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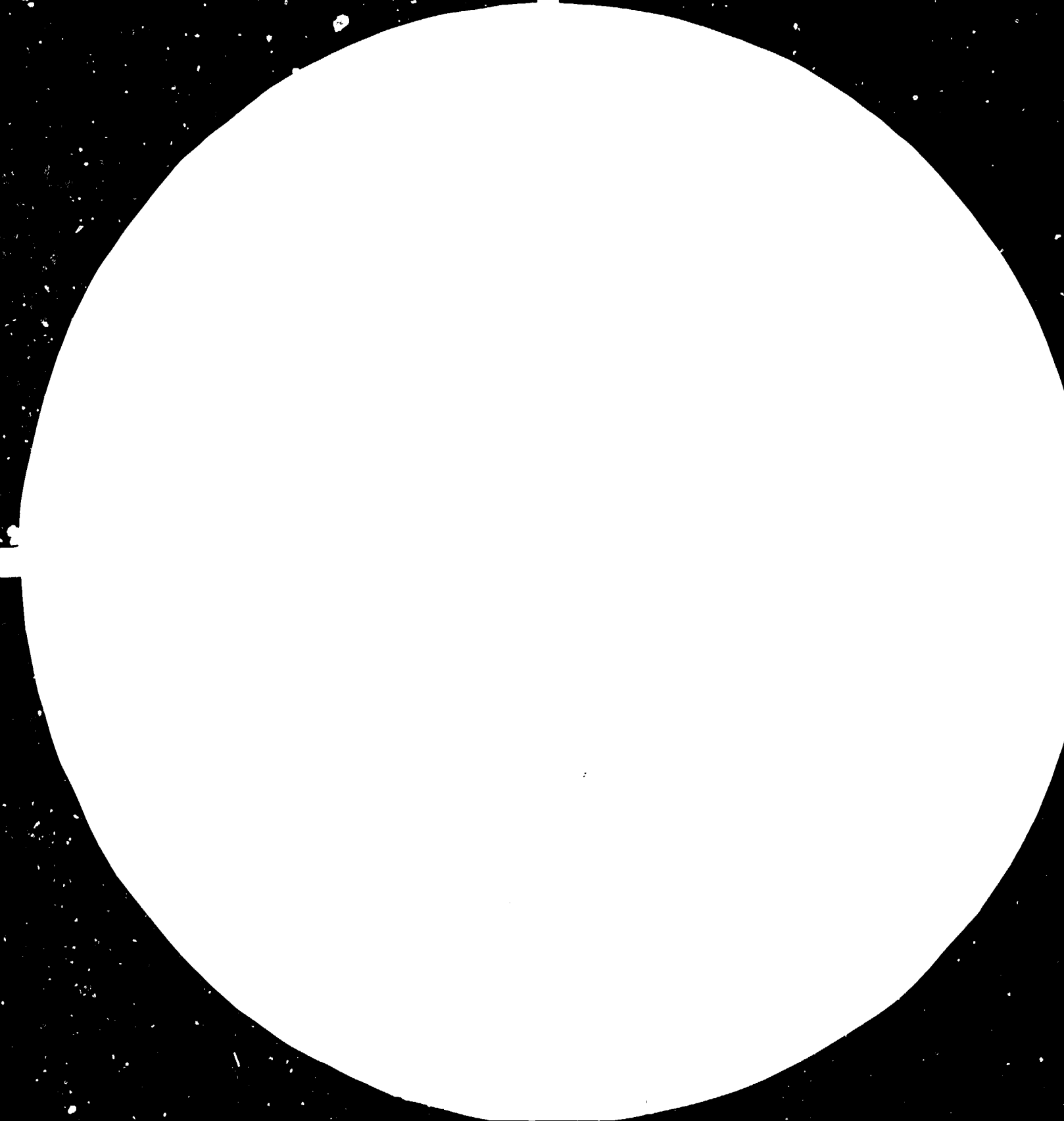

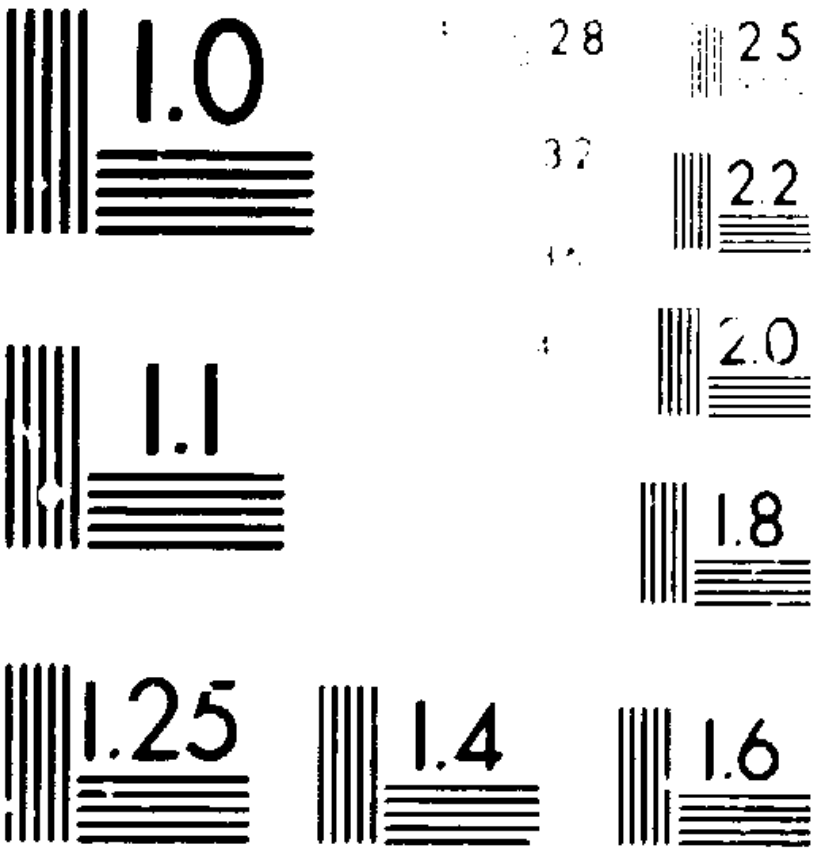

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THE DEVELOPMENT OF CHEMICAL AND PETROCHEMICAL INDUSTRIES IN THE EUROPEAN CMEA COUNTRIES

Sectoral Working Paper Series

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SECTORAL WORKING PAPERS

In the course of the work on major sectoral studies carried out by the UNIDO Division for Industrial Studies, several working papers are produced by the secretariat and by outside experts. Selected papers that are believed to be of interest to a wider audience are presented in the Sectoral Working Papers series. These papers are more exploratory and tentative than the sectoral studies. They are therefore subject to revision and modification before being incorporated into the sectoral studies.

This document was prepared by Mr. V. G. Gerus, Head of Section, Market Research Institute, Ministry for Foreign Trade of the USSR, as UNIDO consultant. The designations employed, the presentation of material and the views expressed in this document are those of the consultant and do not necessarily reflect the views of the UNIDO secretariat.

Preface

As part of its study programme on petrochemical industries, UNIDO has commissioned the preparation of this research paper. It presents an input to a wider study on the petrochemical industry which is being prepared as background document for the Third Consultation meeting on the industry. Following the recommendations of the Second Petrochemical Consultation to study all forms of co-operation and long-term arrangements, this paper reveals one aspect of possible means of co-operation namely, compensatory arrangements and production specialization and co-operation in the centrally planned economy countries.

The study has been carried out by Mr. V.G. Gerts, Head of Section, Market Research Institute, Ministry for Foreign Trade of the USSR, as UNIDO consultant.

The document is presented in the Sectoral Working Paper Series in the hope that it may stimulate a discussion of various forms of co-operation arrangements.

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Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise stated.

A comma (,) is used to distinguish thousands and millions.

A full stop (.) is used to indicate decimals.

A slash between dates (e.g., 1980/81) indicates a financial year.

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

Metric tons have been used throughout.

The following forms have been used in tables:

A dash (-) indicates that the amount is nil or negligible.

A blank indicates that the item is not applicable.

1. PRODUCTION TRENDS - SPECIALIZATION AND CO-OPERATION

1.1 The role and place of the chemical industry

The countries of the Council for Mutual Economic Assistance (CMEA) attach special importance to the chemical industry as one of the key industries instrumental in accelerating scientific and technological progress and in raising the production efficiency.

In 1970-1982 the output of this industry went up 3.1 times in Bulgaria, 2.5 times in Hungary, 2 times in the German Democratic Republic (GDR), one time in Poland, 3.4 times in Romania, 2.4 times in the USSR and 2.2 times in Czechoslovakia.

Table 1. Index of chemical production
CMEA countries (1970 = 100)

Country	Chemical industry				Industry as a whole			
	1975	1980	1981	1982	1975	1980	1981	1982
Bulgaria	174	277	289	307	155	206	216	225
Hungary	161	234	248	251	136	161	166	162
GDR	150	190	197	203	137	174	182	188
Poland	176	218	193	193	164	207	184	180
Romania	207	327	338	343	184	290	297	300
USSR	164	216	228	235	143	178	184	190
Czechoslovakia	161	213	217	220	138	174	177	179

Source: The Statistical Yearbook of the CMEA countries, 1983, Moscow, pp. 55, 65.

The rate of growth of chemical industry grew by a factor of 1.3 faster than the total industrial production in 1971-1982, and a factor of 1.5 faster in 1961-1969.

Table 2. Annual growth rates of industrial production
(per cent)

Country	Chemical industry			Industry as a whole		
	1971-75	1976-80	1981-82	1971-75	1976-80	1981-82
Bulgaria	11.7	9.7	5.4	9.1	6.0	4.6
Hungary	10.0	7.8	3.6	6.5	3.4	2.5
GDR	8.4	4.9	3.3	6.5	5.0	3.9
Poland	12.0	4.3	-6.0	10.5	4.6	-7.1
Romania	15.7	9.6	2.4	13.0	9.5	1.8
USSR	10.4	5.6	4.4	7.4	4.4	3.1
Czechoslovakia	9.9	5.8	1.5	6.7	4.6	1.5

Source: The Statistical Yearbook of the CMEA countries, 1983, pp. 56, 58.

It should be noted that the share of the chemical industry in the total industrial production has also grown.

Table 3. Selected indices of the CMEA countries,
chemical industries (per cent)

	Share in industrial output			Share in total industrial capital investment			Labour productivity growth (1970-1982)
	1970	1980	1982	1970	1980	1982	
Bulgaria	7.5	9.0	8.3	15.9	9.4	10.0	197
Hungary	9.1	13.2	13.4	10.5	7.8	11.4	253
GDR	11.0	11.5	11.3	12.3	10.7	13.5	187
Poland	8.2	8.8	9.0	12.4	9.4	9.4	184
Romania	10.4	9.0	10.0	11.7	14.1	12.9	192
USSR	6.6	7.6	7.2	8.8	8.8	8.1	192
Czechoslovakia	6.9	8.5	8.5	12.6	6.4	7.3	194

Source: The Statistical Yearbook of the CMEA countries, 1983, pp. 131, 141, 148.

The accelerated development of the industry was made possible by large-scale capital investments the growth rates of which, especially in 1965-1975, were much higher than in industry as a whole. As a result, the USSR and the other socialist countries have markedly increased their production capacity.

Table 4. New production capacities commissioned in the chemical and petrochemical industry of the USSR (1971-1982)

	Capacity per year	1971-75	1976-80	1981	1982
Mineral fertilizers (100% nutrient)	million tons	9.0	8.8	0.4	1.3
Sulphuric acid	million tons	8.6	9.7	0.7	0.7
Soda ash	1,000 tons	1 038.0	505.0	100.0	100.0
Chemical fibre & threads	1,000 tons	349.4	262.9	39.7	60.7
Synthetic resin & plastics	1,000 tons	981.0	1 505.0	352.0	127.0
Paints & varnishes	1,000 tons	505.0	327.7	15.0	12.9
Automobile tyres	million pieces	12.9	13.2	2.2	0.3

Source: Narodnye khozaystvo SSSR v 1982 (The USSR National Economy in 1982), Moscow, 1983, p. 330.

Between 1950-1982, the number of enterprises in the chemical and petrochemical industry in the European socialist countries that have been commissioned with Soviet assistance alone was 81, with another 51 being under construction.

