufactures imported from LDCs, there is the medium- to long-term effect of lower protection on the market orientation and structure of the domestic manufacturing sector. Although by definition $T^e = T^m$, it takes time before a change in T^m is fully reflected in a change in T^e, and hence the ultimate effect of a lower T^e is studied separately. The increased openness of the South to world trade resulting from a lowering of T^m is assumed to lead in due time to an equal lowering of T^e, thus enhancing its export potential of manufactured products. The immediate and the long-run effects on South-South trade of a lowering of TCMs for intra-South trade flows are both analyzed and discussed in section 4. Before that, the estimation of the gravity equation and the underlying data set have to be dealt with, in section 3.

3. The gravity equation with tariff levels

A basic requirement for any attempt to establish empirically the extent to which trade between LDCs is hampered by TCMs is, obviously, the availability of data on such trade impediments. Even if the analysis is limited to import tariffs as the conceptually and statistically clearest form of TCMs - as is the case in the present study -, it is not easy to collect and process the primary data for a large number of LDCs. Fortunately, use could be made of the valuable set of data being build-up in the Trade Information System of UNCTAD.[1]

However, not all importing developing countries included in our sample are covered by this system as yet. For the developing countries not covered in the system, data on tariffs have been estimated by making use of an established relationship between, on the one hand, nominal tariff protection of the manufacturing sector, and per capita GNP, population size and export orientation on the other hand; see

1 For particulars on the Trade Information System and its data, see Verbruggen (1988).

Verbruggen (1988). It should be noted that for all importing developing countries the tariff-level variable has been measured as the unweighted, rather than the import-weighted, average ad valorem import tariff for the total manufacturing sector, as the former average could be calculated for a much larger number of sample countries. The tariff level variables for the remaining exporting OECD countries are based on import-weighted pre-Tokyo Round tariff levels calculated by Corbet (1979), Deardorff and Stern (1983) and GATT (1980).

The use of unweighted tariff averages for the developing countries might yield upward-biased estimates vis-à-vis import-weighted tariff averages, as one might expect in general that in calculating the latter, high tariff rates are given small weights and low tariff rates large weights. This bias, however, appears to be not too serious. In a sample of 29 developing countries for which both tariff averages could be calculated, weighted tariff averages were lower than unweighted averages in 14 cases; in the remaining 15 cases, the two tariff averages were nearly the same or the weighted version even exceeded the unweighted version.

The trade-impeding impact at the consuming, importing side is indeed most adequately captured by nominal tariff rates. But on the producing, exporting side, it is of course effective rates of protection that matter. Generation of an additional data set on effective rates of protection for such a large number of countries is, however, simply out of the question. Thus, if the average ad valorem import-tariff rate expressed as a percentage of the import price is t, the explanatory variable in the regression analysis $T^m(=T^e)$ is defined as $T^m = 1 + \frac{t}{100}$. In addition to the data on TCMs in general and import tariffs in particular, UNCTAD trade flow data on magnetic tape provided the detailed figures (at 4- and 5-digit level) on imports of manufactures. The most recent year for which the greater part of the required information was available, is 1980.

The commodity class Manufactures as used in this study consists of all products belonging to the ISIC Major Division 3: Manufacturing. UN statistical manuals provided the link between the ISIC and SITC Rev. 2

commodity classifications; see Verbruggen (1988). Import tariffs, when available, are given according to the CCCN classification; relating the latter accurately to the SITC classification required operations at the 4- and 5-digit level. Only for a total of 39 LDC importers this cumbersome work of building-up a set of reliable data could be performed successfully. As countries of origin of the manufactures imported by these 39 LDCs, 60 exporters are included in the analysis: the same 39 LDCs, plus Syria, China, Poland, and 18 OECD countries. A listing of these countries is given in Tables 3 and 5. Data on GNP and population size were taken from World Bank (1983), on value added in manufacturing from United Nations (various years), on exchange rates from IMF (various issues), while geographical distances 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.

Based on the data set just described, the bilateral trade flows of a trade matrix of (60-1) x 39 = 2301 elements may be regressed on the proposed explanatory variables using the gravity equation in its logarithmic specification. As 608 (or 26 percent) of the cells of the trade matrix are empty, this raises the question of the choice of the proper estimation procedure. A standard OLS procedure can be applied to non-zero flows only, but this might lead to biased parameter estimates. Well-known alternatives are a Tobit procedure (Amemiya, 1973), a "threshold regression model" (Dagenais, 1969), or a "censored regression model" (Nelson, 1977). However, as Bikker (1982) has shown, much depends on the cause or causes of zero observations for trade flows, and depending upon the 'true' cause the alternative procedures may be biased as well. Furthermore, minor improvements in explaining the smallest trade flows will hardly carry any weight in the final results (as will be substantiated below). For the sake of convenience it was decided to stick to the OLS procedure; we come back to the issue of the zero flows towards the end of this section.

Thus, for the remaining 2301 - 608 = 1693 non-zero observations, the regression equation is specified as

$$\ln X^m_{ij} = \alpha_0 + \alpha_1 \ln V^m_i + \alpha_2 \ln N_i + \alpha_3 \ln T^e_i + \alpha_4 \ln Y_j + \alpha_5 \ln N_j + \\ + \alpha_6 \ln T^m_j + \alpha_7 \ln D_{ij}$$

with

X^m_{ij} = value of trade in manufactures from country i to country j, in 1,000 US dollars

V^m_i = value added in manufacturing in country i, in million US dollars

N_i = population size of country i, in 1,000 inhabitants

Y_j = GNP in country j, in million US dollars

N_j = population size of country j, in 1,000 inhabitants

$T^e_i = T^m_i = (1 + t_i/100)$ = average <u>ad valorem</u> import tariff of country i, expressed as a factor by which import prices are raised

D_{ij} = geographical distance between countries i and j, in nautical miles.

