INTERNATIONAL TRADE ALTERNATIVES FOR 1990

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ABSTRACT

This paper reports briefly on some of the results of a research project analysing structural change in international trade in the period 1955-1977 and elaborating development alternatives for 1990. The model used includes eleven regions: three for planned economies, 4 - 4 for developed and developing countries and six commodity groups, three for primary products and three for manufacturers.

The project had both methodological and practical objectives: methods were sought to study past and to project future structural change in international trade. It was aimed to reveal the feasibilities and limits within which international trade can develop and to work out characteristic alternatives in a consistent global framework for the main developed, developing and socialist regions.

The paper presents the main assumptions and results of the six alternatives elaborated, three in constant prices assuming very different trade policy environments and three supposing different relative price changes. It also gives a brief account of the methods used in elaborating consistent alternatives corresponding to these assumptions.

CONTENTS

1. Introduction

Analysis of international trade flows is an approach by which, instead of the foreign-trade relations of a single country, or bilateral trade between pairs of countries being surveyed, world commodity trade *as a whole* is examined, in an attempt to demonstrate its structural changes in a consistent framework. There is a considerable demand for projections regarding the possibilities of alternative evolution of international trade flows, especially in developing and centrally-planned-economy countries.

Research on the structural analysis and projection of international trade was started in Hungary in the early seventies (see Nagy (1971, 1977)). On the basis of experiences gained in it, a new research project was started in Hungary in 1979 supported by research grants of the Ford Foundation and of the Hungarian Ministry of Foreign Trade.

The project consisted of two phases: a structural analysis of international trade for the period 1955-1977 and a development alternatives model of international trade for 1990. The structural analysis was based on current price trade data of the UNCTAD Data Bank (UNCTAD Handbook, 1979) and for studying price changes in the period 1963-1975 data of the UNITAD Project was used.

The model includes eleven regions and three regional aggregates, the commodity classification includes six commodity groups and two aggregates:

Regions	Commodity groups	SITC
1. Soviet Union	1. Food & Agricultural Materials	0+1+4+2-27-28
2. Eastern Europe		
3. Centrally planned Asia	2. Minerals & Metals	27+28+67+68
4. Western Europe	3. Fuels	3
5. North America	4. Chemicals	5
6. Japan	5. Other manufactured goods	6+8-67-68
7. Other developed countries	6. Machinery	7+9
8. Latin America	7. Primary products	0+1+2+3+4+67+68
9. Africa	8. Manufactures	5+6-67-68+7+8+9
10. Western Asia	9. Total world trade	0+...+9
11. East Asia and Oceania		
12. Total Socialist countries (1-3)		
13. Total Developed countries (4-7)		
14. Total Developing countries (8-11)		
15. Total world trade (1-11)		

The research project had both methodological and practical objectives: methods were sought to study both past and future structural changes in international trade. The target was not to make projections, i.e., to find the most likely outcome of future development, or planning, to achieve certain targets, but to *study and compare the feasibility of change and the alternatives to development*. The aim was to find out in a consistent and systematic way the limits within which international trade can develop, and to point out specific alternatives in future trade relations of developed, developing and socialist regions.

Much emphasis was placed on satisfying the requirements of *international consistency*, i.e., to form a system in which the estimated exports of country (or region) "i" to country "j" would be equal to the estimated imports of country "j" from country "i". The project concentrated on this aspect: how the development alternatives of the different regions in a commodity breakdown can be coordinated, or where and what are the main obstacles of consistency in this field. It was strongly felt that the international consistency aspect has been neglected in several global models.

2. Structural Changes in International Trade: 1955-1977

The structural analysis of international trade consists of detailed studies by regions and by commodity groups of the changes in the past 23 years. Here we can only show certain features of change in a strongly aggregated form. The 11 regions were aggregated into three main areas and the groups of commodities into primary goods and manufactures.

Table 1 shows the changes in the shares in world trade. It turns out that the export shares of the three regions in 1977 hardly differed from those in 1955 but only because, due to the effect of price changes in the mid-seventies, the structure which had undergone considerable changes between 1955-1972 became "restored". The developed and socialist countries increased

Table 1

Distribution of world trade by main regions and main groups of commodities

Total world trade = 100

Exporting regions	Years	Importing regions: Total				Primary goods				Manufactures			
		TS	TD	TG	TW	TS	TD	TG	TW	TS	TD	TG	TW
TS	1955	7,4	1,8	0,5	9,7	7,2	2,3	0,5	10,0	7,9	1,0	0,8	9,7
	1960	8,6	2,3	1,0	11,9	7,4	3,1	0,6	11,1	9,7	1,2	1,3	12,2
	1965	7,4	2,5	1,6	11,5	6,5	3,7	1,3	11,5	8,3	1,4	2,2	11,9
	1972	6,5	2,4	1,2	10,1	4,9	3,8	0,9	9,6	7,5	1,5	1,5	10,5
	1977	5,4	2,6	1,3	9,3	4,4	4,1	1,1	9,6	6,2	1,5	1,7	9,4
TD	1955	1,4	45,4	18,1	64,9	1,3	39,7	8,5	49,5	1,5	53,1	31,0	85,6
	1960	2,1	47,6	17,2	66,9	2,4	40,5	9,3	52,2	2,3	55,3	26,1	83,7
	1965	2,7	51,8	14,6	69,1	2,5	42,2	8,4	53,1	2,7	60,3	20,7	83,7
	1972	2,9	55,9	13,4	72,2	2,9	44,4	7,6	54,9	3,0	63,9	16,8	83,7
	1977	3,0	46,4	15,6	65,0	2,5	32,5	7,4	42,4	3,7	53,7	22,0	83,0
TG	1955	0,7	18,4	6,3	25,4	1,0	30,4	9,1	40,5	0,1	2,2	2,4	4,7
	1960	0,9	15,5	4,8	21,2	1,7	27,4	7,6	36,7	0,0	2,2	1,9	4,1
	1965	1,2	14,1	4,1	19,4	2,4	26,4	6,6	35,4	0,1	2,5	1,8	4,4
	1972	0,8	13,2	3,7	17,7	1,8	26,9	6,8	35,5	0,2	3,9	1,7	5,8
	1977	1,2	18,4	6,1	25,7	2,2	35,5	10,3	48,0	1,0	4,9	2,6	7,6
TW	1955	9,5	65,6	24,9	100,0	9,5	72,4	18,1	100,0	9,5	56,3	34,2	100,0
	1960	11,6	65,4	23,0	100,0	11,5	71,0	17,5	100,0	12,0	58,7	29,3	100,0
	1965	11,3	68,4	20,3	100,0	11,4	72,3	16,3	100,0	11,1	64,2	24,7	100,0
	1972	10,2	71,5	18,3	100,0	9,6	75,1	15,3	100,0	10,7	69,3	20,0	100,0
	1977	9,6	67,4	23,0	100,0	9,1	72,1	18,8	100,0	10,0	63,7	26,3	100,0