From 1971 to 1982 the CMEA countries rapidly increased the output of various types of chemical products: plastics and synthetic rubber production went up 2.6 times and synthetic fibres production increased 3.6 times. There was also a rapid growth in the production of synthetic organic chemicals, ancillary materials for various industries, plant protection chemicals and mineral fertilizers. The result was an improved production structure.

In most European socialist countries, petrochemistry is a relatively young branch of the chemical industry, the rise and development of which are closely related to the process of economic integration of the socialist

countries. The CMEA community as a whole is endowed with a solid raw material base for the development of the chemical and petrochemical industries. Yet the raw materials, especially their most essential types such as oil and gas, are characterized by a rather irregular distribution. At the time when top priority is assigned to the development of synthetic organic chemistry, provision of essential fuel and raw materials acquires primary importance. At present the CMEA countries furnish 90-95 per cent of their own needs in energy and other resources from their indigenous sources.[1/] In 1982 the share of the CMEA countries in the world output of some types of energy resources essential for the development of the chemical and petrochemical industries was (percentage in parentheses stands for 1970):

Electricity :	21.1 (19.5)
Coal :	32.2 (34.3)
Oil :	24 (16.2)
Natural and associated gas:	34.3 (21.0)[2/]

1.2 Specialization and co-operation

The availability of fuel, raw material and labour resources largely determines the scale and the most rational distribution of chemical and petrochemical industries in the CMEA countries as well as production specialization and co-operation.

The comprehensive programme of socialist economic integration includes the following major activities directly relating to the chemical industry:

- Joint tackling of fuel and raw material problems;
- Deeper production specialization and co-operation;
- Measures aimed at co-ordinating the national long-range economic plans including scientific and technological co-operation.

1/ Kommunist, No. 7, 1983, p. 74.

2/ Mir Sotsializma v tsifrakh i factakh (The World of Socialism: Facts and Figures), Moscow, 1983, pp. 157-158.

Table 5. Major energy resources produced by the CMEA countries in 1982

	Electricity (total generation) billion kWh	Petroleum including gas condensate million tons	Natural and associated gas billion m^3	Coal million tons
USSR	1,367	613.0	467.0	647.0
Bulgaria	40	-	0.1	32.2
Hungary	25	2.0	6.6	26.1
GDR	103	-	-	276.0
Poland	118	0.2	5.5	227.0
Romania	69	12.0	38.0	37.9
Czechoslovakia	75	0.1	0.7	125.0

Source: Narodnoye khozaystvo SSSR v 1982 g. (The USSR National Economy in 1982), Moscow, 1983, p. 66.

The development of the petrochemical industry in the European socialist countries was given a decisive boost by the construction of the Druzhba oil pipeline in 1964 and the Bratstvo and Soyuz (2750 km) gas pipelines in 1967 and 1979 respectively. The Soyuz gas pipeline supplies 15.5 billion cubic metres of gas annually to the CMEA countries, an amount which is more than the total combined gas output from Bulgaria, Hungary, the German Democratic Republic, Poland and Czechoslovakia. From 1976 to 1980, the USSR exported 378 million tons of oil, 52 million tons of oil products, 94 billion cubic metres of gas, and 64 billion kilowatt hours of electric energy to the European socialist countries.[3/] The total exports of Soviet energy resources to the CMEA countries in that period amounted to about 830 million tons of coal equivalent.[4/] Guaranteed by long-term agreements and in a number of cases at prices lower than world prices, fuel and raw material supplies have become a stable base for the development of the chemical industries in the CMEA countries. This is a vital factor taking into account the instability of world markets and sharp fluctuations of energy prices. It has been estimated

3/ Komunist, No. 18, 1983, p. 74.

4/ Ekonomicheskoye sotrudnechestvo stran-chlenov CEV (Economic Cooperation among the CMEA Member States), No. 1, 1980, p. 7.

that the total economies of hard currency gained by the CMEA countries from the differences between the world and contract prices for oil only traded among the socialist countries in 1974-1979 amounted to at least 3 billion dollars annually.[5/] Currently the hydrocarbon raw materials supplied by the USSR ensure the operation of nearly the entire petrochemical industry of the CMEA countries. For example, in 1982 the CMEA countries accounted for the following shares of the total plastics production in the community:

the German Democratic Republic - 14.2 per cent
Czechoslovakia - 13.7 per cent
Bulgaria - 4.7 per cent (1.3 per cent in 1960), and
Hungary - 4.7 per cent (1.8 per cent in 1960).

In addition, about 60 per cent of the CMEA countries' chemical industry output is produced at factories that have been built in co-operation with Soviet organizations.[6/] Endowed with large raw material and energy resources, in tackling the problems of specialization in petrochemical production within the CMEA framework, the USSR have pledged to develop their most material- and energy-intensive types. The 1979 General Agreement, signed by all the CMEA countries, provides for a substantial growth of production capacities for the manufacture of energy-intensive products in the USSR and less energy-intensive products in other countries to be traded on an equitable basis. Taking into consideration the needs of the socialist countries for petrochemical products, the Soviet Union has planned to increase the production of ammonia, methanol, mineral fertilizers, polyethylene, polystyrene, PVC, acrylonitrile, isoprene rubber etc., while other CMEA countries are planning to raise the output of polyurethanes, epoxy resins, synthetic dyes, paint and varnish materials, optical bleaches, chemical additives, textile ancillary materials, plant protection chemicals, pharmaceuticals, etc. Only in 1981-1985, the USSR is to supply energy-intensive products worth 700 million roubles to the socialist countries in exchange for less energy-intensive products worth 790 million roubles.[7/]

5/ Economicheskoye sotrudnechestvo stran-chlenov CEV (Economic Co-operation among the CMEA Member States), No. 1, 1980, p. 7.

6/ Voprosy ekonomiki (Problems of Economics magazine), No. 3, 1983, pp. 130-132.

7/ Ekonomicheskoye sotrudnechestvo stran-chlenov CEV (Economic Co-operation among the CMEA Member States), No. 11, 1983, p. 63.

To implement this agreement, the Soviet Union supplied to the CMEA countries 28,500 tons of polyethylene in 1981-1982, 314,000 tons of potassium fertilizers, 300,000 tons of nitrogen fertilizers and other products, while the CMEA countries shipped to the USSR 89,000 tons of plant protection chemicals and 20,500 tons of dyes and other products.[8/] The co-operation enables the European CMEA countries to achieve savings in energy and to satisfy mutual demands for these essential types of products.

By now, in addition to developing specialization of the countries in the manufacture of energy-intensive and less energy-intensive products, most tangible successes have been achieved in the sphere of specialization and co-operation in the manufacture of synthetic organic dyes, reagents, plant protection chemicals, household chemicals, cinephotographic materials and pharmaceuticals.

The development of the chemical and petrochemical industries in the CMEA countries involves deeper multilateral and bilateral production specialization and co-operation. The purpose of this activity is to concentrate the manufacture of structurally and technologically homogeneous products in one or several countries with a view to satisfying completely or in part the requirements of all the interested countries, raising the technological level of production, establishing steady economic ties and production co-operation. About 75 per cent of the items covered by agreements on specialization in all industries are to be manufactured in two countries at the most, with 45 per cent of the amount to be manufactured in one country only.[9/]

As a result, a number of countries phased out inefficient industries in favour of imports from other socialist countries in order to focus their efforts on the most efficient productions with a view to satisfying the needs of all the CMEA countries. For example, by the mid-1970s the CMEA countries terminated imports of 86 pharmaceutical products and reduced the level of

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8/ Op. cit. p. 6, footnote 2, No. 11, 1983, p. 63.

9/ Kommunist, No. 18, 1983, p. 59.

imports of 72 other products,[10] not to mention the fact that Hungary phased out the production of a number of dyes and chrome compounds.[11]

Progress of specialization in chemistry in CMEA countries is characterized by the fact that a great number of multilateral and especially bilateral agreements have been negotiated, resulting in increased volumes of specialized supplies in their mutual trade. In the total value of mutual exports of chemical products by CMEA countries, the share of specialized items went up from 12 per cent in 1975 to 34 per cent in 1981, with plant protection chemicals going up from 10 per cent to 71.6 per cent, and photographic materials from 0.6 per cent to 40.2 per cent.[12]

The first multilateral agreement which was signed in 1972 by all the CMEA countries called for specialization in the production of 22 kinds of synthetic rubber. It covered both the utilization of existing free production capacity and the construction of new plants.

Specialization in the production of fine chemicals is organized mainly on a multilateral basis with all participants being at the same time exporters and importers, i.e. they are exchanged in the entire range of products and product-mixes. The requirements of the CMEA countries for certain kinds of products are satisfied through production specialization in two or three countries. For example, as partners in specialization the USSR and the German Democratic Republic are major suppliers of various photographic materials and some kinds of synthetic rubber to other CMEA markets. The cited examples illustrating the level of specialization in certain products provide convincing evidence of the high efficiency of such CMEA multilateral international organizations as Interchim and Interchimvolokno, as well as bilateral organizations set up by the German Democratic Republic and the USSR, such as Domochim for household chemicals and Assofoto for cinephotographic

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10/ Informatsionnyi bulleten po khimicheskoy prom-ti (The Chemical Industry's Information Bulletin), No. 4, 1976, p. 20.

11/ Koezgasdagshagh. semle, No. 2, Budapest, 1977.

12/ Ekonomicheskoye sotrudnechestvo stran-chlenov CEV (Economic Co-operation among the CMEA Member States), No. 6, 1983, p. 25, and No. 1, 1983, p. 19.

and magnetic materials. For example, the Interchim member states doubled the volume of their mutual supplies of synthetic dyes (specialization is calling for the production of 600 items) and ancillary substances for the light industry in 1980 against 1970, while the range of the supplied dyestuffs increased by 100 items, and that of ancillary substances by 200 items. Similarly, the successful implementation of the 1976-1980 intergovernmental agreement on specialization and co-operation in the production of plant protection chemicals among the Interchim member-states contributed to the growth of their output, assortment and natural deliveries. The joint planning of production of plant protection chemicals for 1976-1980 covered 77 items, i.e. 30 per cent of their total assortment.[13/] The agreement for the production of plant protection chemicals envisages the construction of more than 40 new plants and the expansion of 10 existing ones, specialization in the production of certain items, and joint planning of research and development.

Interchim provided a framework for negotiating agreements on specialization and co-operation in the production of ancillary substances for the light industry, chemical additives for polymer materials (38 kinds, including the construction of new capacity), tyres, pharmaceuticals (82 kinds), and chemical and biochemical additives to fodder. Even broader use is made of bilateral agreements on specialization and co-operation in the chemical industry. For example, Poland and Bulgaria have signed more than 20 such agreements with CMEA countries, and Czechoslovakia 31 agreements.

In 1976-1980 under similar agreements with the USSR, Bulgaria specialized in 30 major products, while the USSR specialized in 150 items;[14/] under bilateral agreements with the USSR, Romania specialized in the manufacture of 22 kinds of products, while the USSR specialized in 30 items. The bilateral agreements negotiated between Romania on the one hand, and Bulgaria, Hungary, the German Democratic Republic, Poland and Yugoslavia on the other, provide

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13/ Op. cit. No. 2, 1983, p. 9.

14/ N.B. Sterlina, Mezhdunarodnaya spetsializatsia i kooperirovanie stran-chlenov CEV (International Specialization and Co-operation among the CMEA Countries), Moscow, 1982, p. 64.

the basis for the ongoing multilateral co-operation in the production of isopyrene rubber. The isopyrene factory in Romania supplies rubber to the countries participating in the bilateral agreement in return for the required supply of raw materials.[15/]

Specialization is increasing as a basis for co-operation in interrelated industries which play an important role in the implementation, e.g. of the so-called olefin programme. The bilateral agreements on co-operation in the sphere of production and mutual supplies of olefins and their products have been negotiated between the USSR and Hungary, the German Democratic Republic and Czechoslovakia, and between Romania and Yugoslavia. The agreements produced large-scale industrial projects for the manufacture of ethylene, propylene, plastics, and the ethylene pipelines (760 km) connecting the member countries. This makes part of the ethylene ring that would connect the petrochemical complexes of the CMEA countries with the western regions of the USSR. This endeavour will be crowned by augmented opportunities for industrial co-operation among the CMEA countries' petrochemical plants.