Direct estimation of the regression coefficients of the gravity equation with tariff variables meets with a problem, however. As has been shown in Verbruggen (1988), tariff levels are related to population size. In a cross-section analysis over 45 developing countries, Verbruggen found a significant and positive effect of population size on the level of nominal protection for the manufacturing sector. Thus, the explanatory variables N_i and T^e_i will be intercorrelated, and likewise the variables N_j and T^m_j. Earlier studies using the gravity model, e.g. Linnemann (1966), also found intercorrelation between GNP and population size. The latter case of multicollinearity is in itself not a serious problem in the present context, as there is no need to establish the 'true' contribution of each of these two explanatory variables separately; with respect to the tariff variable, however, it is essential to identify its proper weight in the overall explanation of the trade flows in order to assess in subsequent simulations the impact of tariff changes.

To come to grips with this problem, a series of regression analyses has been made; the results are reported in Table 1. Straightforward

application of OLS leads to the parameter estimates of Case A. The estimate of α_5 (the coefficient of the population variable of the importing country) has the wrong sign. Some explanatory variables show indeed strong intercorrelation; see the below correlation coefficients:

$\ln V_i^m$ with $\ln N_i$	0.619
$\ln Y_j$ with $\ln N_j$	0.699
$\ln T_i^e$ with $\ln N_i$	0.477
$\ln T_j^m$ with $\ln N_j$	0.592

If the tariff variables are omitted from the equation, the results of Case B are obtained. The large negative values of α_2 and α_5 go hand in hand with increased (positive) values of α_1 and α_4, respectively, as compared with Case A. The estimate of α_5 has the correct sign now, but it represents the combined effect of two (supposedly) negative forces: population size and tariff level. On theoretical grounds, it has to be assumed that both variables exert a negative influence on the level of trade - albeit perhaps only moderately so with respect to population. In Cases C and D, the Case B estimate of α_4 is kept constant, while in Case C also α_5 is given a pre-assigned value. On the basis of the results obtained in numerous earlier analyses using the gravity equation, a value of -0.05 was chosen for α_5. As the results for Case C show, a 'reasonable' estimate for α_6 is obtained. A comparable result is obtained in Case D, where the latter coefficient is fixed beforehand (as well as α_4) and a 'reasonable' estimate for α_5 is found.

Scrutiny of the residuals of the above-mentioned regressions revealed that the largest deviations of the regression plane frequently occur when one of the oil-exporting countries is the exporter. Apparently, as exporters of manufactures the large oil producers do not fit too well into the 'normal' pattern. As an additional exercise, a regression was run on the data set excluding the manufactured exports originating from the five OPEC members having a very high share (of about 90 percent or more) of petroleum in their export package. Excluded were the exports of Algeria, Libya, Kuwait, Saudi Arabia and Venezuela. For this somewhat reduced data set, the results of Case E were obtained. It is obvious that now a higher coefficient of determination results. More

important is that all parameter estimates have the proper sign, and are of a magnitude that was to be expected in view of the earlier results.

Taken together, the findings of these exercises induced the final choice of the estimation procedure. As the coefficients of inter-correlation have shown, the multicollinearity problem centres around the population variables. Their parameters have to be determined exogenously. Pre-assigned values of -0.15 for α_2 and -0.05 for α_4 would appear to be in line with information available in the literature as well as with estimates obtained in the various cases discussed above. Using these values, estimates of the remaining parameters are obtained as reported in Table 1 in the column Final estimates. The coefficient of determination adjusted for the degrees of freedom is not particularly satisfactory, but the values of the t statistic are at an acceptable level. The results given in this column will be used in the tariff-lowering simulations discussed in the next section.

At this stage a further comment regarding the neglected zero flows is in place. When the final parameter estimates are used to compute the explained or predicted value of X^m_{ij} for all 2301 cells of the trade matrix, all empty cells or zero observations are assigned a non-zero value, as the gravity equation necessarily predicts a (perhaps very small but always) positive trade flow value. However, many of these predicted values are small indeed. The frequency distribution of the predicted values of the 608 empty cells is (values in 1,000 US dollars):

value range	frequency
1 - 10	135
11 - 100	248
> 100	225
	608

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

$$\ln X^m_{ij} = \alpha_0 + \alpha_1 \ln V^m_i + \alpha_2 \ln N_i + \alpha_3 \ln T^e_i + \alpha_4 \ln Y_j + \alpha_5 \ln N_j + \alpha_6 \ln T^m_j + \alpha_7 \ln D_{ij}$$

Note: <u>underlined</u> parameter values have been determined exogenously

	Case A	Case B	Case C	Case D	Case E	Final estimates
α_0	5.793 (6.7)	6.430 (7.6)	5.302 (6.5)	5.508 (6.4)	6.192 (7.4)	5.743 (7.3)
α_1	1.241 (22.2)	1.390 (39.5)	1.242 (22.2)	1.242 (22.2)	1.200 (22.5)	1.226 (43.1)
α_2	-0.176 (2.1)	-0.413 (8.8)	-0.175 (2.1)	-0.175 (2.1)	-0.123 (1.6)	<u>-0.15</u>
α_3	-2.207 (3.5)		-2.218 (3.5)	-2.217 (3.5)	-2.677 (4.4)	-2.371 (6.7)
α_4	0.734 (11.5)	0.876 (17.8)	<u>0.87</u>	<u>0.87</u>	0.801 (13.0)	0.802 (22.9)
α_5	0.050 (0.6)	-0.165 (3.4)	<u>-0.05</u>	-0.073 (2.1)	-0.047 (0.6)	<u>-0.05</u>
α_6	-2.157 (3.5)		-1.566 (4.1)	<u>-1.60</u>	-1.902 (3.2)	-1.531 (4.0)
α_7	-1.643 (18.9)	-1.646 (19.0)	-1.646 (19.0)	-1.644 (19.0)	-1.660 (19.7)	-1.631 (19.0)
$\bar{R}^2$	0.590	0.585	0.551	0.552	0.632	0.609

Note: Figures in brackets are t-statistics.