TS = Socialist countries
TD = Developed market economies
TG = Developing countries
TW = Total world trade

their share in world exports between 1955-1972 after which it decreased, while the export share of the developing countries gradually fell from 25.4% in 1955 to 17.7% in 1972, again reaching 25.7% in 1977. These changes may be traced back to the exports of primary goods, since the shares of manufactures do not show any break due to the effect of price changes after 1973. The share of the developed market economies in the export of manufactures is extremely high and stable, even though it shows a slight decline. The export share of the developing countries is extremely low, though showing a definite rise from 4.4% in 1965 to 7.6% by 1977. The export share of the socialist countries in manufactures shows a rise only in the late fifties and has been declining since then.

Examining the export shares of the main regions (Table 2), it may be seen that the intra-trade of the socialist countries declined from its high share throughout the whole period: from a 74.7% share in the total export of the socialist countries in 1955, it fell to 56.8% in 1977. It can be observed that in the export of primary goods the same share of intra-trade was, and is, considerbly smaller than in that of manufactures, and the declining tendency is also much stronger.

From the export of manufactures of the developed market economies, 36.2% went to the markets of the developing (then mostly colonial) countries in 1955, it had fallen to 20.1% by 1972, and had risen again to 26.6% by 1977. The intra-trade in manufactures of the developing countries shows a similar movement: from 52.3% in 1955, it had fallen to 30.7% by 1972 and had risen again to 34.3% by 1977. The share of the developing countries in the exports of the socialist countries shows a steady rise: from 6.8% in 1955 to 14.2% by 1977. It is remarkable, however, how much lower this share is compared to that of the developed countries: 14.2% against 24%.

Trade intensity indicators and their changes are shown in Table 3., measuring the trade policy and economic distance effects. Very intensive flows can be found among the socialist countries, mainly in the trade in manufactures, but it can also be observed that the high intensity of intra-trade is declining and, accordingly, this increases in the trade with the other two main regions.

However, the export intensity of the socialist countries rises at highly differing rates by commodity groups and importing regions. While the export intensity of primary goods rose nearly twofold in both regions, that of the exports of manufactures to developed market economies stagnated between 1955-1965 and thereafter increased only moderately. The intensity of the export of manufactures to developing countries rose almost threefold in the first decade, but since then has been slowly declining.

The export intensity of developing countries' exports to the socialist countries shows an unfavourable picture, especially in manufactures: though the export intensity rose quickly between 1955-1965, in the following 12 years there was a strong decrease to an even lower level than that of 1955.

Table 2

Distribution of exports by main regions and by main commodity groups

Total exports of regions = 100

Exporting regions	Years	Importing regions: Total			Primary goods			Manufactures		
		TS	TD	TG	TS	TD	TG	TS	TD	TG
TS	1955	74,7	18,5	6,8	70,2	24,0	5,8	81,1	10,8	8,1
	1960	72,7	18,8	8,5	65,4	27,7	6,9	80,6	9,3	10,1
	1965	64,4	21,8	13,8	56,6	32,6	10,8	71,4	12,1	16,6
	1972	63,4	24,4	12,2	50,4	39,0	10,6	71,8	15,0	13,2
	1977	56,8	29,0	14,2	45,1	43,2	11,7	66,5	17,3	16,2
TD	1955	2,2	70,0	27,8	2,8	80,1	17,1	1,7	62,1	36,2
	1960	3,5	70,8	25,7	4,5	77,7	17,8	2,7	66,1	31,2
	1965	3,9	75,0	21,1	4,9	79,7	15,4	3,3	72,1	24,6
	1972	4,0	77,8	18,2	5,1	81,0	13,9	3,6	76,3	20,1
	1977	4,7	71,3	24,0	5,8	76,8	17,4	4,3	69,1	26,6
TG	1955	2,5	72,8	24,7	2,5	75,2	22,3	2,3	45,4	52,3
	1960	4,4	73,1	22,5	4,7	75,1	20,2	2,5	53,3	44,2
	1965	6,6	72,2	21,2	6,9	74,4	18,7	4,9	53,3	39,8
	1972	5,1	73,8	21,1	5,4	76,0	18,6	4,4	64,9	30,7
	1977	4,1	72,2	23,7	4,5	74,0	21,5	2,4	63,3	34,3

Notation: TS = Socialist countries
TD = Developed market economies
TG = Developing countries
TW = Total world trade