Bilateral and multilateral specialization and co-operation agreements among CMEA countries cover an increasing range of products, facilitate long-term and steadier commercial ties and the growth of mutual flows of deliveries. In 1982 the chemical industry accounted for 10.4 per cent[16/] of the mutual exports of the CMEA countries of specialized industrial products worth 18.8 billion roubles.[17/] Putting an end to overlapping in the production sphere, specialization and co-operation shape a long-term trend of specialization in the production of certain kinds of products. Today's pattern of specialization is such that the USSR acts on the CMEA market as a supplier of raw materials and material- and energy-intensive heavy chemical products, while the majority of the European socialist countries act as exporters of fine chemicals, i.e. specialty chemicals.

15/ Op. cit.

16/ Economic Co-operation among the CMEA Member States, No. 1, 1983, pp. 18-19.

17/ Voprosy ekonomiki, No. 1, 1984, pp. 136-137.

German Democratic Republic -	photochemicals, dyestuffs, plant protection chemicals, certain kinds of synthetic rubber, and potassium fertilizers;
Hungary -	pharmaceuticals, plant protection chemicals, and plastic products;
Poland -	paints and varnishes, cosmetics and pharmaceuticals, and organic dyestuffs;
Czechoslovakia -	chemical reagents and dyes;
Bulgaria -	plant protection chemicals, soda products, and pharmaceuticals
Romania -	polymer materials, certain kinds of rubber, caustic soda and synthetic fibres.

1.3 Joint projects

Implementing the production specialization and co-operation agreements in the chemical industry, the CMEA countries make an increasing recourse to the practice of combining resources, including capital investments, of interested countries in the construction of compensation projects. This serves the purpose of expanding joint production and processing capacity. This form of co-operation can be exemplified by the following projects:

- The construction of the Mozyr factory in the USSR for the annual production of 300,000 tons of fodder yeast from highly purified liquid oil paraffins, of which about 130,000 tons is to be supplied to the German Democratic Republic, Cuba, Poland and Czechoslovakia on a pro rata basis;

- The second stage of the Kingissep phosphorite factory in the USSR (with Hungary, the German Democratic Republic and Czechoslovakia as participating countries) to produce ammophos, whose deliveries began in 1976;

- A factory for the production of caustic soda, chlorine and chlorine derivatives in Romania with the participation of the USSR that is to receive about 60 per cent of the total output as credit repayment;

- The participation of all CMEA countries (with the exception of Czechoslovakia) in the construction of the Ust-Ilim pulp and paper factory to produce 500,000 tons of white sulphate pulp per year. The Soviet deliveries in repayment of credits will exceed 200,000 tons per year during the first 12 years, the term to be extended if the countries show continuing interest in the product;

- The Kiembayev asbestos factory, which started deliveries in 1980 upon completion of the first stage of the project: 180,000 tons of asbestos products per year during 12 years; and a number of other projects.

The agreed plan for multilateral integration activities in 1976-1980 provided for the allocation of 9 billion transferable roubles as joint capital investment by the interested countries.[18/] Under the agreed plan for 1981-1985, 44 per cent of the total expenditures allocated for the construction of joint projects on the Soviet territory will be covered by European CMEA countries (the second stage of the Mozyr fodder yeast factory, Khmelnitsky nuclear power station, the power transmission line Lep-750, the manufacture of energy-intensive chemical products in the USSR).

The participation of interested countries in the construction of enterprises on the cerritory of other countries as a rule takes the form of providing the requisite materials and technologies, such as machinery and equipment, structurals, consumer goods, technical documentation for projects and not infrequently, manpower, to repay the credit. If the need arises, the participating countries allocate hard currency to buy materials and equipment from third countries. The back flow of product supplies is based on the shares of a participating country in the credits granted. Therefore, the repayment of purpose-oriented credits is effected with deliveries of products to be manufactured by the project under construction, i.e. on a compensation basis. For example, in repayment of its 880 million roubles credit for the joint financing of the Soyuz gas pipeline construction, Czechoslovakia is to

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18/ CMEA: Figures, Facts, and Arguments, Moscow, 1982, pp. 13-15.

receive 2.9 billion cubic metres of gas annually during a period of 20 years[19/] with a possible extension of the deliveries. The entire integration activity undertaken by the CMEA countries is entirely voluntary, and is not accompanied by the setting up of supranational bodies, or changes in the independent nature of national planning. Each country decides in which ventures, to what extent, and on what terms it would enter a joint project. The commitments pledged by the participating countries are reflected in their national economic plans, and necessary resources are allocated.

Multilateral agreements on joint construction of projects are concluded, as a rule, on an intergovernmental basis. The agreements define the obligations of the countries on whose territories projects are to be constructed, and those of the other participating countries. Multilateral agreements form the basis of bilateral agreements which specify in greater detail the commitments of the participating countries.

The projects under construction are the property of the country where they are being set up. Joint projects are run by the owner-country.

The CMEA countries have moved from simple co-ordination of goods flows to the joint planning of integration activities, including joint construction of large-scale projects, multilateral specialization and co-operation as well as joint research and development.

1.4 Joint research and development activities

Specialization and co-operation are closely linked to the expansion of scientific and technological co-operation which is carried on in the form of co-ordinated and joint research. This co-operation may be bilateral and multilateral, with the latter form being increasingly practised on a wider scale. Multilateral agreements have been negotiated in nearly all essential branches of chemistry such as plastics and synthetic resins, pulp and paper production, monomers for synthetic rubber, household chemistry, chemical fibres, and microbiology.

19/ Economic Co-operation among the CMEA Member States, No. 5, 1982, p. 25.

Scientific and technological co-operation among the CMEA states is based on the principles of equal and unobstructed access of all the CMEA countries to modern technology owned by the community as a whole, renunciation of technological monopoly, and rendering assistance to less developed socialist states in acquiring technology.

The mid-1960s witnessed a transition in the coordination of activities in the most essential scientific and technological research on the basis of multilateral plans.

The Permanent CMEA Commission for the Chemical Industry co-ordinates annually from 90 to 110 research subjects, in which over 200 scientific research and design institutions took part in 1976-1980.[20/] Scientific research calls for the pooling of efforts and division of labour among the interested countries, and the concentration of effort and funds on the key problems. An increasingly common form of scientific and technological co-operation is joint work of specialists from several countries under co-ordinated plans that feature a clear-cut division of labour and responsibilities under corresponding agreements. Every year the CMEA Commission recommends many research results for practical implementation.

Multilateral and bilateral co-operation has facilitated the completion of research synthesis of new plastics and synthetic resins, the development of new technological processes and the improvement of existing ones in the sphere of petrochemistry and organic synthesis, especially those relating to the production of polypropylene fibres from co-polymers of acrylonitrile, heat-resistant polymers and co-polymers and ethylenepropylene rubber which have found wide application in industry. An advanced technology has been developed for producing polyamide silk, polyester fibres and high-pressure polyethylene. This technology was applied in polyethylene plants in the German Democratic Republic and the USSR. Forty-one organizations in CMEA countries co-ordinate their joint research around 48 themes in household chemicals. As a result, 24 technological processes have been developed and have found wide application in industry. Eleven prototypes of machines have been designed for

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20/ Op. cit., No. 6, 1983, p. 25.

pouring liquid synthetic detergents, and more than 25 new products have been developed.[21] More than 2,000 studies on environmental protection were completed between 1976 and 1980, the findings of 750 of these[22] have already been implemented. A bank of samples (250 catalysts) manufactured in the CMEA countries was established under an agreement on the development of new industrial catalysts,[23] and new catalysts have been developed.

21/ Op. cit., No. 3, 1982, p. 29.

22/ SEV: sotrudnichestvo ravnopravnoye, plodotvornoye CMEA - Equitable and Fruitful Co-operation, Moscow, 1982, pp. 61-62.

23/ Op. cit. pp. 61-62.

2. FOREIGN TRADE - FORMS OF CO-OPERATION

2.1 Development of trade in chemicals

The total foreign trade turnover of the CMEA member-states went up from 13 billion roubles in 1980 to 14 billion roubles in 1982 in chemical and petrochemical goods; in 1970-1980 it increased more than four times: exports 4.3 times, and imports 4 times.[24/]

Table 6. Foreign trade in chemical goods of the CMEA member states (million roubles, in current prices)

	Exports			Imports		
	1970	1980	1982	1970	1980	1982
Bulgaria	65	274	335	125	395	481
Hungary	-	700	-	-	1413	-
German Democratic Republic	-	1248	-	-	742	-
Poland	-	397	-	-	971	-
Romania	117	760	761	118	566	428
USSR	403	1638	1958	602	2401	2482
Czechoslovakia	160	573	549	296	897	860

Source: Recalculated on the basis of data from A Statistical Yearbook of the CMEA Member States, 1983, p. 313 and table No. 7.

In 1980 chemical goods accounted for 5.8 per cent of the CMEA countries' foreign trade with exports accounting for 5 per cent and imports for 6.6 per cent.

Since 1970, the structure of chemical goods exports of the CMEA countries showed an increase in the share of soda products, plastics and mineral fertilizers. The same was true for imports of varnishes and paints, plant

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24/ Economic Co-operation among the CMEA Member States, No. 2, 1983, p. 17.

Table 7. Share of chemical goods in the foreign trade of CMEA countries
(per cent)

	Exports			Imports		
	1970	1980	1982	1970	1980	1982
Bulgaria a/	3.6	4.0 e/	4.0	7.6	6.2 e/	5.7
Hungary	-	6.9	-	-	13.3	-
German Democratic Republic	-	10.2	-	-	5.5	-
Poland	-	3.4	-	-	7.4	-
Romania b/	7.0	10.0	9.7	6.7	6.4	6.5
USSR c/	3.3	3.3	3.1	5.7	5.4	4.4
Czechoslovakia d/	4.7	5.7	4.6	8.9	8.8	7.3

Note: Exclusive of chemical fibres and pharmaceuticals

Sources: a/ Bulgaria's Foreign Trade, A Statistical Yearbook of Bulgaria, 1982, p. 379.
b/ A Statistical Yearbook of Romania, 1982, p. 264.
c/ The USSR Foreign Trade, statistical Overviews for Respective Years. The USSR National Economy in 1982, Moscow, 1983, p. 535.
d/ A reference book of Czechoslovakian Foreign Trade, 1983, p. 20.
e/ Economic Co-operation Among the CMEA Member States, 1983, No. 2, p. 27.

protection chemicals, and plastics (table 8). The increase of the share of soda products is due to the commissioning of major production facilities in the German Democratic Republic, the USSR and especially in Bulgaria. Bulgaria has Europe's largest factory with a capacity of 1.2 million tons of soda ash per year. In 1980 Bulgaria's exports reached 1.1 million tons of soda ash that represent 76.6 per cent of its total production. Plastics exports from the CMEA countries in 1980 were nearly 900 thousand tons or 13 per cent of their gross output. The bulk of plastic exports falls on mutual trade between the CMEA countries. It should be noted that the CMEA countries continue to increase the production and exports of mineral fertilizers (see table 9). The share of their exports in the total production of the CMEA countries averaged 23 per cent in 1980 (19 per cent in 1970) with the major exporters, such as the German Democratic Republic, 63 per cent, Romania 41 per cent and the USSR 16 per cent. A breakdown by countries shows that the German Democratic

Table 8. Structure of the CMEA countries foreign trade in chemicals with all countries (total percentage)

Products and groups of products	Year	Total of CMEA countries a/ E	Total of CMEA countries a/ I	Bulgaria E	Bulgaria I	Hungary E	Hungary I	GDR E	GDR I	Poland E	Poland I	USSR E	USSR I	CSSR E	CSSR I
Soda products and other alkali	1970	3.3	3.0	4.7	0.1	5.9	4.5	2.2	0.6	6.2	0.3	2.9	5.3	2.9	2.5
	1980	8.2	2.4	31.3	0.3	2.5	2.9	3.6	0.2	5.4	1.0	13.0	3.6	2.6	2.9
Plastics and synthetic resins	1970	3.7	7.3 b/	6.5	9.4 b/	4.7	9.1 b/	3.7	8.2 b/	0.5	8.5 b/	3.6	6.4 b/	5.2	8.3 b/
	1980	8.1	7.9	5.3	10.4	3.7	10.4	8.4	9.6	3.2	4.9	4.9	6.9	15.3	7.4
Organic dyes countries	1970	2.1	4.1 b/	-	4.2 b/	-	2.7 b/	1.8	6.0	10.4 b/	3.1	1.0 b/	5.5 b/	11.1	6.0
	1980	2.6	4.0	0.5	4.0	0.1	3.2	1.7	4.1	10.9	2.0	0.7	4.6	8.6	5.5
Varnishes and paints	1970	5.9 b/	7.2 b/	1.6	9.6 b/	8.2	4.1 b/	7.8 b/	4.6 b/	10.2 b/	7.2 b/	2.3 b/	12.6 b/	7.5 b/	3.8 b/
	1980	5.4	8.3	3.8	8.6	2.5	5.6	8.9	5.7	13.9	6.0	2.3	12.7	4.9	5.3
Mineral fertilizers	1970	21.9	13.9	6.8	12.8	5.6	16.4	21.9	19.0	15.2	31.8	37.7	-	-	21.1
	1980	22.5	7.4	8.0	7.6	18.4	12.2	25.1	2.0	9.2	12.6	33.7	1.8	5.8	13.5
Plant protection chemicals	1970	4.4	5.5	7.1	9.7	5.0	6.9	7.2	3.2	3.4	2.4	0.9	7.2	6.0	3.8
	1980	3.4	6.8	3.3	8.1	8.6	6.3	5.1	3.5	1.8	4.6	1.0	10.0	1.4	4.5
Synthetic rubber	1970	4.2	3.9	-	6.3	-	3.5	4.8	2.4	0.5	6.1	6.9	2.3	1.9	5.4
	1980	4.0	4.0	0.8	6.3	0.3	2.9	3.6	3.3	5.7	6.3	7.1	2.8	0.8	6.2
Car tyres and tubes	1970	6.4	3.5	1.9	8.4	4.8	4.7	2.5	7.3	1.7	4.8	11.9	1.3	8.0	1.2
	1980	5.5	3.0	7.3	6.5	6.4	3.4	2.4	4.6	4.9	3.6	7.3	2.0	7.4	1.9

Source: Economic Co-operation Among the CMEA Countries, No. 2, 1983, p. 18 (in Russian).