As these figures show, 63 percent of these predicted values are in the value range up to US $ 100,000 - an amount that could well be the value of an individual consignment of manufactures. For such small amounts it is hardly possible to speak of a 'normal' level of trade on an annual basis; when figures are not averaged over a number of years, relatively large year-to-year variations are likely to occur, even down to a level of zero trade in any particular year. Furthermore, it has to be noted that there are sometimes particular reasons why a trade flow appears as zero in the data set: political reasons (e.g. China-Korea Rep. reported zero, predicted US $ 230 mln), straightforward errors (e.g. Netherlands-Bangladesh reported zero, predicted US $ 4.8 mln), and deliberate non-reporting (e.g. the well-known case of Indonesia-Singapore reported zero, predicted US $ 73 mln). In such cases it would be erroneous to consider the zero values as true observations to be included in the estimation. For these reasons it is by no means certain that the non-inclusion of the zero flows in het estimation procedure has introduced an upward bias in the predictions of the smaller flows that is significant.

Lastly it has to be noted that even if the smallest trade flows would be overestimated somewhat when using the parameters of Table 1, this would hardly affect the overall outcome of the simulation exercises to be discussed in the next section. The reason for this is that these small flows carry little weight in the results, as the effects of tariff-lowering are simulated proportionately (i.e. trade-flow weighted). The predicted values of the 608 empty cells add up to a total of only US $ 548 million, which is 0.485% of the total value of the (2301) predicted flows. So in fact any upward bias induced by overestimating these values must be considered negligible.

It may be concluded from the above that the parameter estimates of Table 1 (Final estimates) are well-suited to describe the general structure of the trade-flow network of the 1980 data set. As is immediately clear from the value of the coefficient of determination (0.61 only), large deviations of actual from predicted trade flow magnitudes do occur. However, there is no reason to expect a particular bias to exist in the matrix of explained or predicted flows - apart from the possibility of a slight overestimation of the smallest flows.

The estimated general structure will be used in the simulations now to be described.

4. The effects of lower tariff levels on the volume of trade

Tariff reductions for South-South trade in manufactures, as envisaged in the context of a GSTP , may be aimed at according to a great variety of tariff-cutting formulas. One of the simplest approaches is that of an across-the-board, linear reduction of all tariffs by a certain percentage. This simple and straightforward approach is the example that will be used in this section to assess the magnitude of the potential trade-stimulating effects of preferential tariff margins for LDC manufactures on LDC import markts. In the trade-flow simulations discussed below, the effects of two levels of preferential treatment will be analysed: a linear tariff reduction for imports originating from LDCs by 20 percent, and a linear tariff reduction by 50 percent.
Establishment of a preferential trading arrangement between LDCs may affect the magnitude of most, if not all, trade flows in the world. If we distinguish two groups of countries, the DCs and the LDCs, the possible effects of the introduction of a GSTP among the LDCs are those shown in the below scheme:

to / exports from	LDCs	DCs
LDCs	1) increase (strongly)	2) decrease (possibly)
DCs	3) decrease (moderately)	4) increase (possibly and marginally)

Bikker (1982), who introduced this scheme, argues that the effects referred to in the second column are erroneously neglected in conventional trade theory but might well occur in actual fact; e.g. contraints at the supply side of LDCs might lead to a certain redirection of exports (box 2 in the scheme) from DC to LDC destinations once the latter become easier accessible. In our study, the effects described in the second column are assumed to be nonexistent, however; as the very purpose of a GSTP for manufactures is to stimulate the growth of manufacturing output in the South, it is assumed that existing export outlets to the DCs will not be damaged by

increasing export possibilities elsewhere (to other LDCs).

Thus limiting the analysis to the two effects in the first column, it has to be determined (a) by how much LDC exports to other LDCs will increase as a consequence of a tariff cut for intra-LDC trade, and (b) by how much LDC imports from DCs will decrease because part of the DC supplies will be replaced by LDC supplies. The first effect, corresponding with box 1 in the scheme, is usually called the gross trade creation; the second effect (box 3) is the trade diversion. The difference between the two is the net trade creation.

Gross trade creation is calculated using the gravity equation estimated in the preceding section. It is assumed that the gravity equation, in spite of its weak theoretical foundation and its essentially static and descriptive character, captures quite satisfactorily the principal structural factors that shape the quantitative pattern of world trade flows.[1] Lowering the value of the explanatory variable representing the tariff level, for the intra-LDC trade flows, will show - ceteris paribus - the new and increased magnitudes of intra-LDC trade, and hence gross trade creation.

In its standard specification used here, the gravity equation does not allow for any substitution effects that may occur. Hence, it cannot be used to estimate the extent of trade diversion. It is possible, however, to determine the maximum amount of trade diversion that could occur when all structural parameters of the gravity equation are kept constant except the scale parameter α_0 (which is adapted downwards). This procedure implies that the enlarged total imports (i.e. after preferential tariff cuts) of an LDC are scaled down, proportionally for all countries of origin, to the original (pre-tariff-cut) total import level. In other words, per importing LDC the value of α_0 is reduced by the reciproke of post-tariff-cut imports over pre-tariff-cut imports according to the gravity equation. Thus, net trade creation is made to be zero, and the lowering of tariffs only results in a partial switch

---

1 Cross-section regressions for fairly long series of successive years have shown a great stability in the parameter estimates obtained; see e.g. Aitken (1973), Sapir (1981) and Van Maanen (1988).

from DC suppliers to LDC suppliers.