Table 3

Trade intensity indicators*/

Exporting regions	Years	Importing regions: Total			Primary goods			Manufactures		
		TS	TD	TG	TS	TD	TG	TS	TD	TG
TS	1955	7,92	0,28	0,27	7,43	0,33	0,32	8,60	0,19	0,24
	1960	6,19	0,29	0,37	5,69	0,39	0,39	6,67	0,16	0,35
	1965	5,68	0,32	0,68	4,95	0,45	0,68	6,34	0,19	0,68
	1972	6,22	0,34	0,68	5,26	0,52	0,70	6,77	0,22	0,66
	1977	6,04	0,43	0,62	5,08	0,60	0,63	6,75	0,27	0,62
TD	1955	0,23	1,07	1,12	0,30	1,11	0,95	0,18	1,11	1,06
	1960	0,30	1,09	1,12	0,40	1,10	1,02	0,23	1,13	1,07
	1965	0,34	1,10	1,05	0,43	1,11	0,97	0,29	1,13	1,01
	1972	0,40	1,09	1,01	0,53	1,09	0,92	0,34	1,11	1,01
	1977	0,51	1,06	1,05	0,66	1,07	0,93	0,44	1,09	1,02
TG	1955	0,26	1,11	0,99	0,26	1,04	1,24	0,25	0,81	1,53
	1960	0,38	1,13	0,99	0,41	1,06	1,17	0,22	0,91	1,52
	1965	0,58	1,06	1,05	0,60	1,03	1,17	0,46	0,86	1,63
	1972	0,51	1,04	1,17	0,55	1,02	1,23	0,42	0,94	1,54
	1977	0,44	1,08	1,04	0,50	1,03	1,15	0,24	1,00	1,31

Notation: TS = Socialist countries
TD = Developed market economies
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*/ The trade intensity indicator is:

$$\delta_{ijk} = \frac{x_{ijk}}{\bar{x}_{ijk}} = \frac{z_{ijk}}{z_{i.k} z_{.jk}} ,$$

where: x_{ijk} is the export of commodity k from region i to region j; $X_{i.k}$ total export of commodity k of region i; $X_{.jk}$ total import of commodity k of region j; $X_{..k}$ total world trade of commodity k; and

$$z_{ijk} = \frac{x_{ijk}}{X_{..k}} , \quad z_{i.k} = \frac{X_{i.k}}{X_{..k}} , \quad z_{.jk} = \frac{X_{.jk}}{X_{..k}} .$$

The rising tendency of the intra-trade intensity of the developing countries between 1955-1972 gave place to a decline in the next period: it is favourable that the intensity of the intra-trade in manufactures was sufficiently strong to show a definite rise in 1955-1965, but it is deplorable that since then it has fallen back to a lower level than in 1955.

Here we cannot discuss in detail the structural change in the trade by regions and commodity groups, the trade balances, and the effects of price and terms of trade changes; these are included in the analytical part of the final report. However, it should be stressed that the main purpose for analysing structural changes of international trade in the past was to prepare the elaboration of the development alternatives for 1990.

3. Development Alternatives of International Trade

The aim of the research project was not to prepare forecasts which try to find the most probable course of development; neither was it intended to compare the probability of different projection variants, nor was it oriented by the desirability of different alternatives; targets were not set, and ways to satisfy certain targets were not sought. The aim was to trace the feasibility set of alternatives: what is feasible and under what conditions? Totally different trade alternatives were elaborated and compared, based on different assumptions on the growth of the regions; on their internal economic, external trade and financial policies; and on the change in their production, consumption, investment and trade structure.

Care was taken in the choice of alternatives not to go beyond the feasibilities, the limitations of structural and political change of the coming decade. On the other hand, excess caution was avoided in order to show the size of changes which can be made. As world economy starts to undergo fundamental changes from the mid-seventies, and this will continue well into the eighties, there is a lot of uncertainty on the future course of international political and economic relations. Consequently, more extreme solutions are possible than in a quiet period, the feasibility set is extended.

Three alternatives were elaborated in constant prices, two of them (alternatives A and Z) are based on rather extreme and in a sense opposite assumptions, and the third one (alternative B) can be regarded as a more conservative projection.

Alternative "A": Fast Growth

A relatively fast rate of growth will be re-established in world economy with about a 4-5% world GDP increase. Economic growth of the developing countries will be faster than in previous periods. International division of labor will regain its earlier dynamism; elasticity of trade will be between 1.4-1.8 in relation to the GDP; that is, world trade volume will increase annually by 7-8%.

Barriers to trade and protectionist measures will decrease, liberalization will be strengthened. East-West 'détente' will continue and North-South confrontation will ease. A rapid growth of trade will be linked to accelerated adaptation of the world market. Production and trade specialization, adjustment to resource endowment and to local potentialities will be strengthened, the efficient restructuring of production will increase.

Technological transfers and the relocation of industrial production to the developing regions will gain strength. A decrease in the agricultural protectionism of certain developed regions will get underway.

The socialist countries will increase the efficiency and the competitiveness of their production by economic and social reforms, thus making their growth more dynamic, their economy more open.

Trade of manufactures will grow faster than that of primary goods because specialization will favour more the trade of processed goods. Industrial goods exports of developing countries will increase especially, and will gradually cover an even larger area of traditional industrial activities. Energy shortage will not seriously curb the rate of growth of world production.

Trade of the different regions will gradually become more balanced, the deficit of the developed countries will be replaced by an export surplus and the oil revenues will no longer cover the deficits of all the other regions.

Alternative "B": Basic Projection

No major changes are supposed to take place in political power relations and in the trade policy regimes during the next decade. East-West and North-South confrontation will neither be significantly strengthened nor eased. No substantial progress will be made in the liberalization of trade, but neither will the protectionist measures be extended.

The former dynamic development of world economy will not be restored. Annual average growth of world GDP is estimated to be 3.5-4.0%, elasticity of trade will be about 1.4-1.6 , the annual average growth of international trade will be around 5.5-6.0%. Growth of production and trade will be hindered by protectionism, slow adjustment, protraction of unemployment and of capacity under-utilization, by the low level of demand and that of credit availability.

Western-European integration will extend to the whole region but it will not become more open for outsiders and its agrarian protectionism will not decrease much. The planning and management system of the socialist countries will be improved, but major economic reform will not take place. As a result, there will be only a moderate improvement in efficiency, competitiveness and in restructuring the economy; characteristics of the economy of short-

age will survive. CMEA integration will develop on its present course, market and monetary relations among member countries will remain limited.

As conflicts between developed and developing countries will be lasting, world economy in the eighties will be greatly influenced by the power-relations and confrontations of different groups of interest and their changing coalitions. This may lead to extreme scenarios. The price alternatives described in the following, are related to these outcomes.