Note: E = Exports; I = Imports.

a/ Exclusive of Cuba, Mongolia and Rumania.
b/ 1975

Republic exports mainly potassium fertilizers, the USSR all kinds of fertilizers and Romania like other CMEA countries nitrogen fertilizers. Exports of a number of countries show an increase in the share of organic dyestuffs, varnishes and paints, plant protection chemicals, and car tyres. This is a result of specialization and co-operation agreements among the socialist countries. In accordance with these agreements the USSR and Poland are major exporters of synthetic rubber.

Substantial shifts have also occurred in the structure of imports. Owing to the self-sufficiency of the CMEA countries, imports of soda products went down in both absolute and relative terms: the value of plastics imports by CMEA countries was 1.4 times[25/] higher than that of their exports in 1980 as against two times in 1970. Plastics import through mutual trade channels are markedly lower than their imports from market economy countries. Increment rates of imports of special kinds of plastics were above average. It should be noted that fine chemicals, such as organic dyes, varnishes, paints, and plant protection chemicals account for a greater share in the imports of the CMEA countries than in their exports. This stems from the fact that the growth rate of demand overtakes that of production capacity. Their share is especially high in the USSR imports. In 1980 the USSR exports of the above products compensated their imports only to a small degree, namely: organic dyes by 10.9 per cent (the average for the CMEA countries is 50.4 per cent); varnishes and paints - 12.3 per cent (46.4 per cent); and plant protection chemicals - 7 per cent (the average is 35 per cent for the CMEA countries).

The volume of fertilizer imports by the CMEA countries remained practically unchanged in 1970-1980. In recent years, the USSR, whose fertilizer imports had been insignificant, began to purchase a certain volume of phosphorus and nitrogen fertilizers.

On the whole, the share of imports in the CMEA countries consumption of fertilizers went down from 16.7 per cent in 1970 to 11.3 per cent in 1980, though in absolute terms it increased by nearly 9 per cent (table 9).

25/ Op. cit., No. 2, 1983, pp. 18 and 19.

Table 9. Mineral fertilizers production, exports, imports and apparent consumption in the CMEA countries (thousand tons of nutrients)

CMEA countries	Production		Exports		Imports		Apparent consumption	
	1970	1980	1970	1980	1970	1980	1970	1980
Total a/	20,497	37,133	3,916	8,636	3,332	3,627	19,913	32,124
Bulgaria	434	652	30	77	124	147	528	722
Hungary	518	1,045	34	206	796	851	1,280	1,690
GDR	3,245	4,735	1,739	2,989	184	50	1,690	1,796
Poland	1,629	2,239	47	99	1,144	1,329	2,726	3,468
Romania	895	2,451	219	1,015	30	150	706	1,589
USSR	13,095	24,778	1,847	3,979	33	143	11,280	20,942
Czechoslovakia	618	1,233	0.1	270	1,021	956	1,702	1,920

a/ Exclusive of Cuba, Mongolia and Romania.

Source: Economic Co-operation Among the CMEA Member States, No. 2, 1983, p. 20.

In 1980 the share of synthetic rubber in exports and imports was equal, while only 70.8 per cent of the value of imports was compensated by exports from the CMEA countries.

Mutual trade in chemicals among the CMEA countries showed more than a threefold increase in 1970-1980 (3.6 times from 1970 to 1981) and amounted to 4.7 billion roubles, with exports increasing 3.2 times and imports increasing 2.9 times. The mutual trade growth rates were lower than those with the rest of the world, i.e. exports to the rest of the world went up 4.3 times, and mutual exports 3.2 times, whereas imports showed increases of 4.0 and 2.8 times respectively. In 1980, the share of mutual trade in the CMEA countries' total foreign trade in chemicals was 36 per cent, lower than the share of mutual trade in total foreign trade (55 per cent). It should be noted that this share differs from country to country (see table 10).

Table 10. Share of CMEA countries' mutual trade in total trade in chemicals (per cent)

CMEA countries	Exports		Imports		Turnover	
	1970	1980	1970	1980	1970	1980
Total	58.4	43.3	42.8	30.4	49.3	36.0
Bulgaria	43.7	47.1	57.9	47.7	53.2	47.5
Hungary	46.9	28.3	42.2	24.2	43.3	25.6
GDR	66.8	51.7	39.4	26.8	57.5	42.4
Poland	48.5	41.0	44.9	32.6	46.0	35.1
Romania	38.3	26.7	31.9	21.8	34.7	24.7
USSR	62.5	50.8	39.8	29.6	48.9	38.3
Czechoslovakia	61.1	44.8	47.2	38.7	57.1	41.1

Source: Economic Co-operation among the CMEA Member States, No. 2, 1983, p. 20.

For imports of chemicals, the share of mutual trade is not large in all the CMEA countries. This reflects the situation which is characterized by the fact that the CMEA countries' demand for all major big volumes chemicals is met through their own production and mutual trade. As for fine chemicals and synthetic organic chemicals, it should be stressed that some of them are produced in the CMEA countries in volumes which are not enough to satisfy their internal demand.

It is important to note here that products manufactured under specialization and co-operation agreements account for a greater share in the structure of mutual exports than in trade with the rest of the world. The following percentages characterize their shares in mutual exports as opposed to trade with the rest of the world: organic dyes, 4.2 versus 23.6 per cent; plant protection chemicals, 5.6 versus 3.4 per cent; and products of the tyre manufacturing industry, 8.8 versus 5.7 per cent. The shares of specialized products in mutual imports are also higher than those in trade with the rest of the world and were as follows: synthetic rubber, 5.3 versus 4.0 per cent; products manufactured in the tyre industry, 7.0 versus 3.0 per cent; and varnishes and paints, 9.7 versus 8.3 per cent. The share of soda products in mutual imports is twice that of imports from the rest of the world. The CMEA countries meet the bulk of their requirements in soda ash through imports from Bulgaria.

In organic dyes the leading position in mutual exports is occupied by Poland (17.9 per cent in 1980) and Czechoslovakia with 14.6 per cent as a runner-up, while in mutual imports the lead is taken by the USSR with 9.9 per cent.[26/] In the Soviet Union imports of varnishes and paints from the CMEA countries accounted for 18.9 per cent in 1980, and of plant protection chemicals for 9.7 per cent.

2.2 Trade regulation among CMEA countries

Trade among the CMEA member-states is regulated by intergovernmental trade agreements which are concluded on a bilateral basis and define product-mixes and quantities of mutual deliveries. The agreements specify mutual obligations for five-year periods in accordance with plans for national economic development plans. Long-term (five-year) agreements and annual protocols on mutual deliveries signed on their basis guarantee a steady and stable economic growth, because the agreed product-mixes have binding force and can be altered only by mutual consent. Long-term agreements are not restrictive in their nature, because in the course of their implementation they impose no limitations on additional export opportunities.

The expansion and deepening of specialization and co-operation programmes in the CMEA countries' chemical industries will enable them to increase their mutual turnover more than three times in 1981-1985 as compared to 1976-1980.[27/]

2.3 Trade between the CMEA countries and market economy developed countries

The chemical trade of CMEA countries with market economy countries has grown at a rather high rate. In 1970-1980, exports to CMEA rose 4.3 times, and to developed market economy countries, 6.7 times, whereas imports grew 4.0 and nearly 5.5 times respectively.[28/] During that period, the CMEA

26/ Op. cit. No. 2, 1983, p. 21.

27/ Op. cit. No. 2, 1983, p. 50, 51.

28/ Op. cit. No. 2, 1983, p. 21.

countries increased their trade in chemicals with the Western developed countries at higher rates than with other countries, with the exception of Hungary and the German Democratic Republic which maintain active trade in chemicals with developing countries.

In the structure of exports from the CMEA countries to developed market economy countries, the share of soda products rose from 3.8 per cent in 1970 to 14 per cent in 1980, that of plastics from 1.9 to 4.6 per cent, and that of products made by the tyre industry from 2.0 to 2.7 per cent, whereas in imports, the leading place is held by specialty chemicals, plastics for special end-uses, plant protection chemicals, varnishes and paints, and organic dyes.

In 1980, four countries (France, the Federal Republic of Germany, Italy and the United Kingdom) accounted for 57.1 per cent of the total CMEA imports from the market economy developed countries and for 45.4 per cent of exports to the same countries. Yet, in chemicals, the share of the CMEA countries in total volume of mutual trade among the developed market economy countries was 5.3 per cent for exports in 1980, against 4.4 per cent in 1970, for imports 3.3 and 2.4 per cent respectively. In 1980 according to data supplied by the CMEA member-states, the share of market economy countries in the total value of chemical imports to the CMEA countries was 58 per cent against 43 per cent in 1970; and in exports, 22 per cent as against 29.5 per cent in 1970 (see table 11).

The CMEA countries have a substantial deficit in trade in chemicals with the developed market economy countries. However, at the turn of the 1970s growth rates began to overtake those of imports.

The CMEA countries' economic and trade relations with the majority of developed market economy countries are based on bilateral long-term intergovernmental agreements on economic, industrial, scientific and technological co-operation which are concluded as a rule for periods of 10 to 15 years, and in some cases for 25 years. For example, the USSR has negotiated such agreements with practically all the West European countries. The long-term agreements are implemented by joint intergovernmental commissions and working groups whose functions include the preparation and implementation of

Table 11. Share of selected groups of countries in trade of chemicals with the CMEA (total percentage for each country)

	Year	Total of CMEA countries a/ E	I	Bulgaria E	I	Hungary E	I	GDR E	I	Poland E	I	Romania E	I	USSR E	I	CSSR E	I
CMEA mutual trade	1970	58.4	42.8	43.7	57.9	46.9	42.2	66.8	38.4	48.5	44.9	38.3	31.9	62.5	39.9	61.1	47.2
	1980	43.3	30.4	47.1	47.7	28.3	24.4	51.7	26.8	41.0	32.6	26.7	21.8	50.9	29.6	44.8	38.7
Trade with developed capitalist countries	1970	22.0	42.6	18.3	32.6	26.0	53.6	21.9	57.5	27.9	45.4	33.4	-	14.9	35.4	26.4	41.1
	1980	29.5 b/	58.0 b/	23.3	45.0	42.8	67.7	31.9	67.0	42.0	64.4	-	-	31.4	54.2	38.9	51.1
Trade with developing countries	1970	9.0	11.4 b/	28.9	8.1	20.9	1.7	5.2	0.9	19.7	9.4	37.2	-	5.1	21.9	7.0	7.9
	1980	9.5 b/	5.8 b/	20.4	5.1	18.8	2.8	9.3	2.7	12.1	2.4	-	-	10.2	11.1	7.2	7.0

Source: Economic Co-operation Among the CMEA Member-countries, No. 2, 1983, p. 22 (in Russian).