The implication of all this is that the present approach only yields an upper and a lower bound for the trade flow consequences of a GSTP tariff cut. As exporters, LDCs stand to gain most if gross trade creation equals net trade creation and no trade diversion occurs; the lower supply price on the domestic market of the importers leads to increased demand for the LDC export products, that do not compete with DC supplies. LDC exporters gain the least if trade diversion is at its maximum and net trade creation nil; LDC and DC supplies are substitutes for each other and the price advantage of the LDC-supplied products gives LDC exporters a larger share in the constant import total. In reality, the actual situation is likely to be an in-between case: some products supplied by LDCs will primarily compete with domestic products produced in the importing countries, and other products will compete primarily with existing DC supplies.

In our comparative-statics exercise, we will first determine the effects of a lowering of the value of T^m, the import tariffs as a trade impediment at the demand side. The relevant term in the gravity equation is

$$\left(1 + \frac{t_i}{100} \right)^{-1.531}$$

with t_i = average <u>ad valorem</u> import tariff of country i as a percentage. Obviously, the effect of a proportional tariff cut will be the larger, the higher the initial value of t_i. The table below shows the elasticity ξ of the trade-flow value with respect to the tariff level, for different values of t_i.

t_i	ξ
100	- 0.77
80	- 0.68
60	- 0.57
40	- 0.44
20	- 0.26
10	- 0.14
5	- 0.07
1	- 0.02

For the countries in the sample, the highest average tariff levels are those for Pakistan (81.1), Bangladesh (80.1) and India (73.0), and the

lowest are those for Hong Kong and Singapore (both 0.5). Thus, the linear tariff cuts studied here will have the strongest effects on the imports of the three first-mentioned countries, while the imports of the latter two will hardly be affected.

The results of the simulations with a 20 percent and a 50 percent tariff cut (T^m) are shown in Table 2 per importing country and in Table 3 per exporting country. Columns (1) and (3) show the effects on LDC trade if it is assumed that no trade diversion occures, and columns (2) and (4) report the simulated changes in case of maximum trade diversion. The last column of Table 2 lists the initial tariff levels of the individual countries.

The numerical findings given in Table 2 require little further comment. The magnitude of the percentage-wise import increases can easily be understood, given the initial tariff level (column 5), the assumed tariff cut, and the 'elasticities' ξ mentioned above. It is somewhat surprising that the differences between the columns (1) and (2) are so small, and similarly those between the columns (3) and (4). The reason is that the LDC imports of manufactures still come overwhelmingly from the industrialized countries; therefore, an increase in the (small) part originating in other LDCs raises total imports very little, so that a scaling down to the original total requires a modest reduction only. (It has to be noted, however, that the differences concerned should have been somewhat larger; for the countries in the sample the actual share of DCs in the LDC imports of manufactures was 87 percent, but the simulations on which Table 2 is based imply a DC share as high as 93 percent).

For the 39 countries of the South included in the sample, total (simulated) imports of manufactures of Southern origin increase by 5.8 percent for a mutual tariff preference of 20 percent, and by 16.0 percent for a mutual tariff preference of 50 percent, in case of trade creation only. When a maximum of trade diversion is assumed, these overall increases are 5.1 and 13.9 percent, respectively. (For the reason given in the above paragraph, these percentages have an upward bias).

Table 3 summarizes the same results per exporting country. The numerical findings understandably differ much less now between the individual countries, and remain closer to the overall percentage changes just mentioned. Proximity to large import markets with high initial tariff levels makes an LDC exporter gain more than average trade expansion (Cyprus, Bangladesh); closeness to trade partners with an already very low protection level reduces the export gains from a linear tariff reduction (Kuwait's closeness to Saudi Arabia; Malaysia's closeness to Singapore). In the case of maximum trade diversion (columns 2 and 4), the DCs in the sample see their exports to the South reduced by, on average, 0.4 percent (20 percent tariff cut) and 1.0 percent (50 percent tariff cut); again, geographical location vis-à-vis the changing import markets introduces some variation in the outcomes per country.

Thus far, the analysis has focused on the consequences of a lowering of the import tariffs T^m that constitute a barrier for foreign supplies seeking to enter the LDC domestic markets. As discussed in section 2 already, this is but one role that is played by tariffs in an explanation of foreign trade levels. There is another effect that has to be taken into account as well: high tariffs not only curtail imports, but at the same time reduce the export orientation of production. In the gravity equation this tendency was introduced in the form of the variable T^e, i.e. the (import) tariff level as an explanatory variable at the export side. In due time, a lowering of the tariff level will lead to a stronger world-market orientation of the manufacturing sector and to a larger export share of manufacturing production. This medium- to long-term effect may be simulated by reducing, in the gravity equation as estimated before, the value of the variable T^e.

Again the simulations concern two levels of tariff reduction, by 20 and by 50 percent, respectively. Obviously, in these cases the tariffs in their import-curtailing function (T^m) are lowered as well, and by the same percentage. As the latter are lowered for intra-South trade only, the export-expanding effect of a lower T^e is also assumed to apply to export flows to Southern countries only. Thus, in their trade contacts with DCs the LDCs remain relatively 'closed' economies (i.e. with

Table 2. Trade-increasing effect of a tariff cut for manufactures originating from the South, in percentages of imports of manufactures from the South, per importing country; short-term effect only