Growth in volume of trade of manufactured goods will be restrained by the continuation of protectionism and the limited redeployment of inefficient industrial activities. Even if the export surplus of developed regions and OPEC countries will grow, the availability of aids and credits for developing countries will not be markedly improved. The stability and unity of the international monetary system will not be re-established and uncertainty of the financial markets will restrain capital movements and trade flows.

Alternative "Z": Slow Growth

The slow-down of the growth of world economy will be lasting, with an average world GDP growth of 3.0-3.5%. This will be due to the lack of demand of developed countries and to the insufficiency of investment sources in the developing regions. Dynamism of world trade decline, trade elasticity will be around 1.2-1.5 , and world trade volume will grow 4.5-5.0% annually. Both the cause and the consequence of this slow-down is the strengthening of trade barriers and the intensification of protectionism. Political relations will become more strained between East and West, among certain developed countries, and between developed and developing countries.

Adaptation to changed world market conditions will decline, international specialization will slow down, the resistance to change inefficient production and to substitution by imports will be strengthened. Production will become more inward-looking, and the strive for self-sufficiency will strengthen. Regional integration will become more autarkic and developed regions will strive to draw into their sphere of interest certain developing regions.

Internal economic management of socialist countries and the mechanism of their economic relations will become stiffer, the tendency of regional autarky and joint planification will increase.

Trade of manufactures will develop, especially within regions. In inter-regional trade the share of energy sources and raw materials will increase. Industrialization and exports of industrial goods of developing countries will be hindered.

Price Alternatives

Current-price (P) alternatives were computed from alternative B in a way that trade flows in volume terms were multiplied by price-indices indicating price increases between 1977-1980, while the price-elasticities were taken into account.

Three feasible alternatives have been worked out for the changes in the prices of the six commodity groups of the model. In all three price alternatives, the average annual price increase was estimated to be 8%, but the relative price changes of the commodity groups are different.

Alternative PU supposes the stability of the relative prices of 1980 for primary and manufactured goods. The assumption of alternative PP is the further rapid increase of the relative prices of primary products, while alternative PM supposes the opposite: a faster growth of manufacturing prices. In alternative PU, it is assumed that the 122% relative price increase of primary products in the seventies will continue to exist in 1990. The hypothesis for alternative PP was that the relative prices of primary goods will again be doubled during the next twenty years. As a consequence, the relative prices of primary goods, as compared to 1970, will be 4.45 times higher than that of the manufactured goods in 1990. In alternative PM, an opposite change in relative prices is assumed: the difference in the price levels of the two main commodity groups will disappear in the next two decades; accordingly, their price increases between 1970-2000 will be equal. This would significantly decrease the price-gap between the two main commodity groups and, as a result, the price level of primary products on the basis of 1970 will only be 49% higher than that of manufactures in 1990. (See Fig.1.)

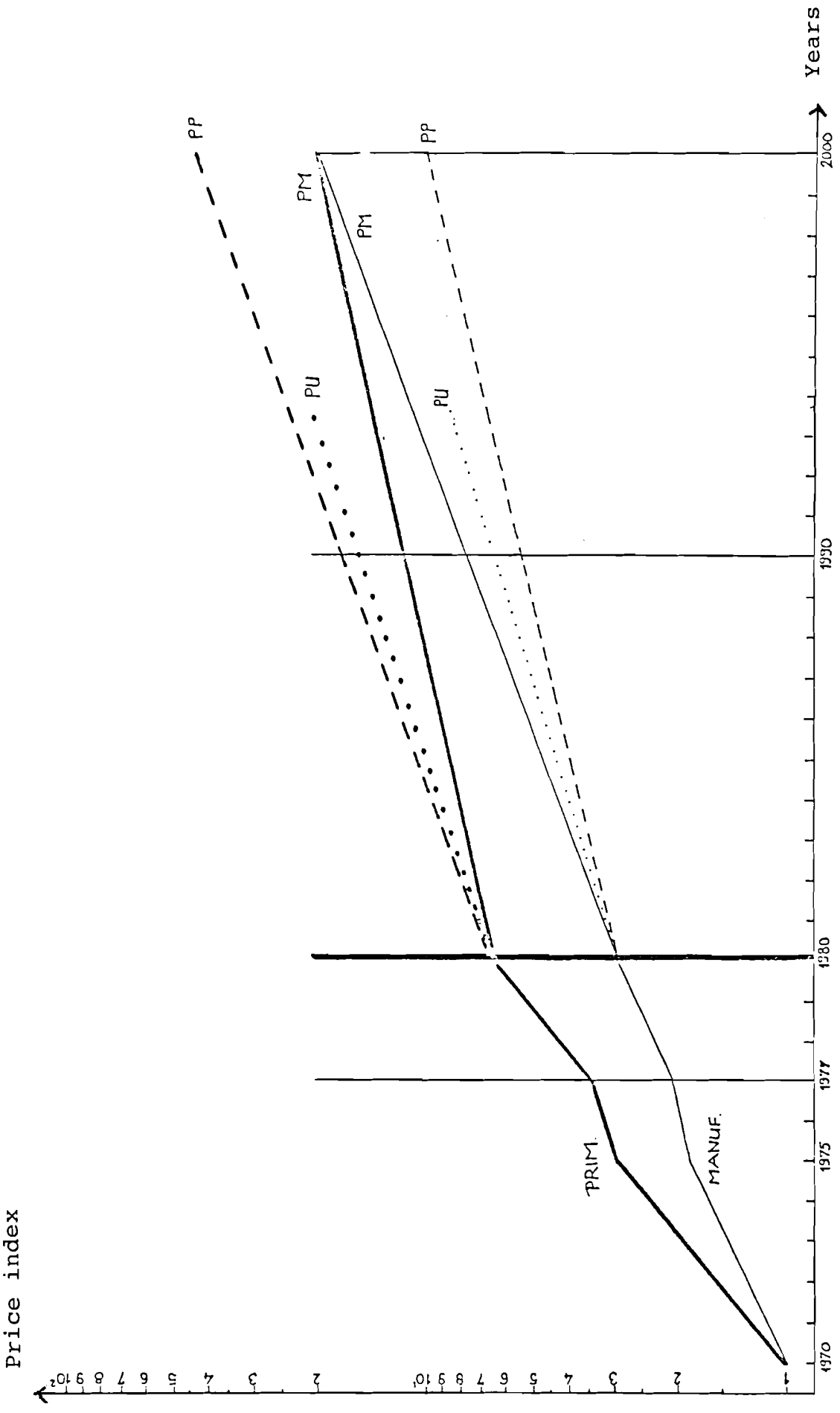
The hypotheses and estimations concerning future price changes of international trade, described above, are far from being well-founded. Theoretical analysis of price changes in international trade and exchange rate fluctuations is only at its initial stage. Our aim is not the most probable forecasting of the price changes, but to analyse the consequences of feasible (including extreme) relative price changes on the structure and the balances of international trade.