Note: E = Exports; I = Imports.

a/ Exclusive of Romania, Cuba and Mongolia
b/ Exclusive of Romania.

co-operation projects. The agreements lay a legal foundation for further contracts and open multiple opportunities for tending relations among the countries in the spheres of commerce, industrial co-operation, project construction in third countries, and so on.

Prospects for expansion of trade and economic relations between the CMEA countries and market economy countries include the construction of new petrochemical complexes in the CMEA countries and the boosting of production for many sophisticated products, including energy-intensive ones. The mid-1980s will witness the commissioning of new or modernised capacities in accordance with production specialization and co-operation agreements between the CMEA countries and pay-back deals with Western firms.

2.4 Compensatory trade

Trade on a compensation basis is a mutually beneficial form of co-operation that found recognition in the international arena in the 1970s. This form is an important factor to improve the international division of labour and to expand trade. The co-operation on a compensation basis is used in relations among the socialist countries on one hand and among developed market economy countries and developing countries on the other. Compensation purchases of raw materials are also used by Western firms in developing countries.

Unlike sporadic transactions, compensation agreements offer many advantages to the partners concerned and meet their long-term interests. The agreements offer opportunities for Western firms to expand their exports of equipment, to meet their demand for certain products on a long-term basis, including energy-intensive ones, to increase output and improve utilization of capacity and to improve the employment situation. Through such agreements countries obtain credits for the development of capital-intensive industries. This large-scale and long-term co-operation on a compensatory basis brings in a dimension of stability and reliability under the conditions of market fluctuations, facilitates production planning and marketing, and opens up additional prospects for production specialization. Many of the large firms polled by the United Nations ECE Secretariat regard compensation basis as a

factor protecting them against fluctuations on the market (see ECE Doc. TRADE/R, 410, 30 September 1980, p. 24; and TRADE/R 385, 9 September 1979, p. 52). This has resulted in the growth of a number of such agreements. For example, part of the output, mainly energy-intensive products, to be manufactured by projects under construction (about 20 per cent) is to be exported to market economy countries in compensation for equipment supplied to the USSR.

The development of raw material resources in certain countries through the use of foreign equipment and know-how is an objective process which also involves moving production closer to the countries short of raw material supplies; it is part of the objective process of international division of labour under the conditions of the energy and raw material crisis. The idea has been stressed in a United Nations ECE study.[29/]

For example, purchasing energy-intensive chemicals from the USSR on a compensation basis is more advantageous and profitable for consumers in the market economy countries than importing crude oil and gas for processing into chemicals. This view is confirmed by a comparative analysis of the dynamics of naphtha prices, natural gas, chemical raw materials, semi-finished products, and finished chemicals in the 1970s.[30/] The fact that there is a great number of compensation agreements between the CMEA countries and Western firms is an indication of the benefits of this form of co-operation. If a company has no interest to conclude such a contract, it would not do so. Moreover, the range of products to be delivered under compensation agreements is voluntarily agreed upon by the parties concerned.

Often quoted remarks that compensation agreements represent a threat to the system of market economies, that repayment in kind is obligatory and the products thus supplied flood the markets are doubtful and hard to prove; they often reflect the divergence of interests between different industrial

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29/ East-West Trade in Chemicals (ECE/CHEM/39) 11 June 1982, p. 36.

30/ Second World Wide Study on the Petrochemical Industries (UNIDO/ID/WG.336/3).

groups, namely the suppliers of equipment, the manufacturers and the users of chemical products. Exports of most chemicals from the USSR account for a small portion of the market economy countries' total chemicals imports, because the bulk of output is intended for internal consumption in the USSR and for export to other socialist countries. An OECD study stresses that the socialist countries' share in the imports of chemicals by the OECD countries is small, and the volume of anticipated deliveries is not large either in relation to the OECD countries' mutual trade and estimated growth of demand.31/

It is also doubtful whether imports from the socialist countries under compensation agreements adversely affect the net employment situation in the market economy countries. The calculation of labour inputs on the basis of wages and the number of persons employed per equal value of output in the machine-building and chemical industries of the market economy countries shows that they are higher in the machine-building industry. Within this context the total balance of labour resources embodied in the compensation agreements would be favourable for the market economy countries, i.e. it contributes to employment.

The experience of co-operation between the USSR, on the one hand, and developed, developing and socialist countries on the other, based on compensation agreements, shows that it does not replace traditional forms of trade and is used only when and where the partners involved find it mutually beneficial, therefore contributing to the growth of trade.

Moreover, methods and principles of this form of trade are in a process of constant evolution and improvement. The record shows that equipment purchases are not necessarily paid for by products from the compensation projects, but also by other products in quantities agreed among the countries involved, which broadens the choice of forms of compensation agreements. This can be exemplified by agreements with West German firms, such as Hoechst, F. Uhde, Krupp Koppers, Brentag, and Dynamit Nobel in building projects for the production of polyester fibres and threads in the USSR, where the credit is

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31/ West-East Trade in Chemicals, OECD, Paris, 1980, p. 63.

to be repaid by deliveries not only of these products, but also cotton. Some agreements require continuing deliveries of Soviet products even after the credit repayment obligations have been fulfilled, while there are a number of other agreements which stipulate continuous exports from the USSR. Many agreements provide that part of the equipment for the ongoing projects be bought for payments in cash, rather than on credit.

Co-operation on a compensation basis has good prospects for growth in terms of both bilateral and multilateral agreements. Implementation of many large-scale projects becomes possible only through multilateral co-operation among countries, firms and banks. A major contract with Technip for the supply of equipment for the production of paraxylene, ortoxylene and benzene to the USSR calls for the participation of two more French firms, such as Litvine Engineering and Procofrance, as well as Eurotechnique from Italy and Universal Oil Products from the United States. This may confirm further the idea that bilateral compensation helps the development of trade.32/

Co-operation on a compensation basis is a flexible system that abounds in many diverse forms suited to the interests of the partners. Given the long-term nature of co-operation on a compensation basis, the USSR is willing to co-ordinate its activities with respect to sales volumes on certain markets with its trade partners. Of interest is a suggestion made by some large firms to sell Soviet goods supplied under compensation agreements to a market economy country market through the marketing networks of their partner firms. In this case, prices for Soviet goods to be sold by the partner firms would be fixed at the same level as prices for the firm's own products.

During the 1970s alone, Soviet foreign trade organizations and Western firms signed more than 100 long-term agreements and contracts for co-operation on a compensation basis in the chemical and other industries. It would be still attractive to continue this co-operation in various sectors of the chemical industry, including the manufacture of technology-intensive products, particularly toxic chemicals, such as herbicides and insecticides, in exchange

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32/ East-West Trade in Chemicals (ECE/CHEM.39) dated 11 June 1982, p. 33.

for energy-intensive chemical products; as well as the development of titanium dioxide production on the basis of its enormous deposits in the USSR; as well as chlorineless potassium fertilizers and the use of methanol.

2.5 On the question of countertrade

East-West trade and economic relations in the 1970s were characterized by the introduction of integrated export-import deals, industrial co-operation, joint commercial and industrial ventures and implementation of joint projects in third countries. According to OECD, deals combining in one form or other both export and import operations, accounted for about 20 per cent of the total East-West trade in the 1970s.33/

Some experts believe that this share has reached 30-40 per cent in recent years.34/

The increased use of the new forms of trade and economic links called for an analytical approach and generalized evaluation. The trend for simplifying the task of analysing various forms of trade relations among different countries, tend to combine within the framework of one concept heterogeneous phenomena which only appear to have an outward resemblance. The concept in question is the term countertrade which first appeared in the Western press in the late 1970s.

Various sources give substantially different definitions of countertrade. This concept is arbitrarily interpreted as comprising completely different forms of economic relations. Thus, an OECD study35/ provides the following definition:

> "Countertrade can be defined as an international commercial operation in the framework of which the seller has to accept in partial or total settlement of his deliveries the supply of products (or more rarely services) coming from the purchasing country."

33/ The Economist, 25 Dec. 1982 - 7 Jan. 1983, p. 82

34/ L'Usine Nouvelle, 20 mai 1982, p. 95.

35/ East-West Trade. Recent development in countertrade, OECD, Paris, 1981, p. 9.

American economists define countertrade as a way of financing the flows of goods in international trade through the exchange of products.[36/]

The ambiguity of the term countertrade allows different definitions for essentially similar deals and, conversely, to define different phenomena by one concept. The most simple forms of trade relations consisting of non-cash exchange, e.g. barter, is included in the concept countertrade. A large group is constituted by the so-called counterpurchases or tied purchases, parallel deals, offset operations, etc. Their general meaning is that, under the contract, the exporter assumes an obligation to purchase from the importer the goods for a certain part of the value of his export, or, in other words, the contract provides for some form of tying export to import. Countertrade is also regarded as comprising such new form as co-operation on compensatory basis which is often termed in the West as buy-back-deals. Unclear definition of the criterion results in inclusion into the category of countertrade of such operations that are not independent forms of foreign trade relations, for example, switch operations as well as offset operations. Such operations characterize only the technical side of the deals.

Presence in each particular case of both export and import operations, i.e. counterflows of goods, serves as a general criterion that allows some economists to bring together all these different forms into a single concept.

If this criterion is applied one can define countertrade as comprising almost all modern forms of trade and economic relations (including industrial co-operation, intracompany trade, joint ventures, etc.) between all country groups and within those groups. Furthermore, this logic could lead to the inclusion into the countertrade category of any trade between two countries, provided that it does not represent a one-way street. Thus, completely external phenomena are being amalgamated without taking into consideration their real economic essence. Indeed, the single rather broad criterion that is taken into account is a presence of the counterflows of goods.

36/ Analysis of recent trends in US countertrade, U.S. International Trade Commission, Washington, 1982 p. V.

It would be inaccurate to artificially tie export to import within the framework of one deal and thus ignore the objective trend of transition in international economic relations from one-time one-way deals to package or complex forms of relations that are becoming increasingly characteristic of the general external economic relations and not only of East-West relations. The existing various complex forms of trade and economic links cannot be forcibly fitted into the term countertrade which has unnecessarily and often been mentioned as an obstacle to the development of trade between countries.37/

Some of the concepts of countertrade reflect the desire to restrict the flow of goods from other countries, to reserve an exclusive right to export and to consider import merely as an unavoidable evil. The striving to picture everything that goes beyond isolated one-time deals as a somewhat extraordinary phenomenon in the trade between countries with different social systems, overlooks the fact that the combination of export and import operations is widely used by market economy countries' companies in their relations between themselves, as well as with the developing countries. It is estimated that deals combining export and import account at present for 25-30 per cent of total world trade.38/ For example, under the contract between Sweden and General Electric the United States company undertook to purchase the output of the Swedish industry against deliveries of aircraft engines. McDonall Douglas will deliver to Canada aircrafts worth $US 2.4 billion, while Canadian companies will make during a 15-year period counterdeliveries worth $US 2.9 billion. The Brazilian Government obliged the branches of foreign car-manufacturing companies to export until 1989 their output for a total amount of $US 21 billion in exchange for the right of duty-free import to Brazil of necessary components and articles. This form of relations was characterized by the Vice-President of Data Control Company in the following way: "This is a common practice. More and more countries are demanding mutual exchange. This is one of the realities of modern business."39/

37/ East-West countertrade practices: An introductory guide for business. U.S. Dept. of Commerce, Washington, 1978, p. 4.

38/ Business Week, July 19, 1982, p. 118.

39/ Op. cit.

Some market economy country sources include also compensatory partnership in countertrade which is an established practice in the relations betweeen the USSR and market economy countries in the concept countertrade. This issue, seemingly theoretical, is of practical significance to parties in large-scale and long-term relations. This inclusion would tend to distort the concept of compensatory partnership in two ways. First, there is a tendency to include compensatory partnership, along with other forms of ties, among countertrade and to ascribe to it a non- conventional meaning. The second error consists of extending the term compensation to include all non-uniform trade ties, inter alia, barter trade, counterpurchases, switch operations, etc. In fact, the actual harmful impact of such inaccuracies consists of distorted images of principles guiding compensatory partnership. This form of economic relations stands as as scapegoat, falsely accounting for all the real and imaginary drawbacks characteristic of absolutely different phenomena, which misguides potential partners in such relations.