importing country	tariff preference 20% no trade diversion	tariff preference 20% maximum trade diversion	tariff preference 50% no trade diversion	tariff preference 50% maximum trade diversion	initial tariff level in %
	(1)	(2)	(3)	(4)	(5)
Algeria	6.6	6.5	17.8	17.6	25.5
Libya	4.4	4.3	11.6	11.3	16.1
Morocco	12.3	12.0	36.0	35.1	57.2
Sudan	11.5	10.9	33.5	31.5	52.5
Tunisia	7.4	7.3	20.5	20.0	29.7
Egypt	12.4	11.9	36.6	34.8	58.3
Cameroon	8.2	7.7	22.8	21.1	33.5
Centr. Afr. Rep.	8.6	8.0	24.0	22.1	35.5
Congo	6.8	6.4	18.7	17.2	26.8
Gabon	4.2	3.9	11.0	10.2	15.1
Ethiopia	8.4	7.9	23.3	21.9	34.3
Kenya	10.3	9.5	29.5	26.7	45.0
Liberia	7.3	6.9	19.9	18.7	28.8
Mauritius	10.1	9.2	28.9	25.9	44.0
Niger	4.9	4.6	13.1	12.2	18.3
Somalia	8.5	7.8	23.6	21.5	34.9
Togo	3.8	3.6	10.1	9.4	13.8
Tanzania	5.9	5.4	15.9	14.5	22.5
Argentina	6.3	5.4	16.9	14.4	24.1
Brazil	8.4	7.4	23.4	20.2	34.5
Colombia	8.4	7.8	23.5	21.5	34.7
Mexico	6.5	6.4	17.8	17.2	25.4
Paraguay	3.3	1.9	8.5	4.9	11.6
Venezuela	5.6	5.3	15.0	14.0	21.1
Jamaica	5.7	5.2	15.2	13.8	21.5
Cyprus	5.3	4.9	14.3	13.0	20.0
Kuwait	0.8	0.7	2.0	1.6	2.6
Saudi Arabia	0.8	0.7	2.0	1.8	2.6
Bangladesh	15.3	13.2	47.0	38.8	80.1
Sri Lanka	9.6	8.5	27.3	23.6	41.2
Hong Kong	0.2	0.1	0.4	0.4	0.5
India	14.5	13.2	43.7	38.9	73.0
Indonesia	8.1	6.6	22.4	18.0	32.9
Korea Rep.	8.4	8.2	23.3	22.7	34.4
Malaysia	4.6	3.0	12.1	7.7	16.8
Pakistan	15.5	13.9	47.4	41.3	81.1
Philippines	8.0	7.0	22.1	19.2	32.3
Singapore	0.2	0.1	0.4	0.3	0.5
Thailand	8.3	7.1	23.0	19.4	33.8

Table 3. Trade-increasing effect of a tariff cut for manufactures originating from the South, in percentages of exports of manufactures to the South, per exporting country; short-term effect only

exporting country	tariff preference 20% no trade diversion	tariff preference 20% maximum trade diversion	tariff preference 50% no trade diversion	tariff preference 50% maximum trade diversion
	(1)	(2)	(3)	(4)
Algeria	7.0	6.7	19.7	18.7
Libya	7.4	7.1	20.7	19.7
Morocco	6.4	6.2	17.7	16.8
Sudan	6.4	6.0	18.3	16.7
Tunisia	5.8	5.6	15.9	15.3
Egypt	6.0	5.6	16.5	15.3
Cameroon	5.9	5.4	16.3	14.8
Centr. Afr. Rep.	6.7	6.1	18.6	16.7
Congo	6.6	6.0	18.2	16.4
Gabon	7.2	6.7	20.1	18.3
Ethiopia	6.5	6.0	18.6	16.9
Kenya	6.3	5.7	17.8	15.9
Liberia	6.9	6.3	19.1	17.4
Mauritius	6.7	6.0	19.2	16.9
Niger	6.8	6.2	18.8	17.0
Somalia	6.8	6.2	19.5	17.4
Togo	6.8	6.3	19.0	17.2
Tanzania	7.4	6.7	21.2	19.0
Argentina	7.2	6.3	19.9	17.2
Brazil	6.0	5.3	16.4	14.4
Colombia	6.1	5.7	16.7	15.5
Mexico	6.6	6.0	18.2	16.5
Paraguay	7.4	6.5	20.5	17.8
Venezuela	7.2	6.7	19.8	18.2
Jamaica	6.3	6.0	17.3	16.1
Cyprus	8.3	7.9	23.7	22.4
Kuwait	2.3	2.1	6.6	5.9
Saudi Arabia	3.7	3.3	10.6	9.3
Syria	7.1	6.6	19.9	18.6
Bangladesh	8.4	7.5	24.5	21.5
Sri Lanka	7.3	6.5	21.1	18.4
Hong Kong	7.2	6.4	20.1	17.6
India	5.1	4.5	14.6	12.6
Indonesia	4.4	3.7	12.4	10.3
Korea Rep.	5.1	4.5	14.4	12.4
Malaysia	3.0	2.6	8.5	7.1
Pakistan	5.8	5.3	16.9	15.0
Philippines	4.2	3.7	11.8	10.2
Singapore	5.8	4.4	15.8	11.8
Thailand	5.3	4.5	14.7	12.4

Table 3, continued

non-South countries	(1)	(2)	(3)	(4)
Canada		- 0.5		- 1.3
United States		- 0.4		- 1.2
Japan		- 0.5		- 1.3
China		- 0.5		- 1.3
Belgium-Lux.		- 0.4		- 1.1
Denmark		- 0.4		- 1.1
France		- 0.3		- 0.7
Germany, Fed. Rep.		- 0.4		- 1.1
Ireland		- 0.4		- 1.0
Italy		- 0.2		- 0.6
Netherlands		- 0.4		- 1.1
United Kingdom		- 0.4		- 1.1
Austria		- 0.4		- 1.0
Portugal		- 0.3		- 0.7
Sweden		- 0.4		- 1.2
Switzerland		- 0.3		- 0.9
Spain		- 0.2		- 0.6
Poland		- 0.4		- 1.2
Australia		- 0.7		- 1.8
New Zealand		- 0.6		- 1.7

'both' tariffs T^e and T^m at their initial level), but in their mutual trade contacts the LDC economies become more 'open' as importers and exporters.

Tables 4 and 5 list the results obtained, per importing and per exporting country, respectively. Comparison with the tables 2 and 3 shows at once that the magnitudes of the changes are much greater: not only is the export-side effect added to the import-side effect, but the former is also stronger than the latter as the absolute value of α_3 is larger than that of α_6.