4. Methods of elaborating alternatives

In the computation of the alternatives, expert estimates were made consistent by a trade flow model, in which the divergent, eventually contradictory expert opinions were confronted and a man-machine dialogue was used to iterate a consistent solution while checking its economic content. This process was based on the interaction of regional and commodity experts with a central group: the experts elaborated their proposals according to the different alternatives and these were coordinated at the center.

Figure 1

Alternatives of international trade price changes between 1970 and 2000



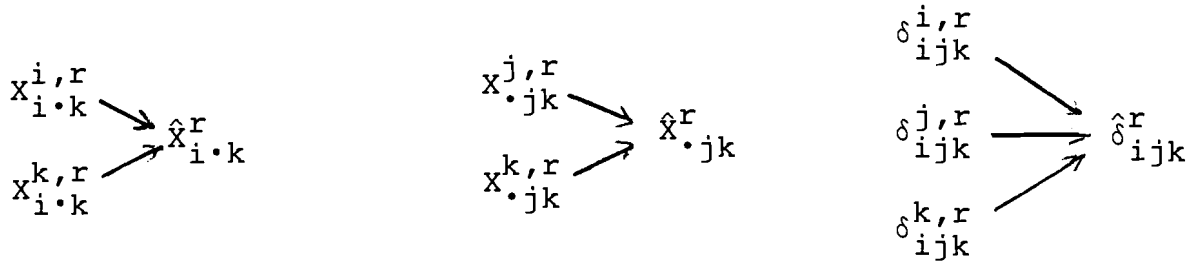
Elaborating the alternatives on constant prices, the proposals contained regional total export and import volumes by commodity groups and estimated trade intensity changes for the main flows. At the center starting inputs were worked out from the three data (that of the exporting, of the importing region and of the commodity group) and a consistent solution had to be found for the total export and import volumes and the estimated trade intensities *.

Let x_{ijk} be the export of commodity k from region i to region j, $X_{i\cdot k}$ total export of commodity k in region i, $X_{\cdot jk}$ total import of commodity k in region j and $X_{\cdot\cdot k}$ total world trade of commodity k, then the trade intensity indicator can be defined as the ratio of the factual trade flow to the "normal" flow (marked by an upper dash). In this sense, a flow is "normal" when its share in total trade of a given commodity group is equal to the product of the corresponding total shares of the exporting and importing countries, i.e.:

$$\delta_{ijk} = \frac{x_{ijk}}{\bar{x}_{ijk}} = \frac{x_{ijk}/X_{\cdot\cdot k}}{(X_{i\cdot k}/X_{\cdot\cdot k})(X_{\cdot jk}/X_{\cdot\cdot k})}$$

The trade intensity indicator shows the effects of all factors affecting the trade flows between a given pair of countries in a given period of time, apart from the "volume" effects of total export "push" and import "pull". If the effects of trade-policy measures, discrimination, integration, traditional and other historical links, distance, etc., do not strongly influence the bilateral trade between two countries, the value of the trade intensity coefficient will be unity, or near to it. If, however, these factors considerably reduce or increase the trade flows in question, this coefficient will be less or greater than unity, respectively.

The proposals of the regional and commodity experts contained the total export and import volumes by alternatives, of which the starting input vectors were chosen through analytical control and discussions. The trade intensity coefficient proposals were unified in a similar way:



* See in more detail: A. Nagy [8,9].

where the upper indices show from where the proposal is coming (i, j, or k) and to which constant price alternative it is related (r = A,B,Z). Upper ^ shows the starting input data. By unifying the elements of the input vectors, the equality of estimated total world exports and imports for each commodity group had to be assured:

$$\sum_i \hat{X}^r_{i\cdot k} = \sum_j \hat{X}^r_{\cdot jk} = \hat{X}^r_{\cdot\cdot k} \quad .$$

In the unification and choice of the starting input data it was controlled and discussed as to how the hypotheses of the different alternatives were applied to the different regional exports and imports, to the different commodity groups and to the trade policy changes of the individual flows. The confrontations of the experts in brain-storming discussions revealed many of the future tensions and conflicts of the different commodity markets, as a consequence they were very useful in the detailed elaboration of the alternatives and in the analysis of the results.

The process of computation consisted of two phases: in the first, the inconsistencies of the total export and import vectors with the trade intensity indicators were checked and corrected; in the second, consistent trade flow matrices were prepared from the corrected input data. The close relationship linking total export and import vectors to trade intensity structures* were utilized in the first phase: a given system of δ coefficients determines the shares of total export and import vectors. If they are not consistent then such trade flow matrices can be computed whose totals by rows and columns are not equal with the total export and import vectors of the starting input:

$$x^{o,r}_{ijk} = \frac{\hat{\delta}^r_{ijk}\ \hat{X}^r_{i\cdot j}\ \hat{X}^r_{\cdot jk}}{\hat{X}^r_{\cdot\cdot k}}$$

where, by x^o, the inconsistent trade flows, are denoted. By summing these, such total export and import vectors are gained which diverge with an $\pm$ e error term from the input vectors:

$$\sum_j x^{o,r}_{ijk} \pm e = \hat{X}^r_{i\cdot k} \quad \text{and} \quad \sum_i x^{o,r}_{ijk} \pm e = \hat{X}^r_{\cdot jk}$$

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* See B. Marin Curtoud [5].