Mixing up the terms countertrade and compensatory agreements is also wrong from the formal point of view. Compensatory partnership involves ties aimed at the following objectives: provision of financial and material resources in the form of a stipulated credit; setting up new production capacities; repayment (compensation) of the credit by supplying goods produced with the new capacities or by supplying similar products of other enterprises. Among all the above-mentioned forms of trade agreements, only buy-back deals involve such elements.[40/] Thus to consider partnership on the basis of compensation as equal to barter trade and other similar commercial operations would be wrong from the point of view of substance as well. In contrast, with partnership on the basis of compensation, these operations do not involve long-term and steady ties. In general, their objectives are limited to balancing trade between two countries and are within the non-production sphere. At the same time, partnership on the basis of compensation primarily touches upon the production sphere. It presupposes mutual adjustment by partners in certain fields of their production. This involves setting up new production capacities and using them to produce goods of such quality and in such quantities as required by a foreign partner. In general, such capacities are set up on the basis of long-term co-operation

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40/ Business Week, July 19, 1982, p. 118.

starting at the stage of design and up to equipment installation and setting it to work. Moreover, compensatory partnerhsip directly influences the investment process. Credits granted within the process serve as a source of financing part of the borrowing country's capital investments.

Thus, both parties' interests in compensatory partnership go much further than mere balancing of purchases with counter exports. Moreover, market economy country partners have a substantial advantage in the external exchange aspect of such partnership. They supply goods into a guaranteed market, while the Soviet side when making its repayment obligations, runs certain risks inherent in market economy country markets with their conjuncture fluctuations and recessions.

Several features of compensatory agreements allow to regard them as one of the forms of industrial co-operation. The fact that they belong to the sphere of industrial co-operation going beyond the framework of purely commercial transactions, was recognized by authoritative international organizations.41/

It should be mentioned here that on a number of occasions, some market economy country authors of the concept of countertrade realize that referring mechanically to compensatory partnership as another form of various counter, parallel and other purchases, which are limited to the sphere of trade, or calling them all compensation, without any distinction, meant an artificial approach. An OECD study concedes that this is the main cause of misunderstanding.42/ Trying to avoid it, the OECD researchers proceed with further classification: they refer to barter trade, counterpurchases, parallel and similar deals as commercial compensation, while calling buy-back deals, i.e. compensation itself, industrial compensation.

In our opinion, such complex terms do not help to avoid misunderstanding and lack of clarity in classification. This lack of clarity is caused by an

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41/ Analytical Report on Industrial Co-operation among ECE countries, United Nations, Geneva, 1973, p. 2.

42/ Analytical Report on Industrial Co-operation among ECE countries, United Nations, Geneva, 1973, p. 2.

attempt to integrate different concepts under an oblique term of countertrade which, when applied to compensation partnership, lacks concrete economic meaning. The only aim of this consists of depicting the tendency towards strengthening the principle of reciprocity in East-West relations as a random phenomenon that is largely not beneficial to market economy country partners. However, even following elementary logics, one would come to the conclusion that hampering supplies from socialist countries means hindering broader access of Western companies' exports to the markets of socialist countries.

Enhanced reciprocity in trade ties between states with different social systems is a logical, objective process. This tendency is universal for the whole of international trade today. According to P. Versariou, an expert of the U.S. Department of Commerce, an enhanced bilateral character of trade is a reality not only in East-West and North-South relations, but in trade among developed countries as well.[43/]

Compensation-type supplies of equipment for mining industries development are increasingly characteristic of deals between, for example, United States companies and developing countries. In these contracts, United States firms provide for purchasing part of the products of plants under construction, proportional to their investment costs. Often, companies of several market economy countries participate in implementing such projects. The mechanism of compensation is used by developing countries on an increasing scale for implementation of new projects - first of all, in mining industries and in selling their products in new markets.

Economic ties between East and West and North and South are evolving in many directions within the sphere of exchange. As practice shows, even archaic barter proves useful in certain cases. In recent years this form of countertrade has come to be used by individual petroleum exporting countries (e.g. Algiers, Indonesia) for financing large-scale development programmes. The same can also be said about Mexico.

43/ East-West Trade, Recent Development in countertrade. OECD, Paris, 1981, p. 18.

In 1984, India has signed a barter agreement with Libya so as to facilitate the settlement of outstanding debts due to Indian contractors for work on projects executed in Libya. Greece has also signed an agreement with Libya to import 900,000 tons of Libyan crude oil up to 1985, with an option for an additional 300,000 tons in exchange for Greek goods and services. Additionally, Libya has concluded oil-for-goods deals with a number of Greek companies as a means of settling outstanding debts.44/

Further evolvement of various forms of countertrade is inevitable due to several factors, the most significant of which is further growth of developing countries' balance of payments deficits and foreign debts. Evolvement of various forms of non-cash operation is prompted by the inflationary growth of prices, sharp exchange fluctuations and complete or partial inconvertibility of currencies of many countries. Under these circumstances, there is an increasingly broader linkage between imports and exports, which makes it possible to pay for purchases in national products. In recent years United States banks have started recommending to their client companies to use various forms of countertrade with developing countries for financing deals and facilitating payments of outstanding credits. Representatives of the United States Department of Commerce, while objecting to countertrade as a whole as an obstacle to free trade, nevertheless concede the inevitability of its further development.

The main direction for broadening reciprocity in East-West trade and economic relations consists of further involvement of the production sphere into these relations. And one of the first steps in this direction would be implementation of compensatory projects. Western business interests realize profitability of co-operation with partners from centrally planned economy countries in production of goods that would meet necessary quality requirements and could often be supplied at lower prices, compared to the costs of producing them by themselves. Compensatory agreements constitute a way of switching from single, random commercial deals to a stable, long-term co-operation increasingly touching upon the production sphere.

44/ Arab Oil and Gas, 1 August 1984, p. 11.

2.6 Relations with developing countries

In 1980 the developing countries accounted for 9.5 per cent and 5.8 per cent of the total trade in chemicals by the CMEA countries in terms of exports and imports respectively. Trade with developing countries is supplemented by credit, scientific and technological ties, as well as industrial forms of co-operation. Of prime importance is the growing role played by the projects in key economic branches of the developing countries, including projects in the sphere of fuel and raw material resources which are of special importance for the chemical and petrochemical industries. As of 1 January 1983, the production capacities in selected branches that were put in operation with assistance from the USSR alone amounted to (in parentheses are capacities of projects under construction): electric power station, 12.3 million kilowatt hours (17.5); coal, 17.9 million tons (65.4); coke, 10.7 million tons (11.0); oil processing, 19.6 million tons (10.2); mineral fertilizers, 960 thousand tons (380 thousand tons) etc.[45/]

The bulk of Soviet assistance to developing countries is rendered on the basis of long-term government credits at 2.5-3 per cent interest, to be repaid, as a rule, within a period of 12 years (starting a year after the completion of equipment deliveries).[46/] In recent years nearly 40 per cent of all projects built by Soviet organizations have been turnkey projects.

Co-operation between the CMEA countries and developing countries is carried out on a bilateral as well as multilateral basis. For example, the USSR, Hungary, Bulgaria and Czechoslovakia rendered assistance to Iraq in setting up a complex of projects in the oil extraction, oil processing, and petrochemical industries.

45/ Parodnoje Rhosaystvo v 1982 (the USSR National Economy in 1982), 1983, p. 537.

46/ A.F. Alexeev, Foreign Economic Activities of the Soviet State, Moscow, 1982, p. 19.

The developing countries' exports potential benefits greatly from co-operation on a compensation basis with the socialist countries which are repaid partly in products manufactured by completed projects. Such projects exist with Afghanistan in the gas industry, with Iraq, Libyan Arab Jamahiriya, and the Syrian Arab Republic in the petroleum industry, and with Turkey, Morocco and the Syrian Arab Republic in phosphates extraction, etc. In total, by early 1981 the USSR alone signed nearly 30 agreements for deliveries on a compensation basis with developing countries.47/

Recent years also witnessed the growth of industrial co-operation, joint activities of the socialist and developing countries in third countries' markets, as well as co-operation on a tripartite basis including partners from the CMEA, developing and developed countries. For example, Poland is party to 40 of such agreements, including several in the chemical industry; negotiated with West German firms for the joint construction of a fertilizer factory in Morocco and a nylon yarn plant in Iran, as well as with a French firm for building a factory for the manufacture of soda products, etc.

Some socialist countries co-operate with developing nations in the sphere of joint ventures, mainly in the field of pharmaceuticals production, e.g. Bulgaria in Algeria, Poland in Nigeria, and Hungary in India and Nigeria.

Trade and economic ties between the CMEA countries and the majority of the developing countries are carried out on the basis of intergovernmental trade agreements and long-term agreements for economic, scientific and technological co-operation, which form a stable legal and contractual foundation for relations in all spheres. They define areas of co-operation, list priorities of projects to be built, volumes and terms of mutual deliveries, as well as terms and conditions for the repayment of credits received. The agreements introduce an element of planning and provide for steady marketing of traditional and new goods produced by the developing countries and the regular backflow deliveries.

47/ Op. cit., p. 22.

At present, some new trends are discernible which are certain to affect the prospects of co-operation between the CMEA countries and developing nations in many fields, including the chemical industry. There are reasons to anticipate a further increase in the number of long-term agreements and their operative periods. This is going to result in the formulation of long-term co-operation programmes, their extension into new fields, including non-traditional ones, and increased joint activities in third countries. These long-term programmes will provide a framework for a planned selection of industries which could be expanded or set up in developing countries through joint efforts of the parties concerned and which could be oriented towards long-term exports to the CMEA countries which may include the renunciation of the latter to build their own new or expand existing capacity for the manufacture of identical products.[48/] This would facilitate a closer tying-in of the CMEA countries' foreign trade growth with their economic development plans. This in turn would expedite the process of the emergence of mutually complementary structures.

At present, there is certain experience of co-operation between the planning bodies of the CMEA countries and some developing countries. Thus, in 1980 a joint session of the German Democratic Republic's and Syria's planning commissions defined the objectives, directions and forms of their co-operation within the framework of the five-year development plans of the two countries for the period from 1981 to 1985. Simultaneously, an agreement was concluded on co-operation between the planning bodies. In its relations with developing countries, such as Iraq and Mexico, the Council for Mutual Economic Assistance co-operates in forming joint commissions for the organization of economic, scientific and technological co-operation.

At the present time, the CMEA countries join their efforts in the construction of large-scale projects in a number of key branches, including the chemical and petrochemical industry. The great scope, long-term nature and planned character of this activity open up an opportunity for the participation in some of these projects of interested developing countries.

48/ Voprosy Economiki, No. 9, 1983, pp. 124-126.

Large-scale agreements on production specialization and co-operation may become one of the main directions of co-operation between the socialist and developing countries in the manufacturing industries. Simultaneously, deeper specialization and co-operation in the CMEA countries provide an opportunity for the participation of suppliers of component parts from developing nations. The growth of trade turnover may also be facilitated by broader use of the practice of placing orders by the CMEA countries for the manufacture of requisite products in developing countries from local raw materials and the subsequent import of ready products. Prospects are also promising for the development of co-operation through mutual utilization of underloaded capacities. The availability of great unused labour resources in the developing countries creates good opportunities for the organization of and co-operation in the manufacture of labour-intensive products.

3. PROSPECTS OF DEVELOPMENT

The national economic development plans of most CMEA countries for the 1981-1985 period stipulate that higher growth rates should be maintained in the chemical industry in comparison with the industry as a whole. Yet, reflecting the slight decrease in economic development rates in the majority of the countries, they will be lower than in the preceding period. At the end of the 1980s structural adjustments in the economy aimed at intensifying production are to create prerequisites for a more dynamic growth.[49/]

Table 12. Annual growth rates of industrial production in the CMEA countries from 1981 to 1985 (per cent)

	Estimates for industry as a whole	Chemical industry
Bulgaria	5.1	7.4
Hungary	3.5 - 3.9	6.0
GDR	5.6	6.0
Romania	7.6	10.0
USSR	4.6	5.4 - 5.9
Czechoslovakia	2.7 - 3.4	2.3

Sources: Statistical Yearbook of the CMEA Countries, 1983, pp. 56, 58.
Economic Co-operation among the CMEA Member States, No. 6 1983, p. 25.
News of the USSR Academy of Sciences, Economics Series No. 3, 1983, p. 66.