Because all changes in the trade flows are computed according to the 'standard pattern' of the gravity equation, the largest increases in both imports and exports are predicted again for countries with the highest initial tariff levels. Thus, in case of LDC tariff preferences of 50 percent the imports of Bangladesh and of Pakistan would take twice their original level (Table 4, column 3), and percentage-wise their exports would grow even stronger (Table 5, column 3). The trade flows that are least affected are those of Kuwait, Saudi Arabia, Hong Kong, Singapore and Malaysia. Assuming maximum trade diversion, the DCs would see their exports of manufactures to LDCs reduced by, on average, 2.8 percent.

To round off this presentation of the empirical results, a note of warning is called for. The country results as given in Tables 2-5, though indicative of the order of magnitude and of the relative impact of increased mutual trade on different LDC countries, cannot be interpreted as accurate forecasts of the actual impact of a 20 percent or 50 percent GSTP arrangement. Apart from the estimation problems already discussed in section 3, and the just middle-range value of the coefficient of determination, the level of commodity aggregation ('all trade in manufactures') is too high to warrant firm statements at the country level. The results for all (sample) countries of the South taken together have greater reliability and deserve more attention than the country findings. They are brought together in Table 6.

As this and the preceding tables show, the issue of trade creation versus trade diversion cannot be settled in the approach followed in

Table 4. Trade-increasing effect of a tariff cut for manufactures originating from the South, in percentages of imports of manufactures from the South, per importing country; long-term effect

importing country	tariff preference 20% no trade diversion (1)	tariff preference 20% maximum trade diversion (2)	tariff preference 50% no trade diversion (3)	tariff preference 50% maximum trade diversion (4)
Algeria	19.6	19.4	60.3	59.2
Libya	16.8	16.3	50.1	48.3
Morocco	24.5	24.0	78.4	76.0
Sudan	24.3	22.9	78.7	72.4
Tunisia	19.2	18.7	58.2	56.3
Egypt	23.6	22.5	75.2	70.7
Cameroon	20.1	18.6	61.3	55.3
Centr. Afr. Rep.	20.7	19.1	63.5	57.1
Congo	18.7	17.3	56.4	50.9
Gabon	16.0	14.8	47.2	42.7
Ethiopia	20.6	19.3	64.6	59.4
Kenya	22.3	20.3	70.8	62.3
Liberia	19.4	18.2	58.9	54.2
Mauritius	22.2	20.0	70.3	61.0
Niger	16.6	15.5	49.3	45.0
Somalia	20.9	19.1	66.0	58.3
Togo	15.5	14.5	45.5	41.8
Tanzania	18.0	16.3	55.0	48.5
Argentina	19.5	16.5	58.8	47.5
Brazil	19.1	16.5	57.4	47.7
Colombia	19.3	17.7	58.2	52.0
Mexico	18.0	17.4	53.8	51.6
Paraguay	14.9	8.3	43.2	21.7
Venezuela	17.4	16.3	51.6	47.3
Jamaica	16.4	14.8	48.0	42.3
Cyprus	18.3	16.6	55.9	49.4
Kuwait	6.1	5.0	17.9	14.3
Saudi Arabia	12.0	11.0	36.3	32.6
Bangladesh	29.8	25.1	103.7	80.3
Sri Lanka	22.2	19.2	71.6	58.9
Hong Kong	11.5	10.5	33.3	29.8
India	24.0	21.7	78.5	68.0
Indonesia	14.6	11.8	43.5	33.7
Korea Rep.	16.0	15.6	48.4	46.7
Malaysia	7.8	5.0	22.1	13.6
Pakistan	28.7	25.4	98.9	82.5
Philippines	13.8	12.2	41.3	35.2
Singapore	8.7	5.7	24.3	15.1
Thailand	16.0	13.6	48.3	39.6

Table 5. Trade-increasing effect of a tariff cut for manufactures originating from the South, in percentages of exports of manufactures to the South, per exporting country; long-term effect

exporting country	tariff preference 20% no trade diversion	tariff preference 20% maximum trade diversion	tariff preference 50% no trade diversion	tariff preference 50% maximum trade diversion
	(1)	(2)	(3)	(4)
Algeria	18.1	17.2	54.3	50.9
Libya	14.8	14.0	43.1	40.1
Morocco	27.3	26.4	89.5	85.5
Sudan	26.1	24.6	85.2	78.5
Tunisia	18.3	17.7	54.6	52.3
Egypt	27.0	25.8	88.8	83.1
Cameroon	19.7	18.1	59.8	53.7
Centr. Afr. Rep.	21.2	19.4	65.4	58.4
Congo	18.0	16.4	54.0	47.7
Gabon	14.2	12.7	41.1	35.4
Ethiopia	20.6	19.1	64.0	57.7
Kenya	23.7	22.0	75.6	68.0
Liberia	19.1	17.5	57.8	51.5
Mauritius	24.0	22.0	76.6	68.3
Niger	15.0	13.4	43.8	37.9
Somalia	21.1	19.4	65.9	58.6
Togo	13.2	11.7	38.0	32.5
Tanzania	17.4	15.6	52.3	45.3
Argentina	17.7	15.1	52.7	43.3
Brazil	20.1	17.5	61.2	51.6
Colombia	20.3	19.1	61.8	56.9
Mexico	17.6	16.0	52.2	46.3
Paraguay	12.9	10.5	36.8	28.4
Venezuela	16.6	15.2	48.7	43.6
Jamaica	15.8	14.7	46.1	41.8
Cyprus	17.3	16.3	52.1	48.0
Kuwait	3.6	2.5	9.9	6.3
Saudi Arabia	4.9	3.6	14.0	9.6
Syria	15.3	14.1	45.0	40.5
Bangladesh	35.2	32.8	126.0	114.1
Sri Lanka	23.7	21.6	76.0	67.1
Hong Kong	7.5	5.8	20.9	15.4
India	29.5	27.5	100.9	91.4
Indonesia	17.8	15.4	53.7	45.0
Korea Rep.	19.1	17.2	58.2	51.2
Malaysia	10.4	7.7	29.5	21.0
Pakistan	32.2	30.4	113.2	104.2
Philippines	17.4	15.7	52.3	45.9
Singapore	6.0	3.6	16.5	9.1
Thailand	19.0	16.8	58.0	49.6