A simple and fast computer program has been worked out for the correction of the input intensity indicators and the total trade vectors by which, in a few man-machine interations, the inconsistencies decreased very significantly. In this process the changes in the input data could have been controlled by the experts to see whether they went in the right direction, according to the assumptions of the different alternatives.

The second phase came after n step of iteration of the first phase, when we had

$$x^{n,r}_{i\cdot k}\ ,\quad x^{n,r}_{\cdot jk}\ ,\quad x^{n,r}_{\cdot\cdot k}\ ,\quad \delta^{n,r}_{ijk}\ ,$$

not yet consistent, but their inconsistencies were strongly reduced. Starting from these, such $x^{r}_{ijk} \geq 0$ trade flows had to be found:

a) the totals of which are equal to the total export and import vectors, i.e.,

$$\sum_j x^r_{ijk} = x^{n,r}_{i\cdot k} \qquad \text{and} \qquad \sum_i x^r_{ijk} = x^{n,r}_{\cdot jk}$$

and b) the sum of the squares of the relative trade intensity deviations should be at minimim:

$$\sum_i \sum_j \left(\frac{\delta^r_{ijk} - \delta^{n,r}_{ijk}}{\delta^{n,r}_{ijk}} \right)^2 \longrightarrow \min\ .$$

As can be seen the consistency was achieved in the second phase by changing only the input intensity coefficients. The estimation of these was regarded as more uncertain than the total trade volumes. The adaptability of the trade intensity indicators were again proved*: very small changes of a great number of intensity coefficients were sufficient in most cases to find trade flow matrices consistent with the input total export and import vectors.

The current price alternatives were obtained by multiplying the consistent trade flows of alternative B with two coefficients: a) the estimated price index and b) the price elasticity index:

$$x^m_{ijk} = x^B_{ijk}\ p^m_{ijk}\ q^m_{ijk}$$

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* This was first noted by Ph. Carré. See [10].

where m denotes the current price alternatives (m = PU,PP,PM); p is the price; and q the elasticity coefficient. Both of these coefficients were proposed by the regional and commodity experts by estimating how far the price increases of the total or bilateral flows will deviate from those of the hypotheses of the different alternatives and what will be their effect on the volumes of trade. These proposals were coordinated through confrontations and discussions also.

There were two reasons for using such simple methods: 1) time was short and the resources insufficient for building a global econometric trade model; 2) it was intended to avoid any type of mechanical extrapolation of past relationships, to concentrate on the limits of feasible structural change. It was expected that experts opinions based on a wide range of information on the future development of the different regions and on the future behavior of different commodity markets will provide a firm basis for elaborating the characteristic features of the different alternatives.

5. Future Structural Changes in International Trade

Only a very few of the results of our computation can be presented here but hopefully they will give an idea of what can be expected of such an exercise.

The growth rates for 13-years shown in Table 4. are very divergent even in this strongly aggregated form. The growth of total world trade in constant prices are estimated to 7.2, 5.4, and 4%, according to alternatives A, B and Z, i.e., the rate can be $^1/_3$ higher in the "fast growth" case, and 26% lower in the "slow growth" case than in the basic projection. The "gain" in case of A to B would be about 570 billion dollars in constant prices, i.e., 52% of total world trade in 1977 and the "loss" in case of Z compared to B, 350 billion, i.e., 32% of the same. This gives an idea of how big the stake is in looking for different development paths for the world economy and trade.

The price increase is 10.4% yearly in all three alternatives which, taking into account the fast price rises in 1979-1980, gives about 8% annual increase in the eighties. As the price alternatives were computed from the basic variant, the growth of world trade in current prices (16.7-17.1%) do not differ much, except in the details of the regions and commodities.

Growth on export side in the developed regions is the fastest in all three constant price alternatives and in the developing regions it is the slowest. On the import side the opposite is the case. The exports of manufactures of third world countries is assumed to be fast, the rate is about twice as high as that of their total exports. Particularly fast-growing is their manufacturing exports to the socialist countries in alternative A (13.1% yearly), where it is supposed to correct a lag of the past decade. Growth of primary goods exports is relatively slow for both socialist and developing countries; in anternative Z for example, a near stagnating export is estimated from East to West in primary goods (annual growth of 0.7%).

Table 4.

Average annual growth of international trade in p.c. between 1977 - 1990.