Maintenance of economic growth of the CMEA countries against the background of the situation in fuel and raw material resources, which are especially important for the chemical industry, calls for lower inputs of these resources per unit of output. The plans are oriented to this goal. Central to this are joint efforts intended to conserve the raw material and fuel resources in the CMEA countries, rather than an increase of their production and exports in absolute terms (on which there are certain

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49/ Kommunist, No. 7, 1983, p. 78.

limitations).[50/] So far, the combined efforts have resulted in a high level of energy supplies available to the CMEA countries: the average primary energy resources consumption per capita in a number of the European CMEA countries is greater than in the four major EEC countries (the Federal Republic of Germany, Great Britain, France and Italy), while in the remaining CMEA countries it has come very close to the West European level. However, the primary energy resources consumption per unit of national income is 35 to 40 per cent higher in the European CMEA countries than in the EEC countries. At the same time, the 1970s witnessed a slowing down in the production growth rates of some types of fuel and raw materials in the European CMEA countries. In 1961-1970 and in 1971-1980, the growth was 26 and 14 per cent respectively in coal, 129 and 67 percent in petroleum, i.e. it dropped nearly by half.[51/] In the 1980s the trend will become even more pronounced as a result of more difficult natural and economic conditions of extraction that involve greater costs of maintaining the volume of extraction achieved, let alone increasing it. Thus in 1976-1980, the cost of production of one ton of petroleum in the USSR more than doubled as compared with the period prior to 1972, and is expected to grow even more in 1981-1985.[52/] This situation calls for stricter measures to save fuel and raw materials and to develop material- and energy-saving technologies. Long-range measures are being undertaken to readjust national economic structures and to rationalize the distribution of energy-intensive industries within the CMEA community so as to limit their growth in countries with insufficient fuel and raw material resources. Therefore, programmes of coordination of national economic development plans of the CMEA countries in 1986-1990 lay special emphasis on policies aimed at fuller utilization of opportunities offered by the division of labour.

In the sphere of the chemical and petrochemical industries, this primarily involves the fulfilment of the 1979 General Agreement to greatly increase the capacities for the production of energy-intensive products in the

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50/ Kommunist, No. 7, 1983, p. 78

51/ The Scientific and Technological Revolution and the Socialist Economic System, Moscow, 1983, p. 12.

52/ Economic Co-operation among the CMEA Member States, No. 6, 1982, p. 11.

USSR and less energy-intensive products in other CMEA countries, which is to be followed by an exchange of products on an equitable basis. In particular, it is planned to combine efforts of interested countries in setting up capacities for the manufacture of methanol and its products using Siberian gas deposits and its transportation to the Western borders of the USSR.[53/] Joint efforts will be continued in the construction (in the USSR) of the second stage of the Ust-Ilimsk pulp and paper factory and, at a later date, of the Yenissey and Mozyr fodder yeast factories, the Khmelnitsky nuclear power station and the electric power transmission line LEP-750. Studies are in progress on the joint mining of phosphate deposits in Mongolia and projects for the production of yellow phosphorus, phosphorous fertilizers, and fodder phosphates. Similar activities are under way in Vietnam. The CMEA countries continue to co-operate with a number of developing countries in geological prospecting with a view to increase oil production and oil imports to socialist countries.[54/]

Traditional forms of trade are increasingly giving way to long-term co-operation among the CMEA countries on a planned basis which is aimed to develop production specialization and co-operation and to combine resources.

The coordination of the CMEA countries' national economic development plans will be augmented on a large scale by coordinating the scientific and technological policies, and a gradual transition to a common co-ordinated policy in accordance with the long-range needs of the socialist countries.

Under the existing specialization programmes CMEA members are to ensure accelerated growth of industries which supply the needs of all or several other member-states in chemical products.

In 1981-1985 Bulgaria plans to raise the output of pharmaceuticals, perfumes, cosmetics and some types of rubber by 12.6 per cent/year, plastics processing by 16 per cent, plar protection chemicals and PVC, 2.5 times,

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53/ Economic Co-operation among the CMEA Member States, No. 6, 1983, p. 44.

54/ Ekonomicheskoye sotrudnechestvo stran-chlenov CEV, No. 6, 1983, p. 44.

and epoxy resins 4.7 times. Plans are made to start producing 16 types of engineering plastics and a number of synthetic fibres by 1985. In Hungary the production of pharmaceuticals and plant protection chemicals is to increase by 2.5 and 3.6 times respectively, and plastics processing is to be increased substantially by 1990. The German Democratic Republic is to boost the production of fine chemicals: the output of pharmaceuticals is to go up by 40 to 50 per cent in 1981-1985, and that of plastics and synthetic resins will reach the level of 1.3 million tons in 1985. In the 1981-1985 period, Romania will increase production of polymer materials by 1.6 to 1.8 times, with the manufacture of fibres reaching the level of 500-580 thousand tons, plastics, 900-1000 thousand tons, synthetic rubber, 400-460 thousand tons, and the output of dyestuffs and medicines going up 3 times. In the USSR the production of synthetic resins and plastics will reach 6 to 6.3 million tons, chemical fibres 1.6 million tons and mineral fertilizers 36-37 million tons (nutrients).[55/] In Czechoslovakia a transition is under way to manufacture technology intensive products, such as organic dyes, additives to polymers, varnish and paint materials, pharmaceuticals, etc.

The present situation in the chemical and other branches of industry is characterized by the expansion of direct ties between enterprises in the CMEA countries. The process calls for new forms of economic, scientific and technological activities, for example, by way of setting up joint international firms. The experience of this form of co-operation is not great, and its economic and legal mechanisms are not properly studied. However, the extension of direct ties between enterprises and the setting up of joint enterprises may reveal additional resources for deeper production specialization and co-operation.[56/]

55/ Op. cit., pp. 23-25.

56/ Kommunist, No. 7, 1983, p. 84.

4. SUMMARY AND CONCLUSIONS

Between 1970 and 1982 the chemical and petrochemical industries' output went up 2-3.5 times in the USSR and the European centrally planned economy countries. The rate of growth was a factor of 1.3 faster than total industrial production for the period 1971-1982. Among different types of chemicals, the production of plastics and synthetic rubber went up 2.6 times and synthetic fibres increased 3.6 times; there was also a rapid growth in synthetic organic chemicals and ancillary materials for various industries.

In most European CMEA countries, development of the petrochemical industry is closely related to the process of economic integration of the socialist countries, which includes the following major activities directly related to the petrochemical industry:

- Joint tackling of fuel and raw material problems;
- Deeper production specialization and co-operation;
- Measures aimed at coordinating the national long-range economic plans, including scientific and technological co-operation.

The availability of oil and gas and of labour resources largely determines the rational distribution of petrochemical industries in the CMEA countries as well as specialized production and co-operation. At the present time these countries furnish 90-95 per cent of their needs in energy and other raw materials from their own sources. In 1982, for some types of energy resources essential for the development of the petrochemical industry, the percentage share of the CMEA countries in the world output was: electricity, 21.1 per cent; coal, 32.2 per cent; oil, 24 per cent; natural gas, 34.3 per cent. Yet the raw materials, especially the most essential ones such as oil and gas, are characterized by a rather irregular distribution. Currently the hydrocarbon raw materials supplied by the USSR ensure the operation of nearly the entire petrochemical industry of the CMEA countries. In 1976-1980 the USSR exported 378 million tons of oil, 52 million tons of oil products, 94 million cubic metres of gas and 64 billion kilowatt hours of electricity to the European socialist countries. Guaranteed by long-term agreements and in a number of

cases at prices lower than world prices, fuel and raw material supplies have become a stable basis for the development of the petrochemical industry in the CMEA countries. It has been estimated that, for oil only, as traded among the socialist countries, the total economies of hard currency gained by the European CMEA countries through the difference between the world and contract prices amounted to at least 3 billion dollars annually.

In tackling the problems of specialization in petrochemical production within the CMEA framework, the USSR have pledged to develop the most material- and energy-intensive types of products, while the other CMEA countries are developing less energy-intensive products to be traded on an equitable basis. In 1981-85 alone the USSR is to supply energy-intensive products worth 700 million roubles to the socialist countries in exchange for less energy-intensive products worth 790 million roubles. In addition to the specialization in the manufacture of energy-intensive and less energy-intensive products, most tangible successes have been scored in the sphere of bilateral and multilateral specialization and co-operation in the manufacture of synthetic organic dyes, reagents, plant protection chemicals, household chemicals, cinematographic materials and pharmaceuticals. The purpose is to concentrate the manufacture of structurally and technologically homogeneous products in one or several countries with a view of satisfying completely or in part the requirements of all the interested countries. About 75 per cent of items covered by agreements on specialization are to be manufactured in two countries at the most with 45 per cent of the amount to be manufactured in one country only. As a result, a number of countries phased out inefficient industries in favour of imports from other socialist countries in order to focus their efforts on the most efficient productions. As a result of specialization in the total value of mutual exports of chemicals by CMEA countries, the share of specialized items went up from 12 per cent in 1975 to 34 per cent in 1981.

The first multilateral agreement was signed in 1972 and called for production specialization of 22 kinds of synthetic rubber. It covered both the utilization of existing free production capacity and the construction of new plants. Specialization in the production of fine chemicals is organized

mainly on a multilateral basis. The intergovernmental agreement on production specialization and co-operation of plant protection chemicals envisages the construction of more than 40 new plants and the expansion of 10 existing ones, specialization in the production of certain items, and joint planning of research. Even broader use is made of bilateral agreements on specialization.

Bilateral and multilateral specialization and co-operation agreements facilitate long-term and speadier commercial ties, the growth of mutual flows of deliveries, and shape up a long-term trend of specialization in the production of certain kinds of products.

The CMEA countries make an increasing recourse to the practice of combining resources, including capital investments, of interested countries in the construction of joint projects on a compensation basis. The agreed plan for multilateral integration activities in 1976-1980 provided for the allocation of 9 billion roubles as joint capital investment. Under the agreed plan for 1981-1985, 44 per cent of the total expenditure allocated for the construction of joint projects on the Soviet territory will be covered by European CMEA countries. Interested countries participate in the construction on the territory of other countries by providing technologies, machinery and equipment, consumer goods, and not infrequently, manpower, to repay the credit. The back flow of product supplies is based on the shares of the participating countries in the total value of credits granted. The integration activity is entirely voluntary and is not accompanied by the setting up of supranational bodies. Multilateral agreements on joint construction of projects are concluded as a rule on an intergovernmental basis. The agreements define the obligations of the participating countries. Multilateral agreements form the basis of bilateral agreements which specify in greater detail the commitments of the participating countries. The joint projects are the property of the country on whose territory they are being set up and they are run by the owner country.

Specialization and co-operation are closely linked to the expansion of scientific and technological co-operation. Co-operation in this field is based on the principles of equal and unobstructed access for all the CMEA

countries to modern technology owned by the community as a whole, renunciation of technological monopoly, and rendering assistance to less developed socialist states in the acquisition of technology. The permanent CMEA Commission for the Chemical Industry co-ordinates annually 90 to 110 research subjects, in which more than 200 scientific research and design institutions from all CMEA countries took part in 1976-1980. A form of scientific and technological co-operation which is getting increasingly common is joint work of specialists from several countries under co-ordinated plans that feature a clear-cut division of labour and responsibilities under corresponding agreements.

The total foreign trade turnover of the CMEA member-states for chemical and petrochemical goods exceeded 13 billion roubles in 1980 and 14 billion roubles in 1982. In 1970-1980, it increased more than four times: exports 4.3 times and imports 4 times. Since 1970, the structure of chemical goods exports by CMEA countries showed an increase in the share of soda products, plastics and fertilizers. In imports the same was true for varnishes and paints, plant protection chemicals, organic dyes and plastics. This situation reflects the fact that demand from the CMEA countries for all major big volume chemicals is met through their own production and mutual trade. As for fine chemicals and synthetic organic chemicals, it should be stressed that some of them are produced in the CMEA countries in volumes which are not enough to satisfy even their internal demand.

Trade among the CMEA member-states is regulated by intergovernmental trade agreements which are concluded on a bilateral basis and define product-mixes and quantities of mutual deliveries. The agreements specify mutual obligations for five-year periods in accordance with plans for national economic development. Five-year agreements and annual protocols on mutual deliveries signed on their basis guarantee a steady and stable economic growth because the agreements on product-mixes and quantities have binding force and can only be altered by mutual consent.

The trade and economic ties between the CMEA countries and most of the developing states are carried out on the basis of intergovernmental trade agreements and long-term agreements for economic, scientific and technological

co-operation which form a legal and contractual foundation for relations in all spheres. They define areas of co-operation, list priorities of projects to be built, volumes and terms of mutual deliveries, as well as terms and conditions for the repayment of credits received. The agreements introduce an element of planning and provide for steady marketing of traditional and new goods produced by the developing countries and the regular counter deliveries.