Table 5 continued

non-South countries	(1)	(2)	(3)	(4)
Canada		- 1.2		- 3.5
United States		- 1.1		- 3.2
Japan		- 1.1		- 3.2
China		- 1.2		- 3.6
Belgium-Lux.		- 1.0		- 3.0
Denmark		- 1.1		- 3.2
France		- 0.7		- 2.1
Germany, Fed. Rep.		- 1.0		- 3.0
Ireland		- 1.0		- 2.9
Italy		- 0.6		- 1.8
Netherlands		- 1.0		- 3.0
United Kingdom		- 1.0		- 2.9
Austria		- 1.0		- 2.9
Portugal		- 0.7		- 2.0
Sweden		- 1.1		- 3.2
Switzerland		- 0.9		- 2.6
Spain		- 0.6		- 1.8
Poland		- 1.1		- 3.3
Australia		- 1.6		- 4.6
New Zealand		- 1.5		- 4.4

this paper, and only the 'extreme cases' can be computed. Moreover, the figures for the case of maximum trade diversion are biased, as was indicated above: the gravity model yields a lower explained LDC share in trade in manufactures than the observed share, and hence the magnitude of the diversion of DC trade is underestimated. Using the observed (rather than the explained) trade shares in the imports of the individual countries, and combining these with the unchanged estimates of gross trade creation, the last column of Table 6 would have to show the percentages 12.7 an 35.4 for the LDC sample countries, and -1.8 and -4.5 for the DC sample countries. In point of fact, the last two figures for the DCs may still be too low; at the exporting side, DCs are overrepresented in the sample as compared to LDCs, thus reducing the relative impact of trade diversion.

Table 6. Trade-increasing effect of a tariff cut for manufactures originating from the South; weighted average in percentages

	no trade diversion	maximum trade diversion	no trade diversion	maximum trade diversion
short-term effect	T^m 20% lower		T^m 50% lower	
sample LDCs	5.8	5.1	16.0	13.9
sample DCs		- 0.4		- 1.0
long-term effect	T^m and T^e 20% lower		T^m and T^e 50% lower	
sample LDCs	15.1	13.1	45.7	38.4
sample DCs		- 1.0		- 2.8

As neither the case of no trade diversion nor that of maximum diversion is likely to be a realistic one, an in-between result should actually be expected. The overall quantitative conclusion of the analysis might thus be formulated as follows. For the present sample of countries, and using the methodology of this paper, a GSTP tariff preference for manufactured products of 20 percent is expected to lead to a South-South trade expansion of some 5.5 (short term) to 14 (long term) percent, and a tariff preference of 50 percent to a South-South trade expansion of 15 (short term) to 42 (long term) percent of the level of

intra-South trade in manufactures.

This overall result may be compared with the findings of Erzan, Laird and Yeats (1986) reported in the UNCTAD Discussion Paper No. 16. These authors used a partial equilibrium projection model to analyse the effects of a linear tariff reduction on the mutual trade of 23 major LDCs at the SITC four-digit level. For total South-South trade they found, assuming a 50 percent tariff cut, an expansion of mutual trade of 8.5 percent (of which just over one-fourth would be due to trade diversion). For manufactured products only (defined as SITC 5 to 8), assuming the same tariff cut and infinitely elastic supply, the projected trade expansion is nearly 39 percent - a figure close to our long-term estimate of 42 percent. Comparison of the country results is not possible, as the country figures are reported only for total trade.[1]

5. Summary and conclusions

Using a gravity model with import tariff levels as one of the explanatory variables both at the import side (as a demand-reducing factor) and at the export side (as a proxy for the degree of domestic-market orientation of manufacturing production), bilateral trade in manufactures is analyzed for a sample of 60 DC and LDC exporters and 39 LDC importers. Estimates of the trade-reducing impact of tariffs are obtained, and these parameters are subsequently used to simulate the trade expansion that would result from a lowering of the initial tariff levels. In this analysis, tariff levels are assumed to be representative for the level and impact of all TCMs combined.

The lowering of the tariffs applies only to imports of manufactures originating from other LDCs, thus simulating the consequences for trade of a Global System of Trade Preferences (GSTP) among developing countries. In assessing these consequences, two stages are

---

1 Langhammer (1987), in a study of the effects of preferential tariff reductions among LDCs for nine individual countries, also deals with all trade, rather than trade in manufactures.

distinguished: the short-term or demand-side effects resulting from lower import tariffs as such, and the long-term effects which comprise in addition the supply-side effects of a stronger export orientation of the manufacturing sector.

In the simulation exercise, a crucial assumption is that the estimated parameter values of the gravity equation remain unchanged. The assumption of unchanging structural coefficients also allows an assessment of the maximum of trade diversion that might occur as a consequence of a GSTP; however, whether or not - or rather to what extent - trade diversion will occur cannot be established in this approach.

The numerical results obtained are summarized in Table 6 above. For the present sample of countries it is found that

(a) the short-term effects of a GSTP lowering of import tariffs for manufactures are relatively modest only, a 20 percent linear tariff cut leading to an expansion of trade in manufactures between the LDCs of 5.5 percent, and a substantial tariff cut of 50 percent leading to a trade expansion of 15 percent.

(b) the long-term effects of a GSTP lowering of import tariffs for manufactures are considerably larger than the short-term effects, with expected increases in intra-LDC trade in manufactures of 14 percent (20 percent tariff cut) and 42 percent (50 percent tariff cut), respectively.