Regions	Alternatives	Total trade				Primary goods				Manufactures			
		TS	TD	TG	TW	TS	TD	TG	TW	TS	TD	TG	TW
TS	A	6,4	8,1	8,6	7,3	4,2	5,4	7,3	5,2	7,4	11,9	9,2	8,6
	B	5,1	4,5	6,1	5,1	2,9	2,2	5,1	2,9	6,1	7,9	6,7	6,5
	Z	4,5	1,9	5,2	4,o	2,7	o,7	4,2	2,1	5,4	4,o	5,7	5,2
	PU	16,2	16,5	16,7	16,4	16,3	16,5	18,o	16,6	16,2	16,4	15,8	16,1
	PP	16,2	17,2	16,7	16,6	18,o	18,o	19,o	18,1	15,o	15,3	15,o	15,1
	PM	16,8	16,3	16,7	16,6	14,6	15,o	16,1	15,o	17,8	18,4	17,o	17,8
TD	A	1o,5	7,2	8,2	7,6	9,1	4,5	6,7	5,2	11,1	8,2	8,6	8,5
	B	7,o	5,5	6,6	5,8	6,5	3,7	5,7	4,2	7,2	6,2	6,8	6,4
	Z	4,4	4,o	5,1	4,3	4,7	3,1	4,1	3,4	4,3	4,4	5,3	4,7
	PU	17,4	16,3	17,o	16,5	17,5	16,6	17,7	16,5	17,3	16,4	16,7	16,6
	PP	16,9	15,7	16,4	15,9	18,9	17,6	18,4	17,8	15,6	14,7	15,8	15,o
	PM	17,7	17,3	17,3	17,3	16,4	14,6	15,9	14,9	18,4	18,3	17,7	18,2
TG	A	8,2	4,9	7,7	5,8	7,5	3,4	6,7	4,4	13,1	1o,5	1o,o	1o,4
	B	5,3	3,3	5,7	4,o	4,7	2,2	4,6	2,9	9,7	8,1	8,4	8,3
	Z	4,6	2,2	4,8	3,o	4,3	1,3	3,9	2,1	7,4	6,1	7,1	6,5
	PU	17,7	17,o	19,3	17,6	17,6	17,1	19,8	17,8	18,6	16,9	17,5	17,1
	PP	18,8	17,7	2o,2	18,4	19,o	18,1	21,2	18,9	17,3	15,6	16,3	15,9
	PM	16,7	16,1	18,o	16,6	16,2	15,5	17,9	16,1	2o,4	19,o	18,6	18,9
TW	A	8,1	6,7	8,1	7,2	6,6	4,o	6,7	4,9	9,1	8,5	8,8	8,7
	B	5,8	4,9	6,3	5,3	4,5	2,9	5,1	3,5	6,6	6,4	6,9	6,6
	Z	4,5	3,5	5,o	4,o	3,7	2,1	4,o	2,7	5,1	4,5	5,6	4,9
	PU	16,8	16,5	17,6	16,8	17,o	16,6	18,9	17,7	16,6	16,5	16,8	16,6
	PP	16,8	16,4	17,6	16,7	18,5	17,9	2o,1	18,4	15,3	14,8	15,8	15,1
	PM	17,1	16,9	17,5	17,1	15,5	15,1	17,o	15,5	18,1	18,4	17,7	18,2

Internal trade of the developing regions will grow faster than their other links, assuming that their collective self-reliance and regional integration will develop strongly.

The price alternatives produce very significant terms of trade changes even at this high level of aggregation, as can be seen on Table 5. The terms of trade of the developed countries are deteriorating by 5.5% even in the case of unchanging relative prices (alternative PU), while in case PP their "loss" is 12%. In the case when manufacturing prices increase faster (PM) their "gain" is only 2%. The improvement of the developing regions terms of trade is bigger: 14.4% in case PU (due mainly to the oil price rise of 1979-80) and 32.9% in alternative PP. Their "loss" is 4.7% in case PM. Of course, one should not lose sight of the fact that in the developing regions oil exporters and importers are aggregated, that the improvement is bigger for the former and that there can be a deterioration for the latter even in cases PU and PP. (In the case of Western Asia for example, the terms of trade improvement in PU is 31%, in PP 67%, while in South-East Asia there is a deterioration of 4 - 5% in both cases.)

Terms of trade changes are even higher among regions; in alternative PP for example, the deterioration of developed countries' terms of trade with the developing world would be 34%. Price alternatives do not show much effect on the terms of total trade of socialist countries, but this is due to the equalizing effects of their trade with the two other aggregated regions: in case PP their "gain" would be 23% with the developed countries and their "loss" 27% with the developing ones.

Terms of trade changes of the main commodity groups are smaller, showing that much of these effects are due to differences in commodity structures and not so much to price differences of the same commodity category. Even in the case of East-West primary goods' trade, the "gain" of the Socialist countries is the consequence of the high share of Soviet fuel exports. The "loss" of both the Socialist and developing countries in their manufacturing trade with the West is due to our assumption that prices of high-technology products will grow faster than those of traditional industrial goods.

The extremely high share of intra-regional trade of the socialist countries decreased very significantly in the past two decades from three-quarters to two-thirds of their total exports between 1955-1965 and to 57% by 1977. In the fast growth alternative, this trend will continue and by 1990, intra-trade will go down to 50%, while the share of exports to OECD countries will increase from 29% to 33%. However, the intensities of exports in different directions are quite divergent between the Soviet Union and Eastern Europe (Table 6). According to alternative A, the Soviet export shares to North America and Japan are fast growing, while that of Western Europe is diminishing somewhat. For Eastern European exports, the share of all three main developed regions are increasing, the rate of growth of these trade flows are much higher than their exports to the Soviet Union. In the

Table 5.

Terms of trade changes by alternatives between 1977 - 1990.

Regions	Alternatives	Total trade				Primary goods				Manufactures			
		TS	TD	TG	TW	TS	TD	TG	TW	TS	TD	TG	TW
TS	PU	1oo,oo	1o9,47	85,44	1oo,94	1oo,oo	122,64	1oo,2o	1o7,2o	1oo,oo	83,71	1o4,34	95,48
	PP	1oo,oo	122,81	73,29	1o2,4o	1oo,oo	124,9o	99,94	1o8,o9	1oo,oo	85,86	1o2,87	96,11
	PM	1oo,oo	95,11	1o2,47	98,81	1oo,oo	11o,96	99,59	1o3,96	1oo,oo	85,82	1o4,o6	96,11
TD	PU	91,35	1oo,oo	82,39	94,5o	81,54	1oo,oo	88,83	93,57	119,45	1oo,oo	116,26	1o1,o8
	PP	81,42	1oo,oo	65,69	88,oo	8o,o6	1oo,oo	86,o1	93,11	116,47	1oo,oo	112,89	1oo,46
	PM	1o5,14	1oo,oo	1o7,5o	1o2,o5	9o,12	1oo,oo	94,73	96,82	116,53	1oo,oo	113,37	1oo,71
TG	PU	117,o4	121,37	1oo,oo	114,38	99,8o	112,57	1oo,oo	1o4,24	95,84	86,o2	1oo,oo	88,75
	PP	136,44	152,24	1oo,oo	132,94	1oo,o6	116,27	1oo,oo	1o4,83	97,21	88,58	1oo,oo	9o,52
	PM	97,65	93,o2	1oo,oo	95,26	1oo,44	1o5,56	1oo,oo	1o1,73	96,o9	88,21	1oo,oo	9o,18

Note: The terms of trade indices show the ratio of export and import price indices in per centage.

Table 6.

Shares of the main markets in Soviet and Eastern European exports in 1977 and alternatives A and Z for 1990.

		SU	EE	WE	NA	JP
SU	1977	0	50,3	28,7	1,1	2,8
	A	0	45,2	27,9	2,4	4,7
	Z	0	53,6	21,5	1,2	3,1
EE	1977	34,5	28,9	22,7	1,8	0,4
	A	25,9	30,8	25,3	2,4	1,0
	Z	36,4	30,5	16,7	1,8	0,7

Table 7.

Export shares of developed regions in 1977 and alternatives A and Z for 1990.

Exporting Regions		Importing Regions			
		WE	NA	JP	TW
WE	1977	66,17	7,14	0,99	100
	A	61,63	7,18	2,98	100
	Z	67,02	5,18	1,42	100
NA	1977	23,92	34,28	8,09	100
	A	24,05	27,89	13,59	100
	Z	22,37	32,10	11,43	100
JP	1977	16,13	26,95	0	100
	A	18,40	22,56	0	100
	Z	17,02	20,79	0	100

period 1972-1977, the increasing share of Western markets for Socialist countries was mainly due to Soviet exports of primary goods. According to alternative A, Eastern Europe will have a bigger part in the dynamics of this change. The opening-up process will continue to diminish the share of intra-trade between the Soviet Union and Eastern Europe, while the share of intra-trade of the Eastern European countries is still increasing. The decline in the share of Soviet exports to Eastern Europe is much smaller than the decline in the opposite flow and, as a consequence of this, Eastern European intra-trade will have the largest share in their trade and those of the Soviet Union and Western Europe will be about the same. All of this is, of course, due to the differences in the commodity composition of their exports; in more liberal trading conditions, trade in manufactures can develop faster and they have a higher share in Eastern European exports.

The share of exports to North America and Japan is fast increasing in alternative A as a result of a "normalisation" process. Yet one should not lose sight of the fact that even with this strong growth of intensities, their level remains low (see Table 8).

If we could assume that in alternative A, Eastern and Western European integration can develop significantly, in alternative Z, the opposite is the case. Both the share of Western European imports and the intensity of trade is strongly reduced, much below the 1977 level. This is not true for the other two large developed regions (NA,JP), especially in the case of Japan whose slow growth and strong protectionist tendencies will likely force her to increase trade relations with the Socialist countries of Asia and Europe.

In alternative Z, the intra-trade of CMEA countries will strongly increase, with its share reaching more than 60% of their total trade. The shift will go mainly into the bilateral trade flows of the European Socialist countries with the Soviet Union, the intra-trade of the former countries will not increase substantially. This is a consequence of the assumption that more integration and a liberalized trade with the West can be beneficial for the trade relations of the smaller Eastern European countries as their efficient specialization can remove the consequences of parallel development. Comparing the two extreme alternatives, it is obvious that the increase of world tensions, barriers to trade are harmful for all regions, but the disadvantages are not equal in size. Eastern Europe can gain more in a liberal atmosphere of detente, and loose more in the opposite case.

The intra-trade of the developed regions is slowely decreasing from 46.3% to 44.6% of world trade in all alternatives, but what is happening among these regions is more important than their total share. It can be seen on Table 7 that the share of the intra-trade of Western Europe and North America is diminishing in alternative A, while their shares in trading with other developed regions is increasing. Trade intensities (Table 8) show a similar development with the exception of the intra-trade of Western Europe,

Table 8.

Trade intensity indicators in 1977 and alternatives for 1990.

Exporting Regions		Importing Regions				
		SU	EE	WE	NA	JP
SU	1977	-	9,55	o,64	o,o6	o,44
	A	-	7,98	o,69	o,16	o,49
	B	-	9,53	o,57	o,o9	o,48
	Z	-	1o,oo	o,51	o,o9	o,39
EE	1977	9,23	5,72	o,52	o,11	o,o6
	A	7,34	5,64	o,65	o,17	o,11
	B	8,69	5,91	o,55	o,14	o,o9
	Z	9,81	5,9o	o,41	o,15	o,o9
WE	1977	o,61	o,55	1,53	o,44	o,16
	A	o,71	o,69	1,58	o,51	o,32
	B	o,64	o,6o	1,61	o,43	o,23
	Z	o,55	o,5o	1,64	o,37	o,18
NA	1977	o,33	o,14	o,55	2,11	1,33
	A	o,55	o,24	o,62	1,99	1,48
	B	o,43	o,18	o,58	2,11	1,43
	Z	o,27	o,25	o,55	2,32	1,47
JP	1977	o,6o	o,17	o,35	1,56	-
	A	o,64	o,28	o,43	1,46	-
	B	o,73	o,24	o,4o	1,41	-
	Z	o,68	o,28	o,38	1,39	-

where the intensity is continuing to grow as integration is going to be extended throughout the whole region. The case of Japan is special because their exports to North America will continue to increase rapidly in this alternative also, but their exports to other markets will be even faster resulting in diminishing intensity and share coefficients.

The "normalization" tendency of trade relations can be observed in alternative A in North-South flows also, which means that the intensive flows (like North and Latin America, or Western Europe and Africa) are developing at a slower rate, while other, comparatively neglected, flows of the past, grow faster. In alternative Z, just the opposite can be observed; certain developing regions are more closely linked to certain developed regions, motivated by traditional and political considerations.

Within the limitation of this paper, a very fragmentary and sketchy picture only could have been given of the results of our modelling work. Conceding that these results are rather modest and the methods applied very unsatisfactory, belief has not faltered that the study of development alternatives for international trade in a consistent framework is feasible and more efforts should be made to move ahead in this direction to inform policy makers and planners, both of the limitations and long-term consequences of their decisions.

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