(c) the extent to which trade diversion from DC suppliers to LDC suppliers would occur affects the expected LDC trade increases rather moderately only; in case of a 50 percent tariff cut the long-term LDC trade expansion ranges from 46 percent (no trade diversion) to 38 percent (maximum trade diversion).

(d) even the long-term effects of a 50 percent GSTP tariff cut with a maximum of trade diversion from DCs to LDCs would imply a lowering of DC exports of manufactures to LDC markets by 3 percent only.

For reasons discussed earlier at some length, the numerical findings should not be interpreted as highly accurate forecasts but rather as being indicative of the likely order of magnitude. This is necessarily so when the country coverage in the sample is taken into account: many

developing countries and centrally-planned economies could not be included. Apart from this factor, however, it has to be recognized that also the statistical base on which the numerical outcomes rest is not such as to warrant very precise quantitative predictions.

In terms of GSTP policy making, two conclusions stand out. The first is that the cumbersome and time-consuming process of negotiating the details of a GSTP implementation will only pay off if the eventual lowering of tariffs and non-tariff TCMs will be substantial; a lowering of trade barriers by, say, 10 or 20 percent will have a very limited trade-expanding effect only.[1] The second conclusion is that the long-term effects of lower TCMs (which encompass a re-orientation of the manufacturing sector towards exporting to GSTP member-countries) are much more important than the immediate effects of easier access to LDC import markets, even though they will obviously take longer to materialize.

The possible consequences of a more rapid expansion of LDC exports of manufactures for the rate of growth of GNP are not dealt with here, and the same is true for other implications for the national economies of the countries concerned. These 'dynamic' consequences are often stated to be the most important ones. To the extent that such 'dynamic' effects are part and parcel of a less inward-oriented industrialization policy in LDCs, the present analysis yields some support to this view.

---

1 For all trade, Langhammer (1987) reaches a similar conclusion.

References

Aitken, N.D. (1973), 'The Effect of the EEC and EFTA on European Trade; A Temporal Cross-Section Analysis', American Economic Review, Vol. 63, pp. 881-892.

Amemiya, T. (1973), 'Regression Analysis when the Dependent Variable is Truncated Normal', Econometrica, Vol. 41, pp. 997-1016.

Anderson, J.E. (1979), 'A Theoretical Foundation for the Gravity Equation', American Economic Review, Vol. 69, pp. 106-116.

Bergstrand, J.H. (1985), 'The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence', Review of Economics and Statistics, Vol. 67, pp. 474-481.

Bikker, J.A. (1982), Vraag-aanbod modellen voor stelsels van geografisch gespreide markten, toegepast op de internationale handel en op ziekenhuisopnamen in Noord-Nederland. Amsterdam, VU Boekhandel/Uitgeverij.

Corbet, H. (1979), 'Importance of Being Earnest about Further GATT Negotiations', The World Economy, Vol. 2, pp. 319-341.

Dagenais, M.G. (1969), 'A Threshold Regression Model', Econometrica, Vol. 37, pp. 193-203.

Deardorff, A.V. and R.M. Stern (1983), 'The Economic Effects of Complete Elimination of Post-Tokyo Round Tariffs', in: W.R. Cline (ed.), Trade Policy in the 1980s. Cambridge, Mass., MIT Press.

Deardorff, A.V. and R.M. Stern (1985), Methods of Measurement of Non-Tariff Barriers. UNCTAD/ST/MD/28, Geneva, UNCTAD.

Erzan, R., S. Laird and A. Yeats (1986), 'On the Potential for Expanding South-South Trade through the Extension of Mutual Preferences among Developing Countries', Discussion Papers No. 16, Geneva, UNCTAD.

GATT (1980), The Tokyo Round of Multilateral Trade Negotiations, Vol. II. Geneva, GATT.

Helpman, E. and P.R. Krugman (1985), Market Structure and Foreign Trade. Cambridge, Mass., MIT Press.

IMF (various issues), International Financial Statistics. Washington, D.C., International Monetary Fund.

Karsenty, G. and S. Laird (1986), 'The Generalized System of Preferences - A Quantitative Assessment of the Direct Trade Effects and of Policy Options', Discussion Papers No. 18, Geneva, UNCTAD.

Langhammer, R.J. (1987), 'Effects of Preferential Tariff Reductions among Developing Countries', in: O. Havrylyshyn (ed.), Exports of Developing Countries - How Direction Affects Performance. Washington, D.C., World Bank.

Linnemann, H. (1966), An Econometric Study of International Trade Flows. Amsterdam, North-Holland.

Maanen, J.H.A. van (1988), Exports and Growth - A Quantitative Analysis of the Turkish Economy. Amsterdam, Free University Press.

Merkies, A.H.Q.M. and T. van der Meer (1988), 'Theoretical Foundations for the 3-C Model', Research Memorandum 1988-2. Amsterdam, Faculty of Economics and Econometrics, Free University.

Nelson, F.D. (1977), 'Censored Regression Models with Unobserved, Stochastic Censoring Thresholds', Journal of Econometrics, Vol. 6, pp. 309-327.

Sapir, A. (1981), 'Trade Benefits under the EEC Generalized System of Preferences', European Economic Review, Vol. 15, pp. 339-355.

Srinivasan, T.N. and J. Whalley (1986), General Equilibrium Trade Policy Modelling, Cambridge, Mass., MIT Press.

United Nations (various years), Yearbook of National Accounts Statistics. New York, United Nations.

US Defense Mapping Agency (1985), Distances between Ports, Publication No. 151, Washington, D.C., Government Printing Office.

Verbruggen, H. (1988), 'GSTP, the Structure of Protection and South-South Trade in Manufactures', Research Memorandum 1988-15, Amsterdam, Faculty of Economics and Econometrics, Free University.

Whalley, J. (1985), Trade Liberalization among Major World Trading Areas. Cambridge, Mass., MIT Press.

World Bank (1983), World Bank Atlas 1983, Washington, D.C.