For exports, the developing countries benefit from co-operation on a compensation basis with the socialist countries. The credits granted are repaid partly in products manufactured by completed projects. By early 1981, the USSR alone had signed a total of nearly 30 agreements with developing countries for deliveries on a compensation basis. The recent years also witnessed the growth of industrial co-operation, joint activities of the socialist and developing countries in markets of the third world, as well as co-operation on a tripartite basis, including partners from CMEA, developing and developed countries.

At present, some new trends are discernible which are certain to affect the prospects of co-operation between socialist and developing countries in many fields, including the chemical industry. There are reasons to anticipate a further increase in the number of long-term agreements and their operative periods. This is going to result in the formulation of long-term co-operation programmes, or their extension into new fields, including non-traditional ones, and increased joint activities in third countries. These programmes will provide a framework for the selection of projects which could be expanded or set up new in developing countries through joint efforts of the parties concerned. The production of these projects could be oriented towards long-term exports to the CMEA countries which may include the renunciation of the latter to build their own new or expand existing capacities for the manufacture of identical products. At present there is certain experience of co-operation between the planning bodies of the CMEA countries and some developing countries. In its relations with some developing countries, the Council for Mutual Economic Assistance collaborates in forming joint commissions for the organization of economic, scientific and technological co-operation.

At the present time, the CMEA countries are joining their efforts to build large-scale projects in a number of key branches, including the chemical and petrochemical industries. The large-scope, long-term nature and planned character of this activity opens up an opportunity for the participation in some of these projects of interested developing countries.

The conclusion of large-scale agreements on specialized production may become one of the main directions of co-operation between the socialist and developing countries in the manufacturing industries. Simultaneously, deeper specialization and co-operation between CMEA countries provide an opportunity for developing countries to take part in supplying component parts.

The growth of trade turnover may also be facilitated by the broader use of the practice of placing orders by the CMEA countries for the manufacture of requisite products from their raw materials and the subsequent import of manufactured products. Prospects are also promising for the development of co-operation through mutual utilization of underloaded capacities. The fact that great unused labour resources are available in the developing countries creates good opportunities to organize and co-operate in the manufacture of labour-intensive products.

Trade in chemicals between the CMEA countries and the developed countries grew at a rather high rate in 1970-1980. Yet, in 1980, the share of the CMEA countries in the total value of mutual trade in chemicals among developed countries was 5.3 per cent in exports and 3.3 per cent in imports. In 1980, according to data supplied by the CMEA member-states, the share of the developed countries in the total value of chemical imports of the CMEA countries was 58 per cent and 22 per cent in exports. The CMEA countries have a substantial deficit in chemical trade with the developed countries.

Prospects for further expansion of trade and economic relations between the CMEA member-states and developed countries include the construction of new petrochemical complexes in the CMEA countries and boosting the production of many sophisticated products, including energy-intensive ones. The mid-1980s will witness the commissioning of new or modernized capacities in accordance with specialized production and co-operation agreements between the CMEA countries on buy-back deals with firms from market economy countries.

Such form of long-term arrangements as compensation agreements found recognition in the 1970s. There are different forms of co-operation on a compensation basis in relations among the socialist countries and among the socialist countries on the one hand and developed and developing countries on the other hand. In total, by early 1981 the USSR alone signed nearly 30 agreements for deliveries on a compensation basis with developing countries in different branches. The mechanism of compensation is used by developing countries on an increasing scale for implementation of new projects and for selling their products on new markets. Compensation purchases especially of raw materials are also used by market economy country's firms in developing countries. This large-scale and long-term co-operation brings in a dimension of stability and reliability under the conditions of market fluctuations, facilitates production planning and marketing, and opens up additional prospects for production specialization. Such arrangements open possibilities to pay for purchases in national products. The range of products to be delivered under compensation agreements is voluntarily agreed by the parties concerned. Furthermore, this form of co-operation does not replace traditional forms of trade and is used only when and where the partners involved find it mutually beneficial, therefore contributing to the growth of trade turnover. Co-operation on a compensation basis has good prospects for growth in terms of both bilateral and multilateral agreements. Moreover, the implementation of many large-scale projects becomes possible only through multilateral co-operation. Many features of compensatory agreements allow to regard them as one of the forms of industrial co-operation.

In international economic relations, there is at present an objective trend of transition from one-time, one-way deals to a package of complex forms of relations which provide for some form of tying export to import. Enhanced reciprocity in trade ties between countries is a logical and objective process. This tendency is universal for the whole of international trade today. It is estimated that deals combining export and import account now for 25-30 per cent of the total world trade. Further evolvement of various forms of tying export to import is inevitable, due mostly to the growth of foreign debts of developing countries. Evolvement of various forms of non-cash operations is prompted by the inflationary growth in prices, sharp exchange fluctuations, complete or partial inconvertibility of currencies of many

countries. Under these circumstances, there is an increasingly broader linkage between imports and exports. As practice shows, even archaic barter proves useful in certain cases. This form has come to be used by many developing countries in recent years to finance large-scale development programmes and as a means to settle outstanding debts.

For the developing countries, the experience of the CMEA countries could be useful in the following main directions:

- Joint tackling of fuel and raw material problems, which is essential for the development of the petrochemical industry;
- Production specialization and co-operation on the basis of bilateral and multilateral agreements;
- Practice of combined resources, including capital investments in the construction of joint projects;
- Planning and decision-making mechanism in co-operation between the CMEA countries;
- Collaboration between the planning bodies of the CMEA member-states and some developing countries, as well as between themselves and the Council for Mutual Economic Assistance to form joint commissions for economic, scientific and technological co-operation.

On the basis of the above stated analysis it may be recommended that UNIDO intensifies its activities on assisting developing countries in the specialization and co-operation of production, planning of petrochemical industry on national, sub-regional and regional levels, taking into account the experience of the CMEA countries.

There are also possibilities to expand trade and economic ties between the CMEA member-states and the developing countries. In this respect UNIDO could make use of these possibilities to recommend concrete ways of increasing different forms of economic relations with the CMEA countries.

It may also be recommended that UNIDO places special emphasis on promoting specialization and on increasing trade and other forms of economic relations between the developing and the CMEA countries to enhance the development of the petrochemical industry in the developing countries.

The compensation arrangements became widespread in the 1970s and were established as a reality in trade relations between all groups of countries and within these groups. Such arrangements provide a means for the utilization of credits and of securing markets. It may thus be recommended to make use of compensation arrangements, which have a large selection of different types and forms, for the purpose of obtaining credits, increasing production and securing markets.

Appendix 1

Production of selected chemicals in the CMEA member-states (1000 tons)

Products	Year	Bulgaria	Hungary	GDR	Poland	Romania	USSR	Czechoslovakia
Acetone	1970	16	-	9	7	28	232	12
	1975	22	-	21	18	6	279	21
	1980	22	-	25	24	-	340	21
	1981	24	-	25	22	-	336	20
	1982	23	-	25	20	-	314	22
Ammonia	1970	788	503	585	1143	963	7638	525
	1975	935	624	117	2075	1895	11998	863
	1980	1009	966	1436	1803	2732	16732	1029
	1981	1023	996	1463	1694	2897	17894	865
	1982	1033	862	1419	1683	3141	17757	883
Benzene,	1970	-	13			125	1036	107
pure	1975	-	28		15	125	1427	152
	1980	-	104		10	123	1644	184
	1981		87		13	150	1698	240
	1982		91		10	161	1690	279
Caprolactam	1970	13	6	34	27	9	148	27
	1975	19	7	41	56	27	295	46
	1980	25	6	46	87	34	340	57
	1981	26	7	46	80	43	408	57
	1982	27	6	47	76	46	445	58
Man-made	1970	-	4	167	84	34	456	69
fibers	1975	22	9	170	98	49	500	71
	1980	41	8	154	89	50	606	55
	1981	43	8	157	66	59	604	55
	1982	43	8	153	65	48	581	55
Methanol	1970	26	-	164	84	90	1004	78
	1975	28	-	240	149	106	1447	93
	1980	27	-	249	138	292	1900	113
	1981	28	-	243	185	284	2030	115
	1982	28	-	231	169	288	1989	115
Nitrogen	1970	287	350	395	1030	647	5423	324
fertilizers	1975	380	436	538	1523	1292	8535	366
(in nutrients)	1980	436	6498	943	1290	1707	10241	618
	1981	453	685	967	1274	1822	10705	539
	1982	459	660	948	1298	2008	11593	567
Phenol, pure	1970	27	-	-	52	58	357	44
	1975	35	-	-	73	64	413	47
	1980	35	-	-	67	66	496	45
	1981	38	-	-	64	66	497	43
	1982	39	-	-	65	72	459	46
Phenolformal-	1970	56	5	-	11	8	265	15
dehyde resins	1975	11	5	-	19	16	336	19
(phenoplasts)	1980	16	5		22	21	367	19
	1981	15	5		18		380	18
	1982	169	4		18		357	18

(continued)

Production of selected chemicals in the CMEA member-states (1000 tons)
(continued)

Products	Year	Bulgaria	Hungary	GDR	Poland	Romania	USSR	Czechos-lovakia
Phthalic anhydride	1970	2	2	-	19	11	93	9
	1975	1	6	-	35	32	118	23
	1980	7	17	-	33	33	175	25
	1981	8	23	-	33	36	189	24
	1982	12	21	-	32	-	185	24
Plastics & synthetic resins	1970	89	56	370	224	205	1479	245
	1975	156	124	505	431	347	2390	428
	1980	255	328	861	576	579	3028	894
	1981	310	312	998	502	594	3404	913
	1982	337	326	990	466	591	3319	956
Polyethylene and poly-ethylene co-polymers	1970	34	5		17	66	267	29
	1975	51	36		48	105	420	31
	1980	93	52		III	124	623	164
	1981	94	53		III	129	807	141
	1982	89	53		118	143	776	151
Polystyrol and poly-styrol co-polymers	1970	2	...	...	20	11	82	23
	1975	17	...	...	32	18	144	43
	1980	16	...	...	34	32	247	61
	1981	19	...	...	30	...	329	63
	1982	19	...	...	30	32	306	64
PVC and poly-vinylchloride co-polymers	1970	14	14	...	86	56	160	41
	1975	31	40	...	132	84	334	83
	1980	64	173	...	125	206	398	204
	1981	79	158	...	97	206	404	200
	1982	93	166	...	83	...	393	199
Synthetic fibres	1970	23	66	47	54	24	167	31
	1975	43	11	112	122	71	365	69
	1980	56	21	139	168	102	570	110
	1981	59	22	146	139	146	609	114
	1982	62	20	149	135	108	655	125
Synthetic detergents (100% active substance)	1970	17	7	175*	11	6	471*	13
	1975	10	12	209	25	15	769	19
	1980	11	15	246	28	20	1012	22
	1981	11	15	254	23	19	1076	23
	1982	12	14	249	28	...	1076	25
Synthetic dyes	1970	2	2	-	19	11	93	9
	1975	2	0	10	24	12	89	11
	1980	1	0	10	25	17	81	14
	1981	2	...	11	21	16	82	14
	1982	2	...	11	20		83	15
Xylene	1970	26	0		39	129	214	18
	1975	35	4		79	180	327	58
	1980	30	59		39	203	459	76
	1981	32	63		72	224	4687	99
	1982	32	79		56	254	409	107

Note: Data obtained for the GDR and the USSR have not been recalculated for 100% active substance.

Source: The Statistical Yearbook of the CMEA Member-Countries, Moscow, 1983, pp. 90-99.

Appendix 2

Exports of petrochemicals from the CMEA countries

(1000 tons)

		1970	1975	1980	1981	1982
Acetone						
	Bulgaria	15.5 a/	17.1	12.3	12.2	...
	Romania	18.3	18.6	12.7	12.4	
	USSR	11.9	9.1	10.3	11.3	9.3
Benzene						
	Hungary	8.0	25	94	108	...
	USSR	70.4	107.9	10.8	2.5	5.3
Caprolactam						
	Bulgaria a/	0.5	-	0.9	2.1	...
	Poland	1.1	...	...	3.5	...
	USSR	...	22.1	6.1	6.0	7.2
Detergents						
	Poland	1.4	9.4	7.5	3.2	
	Czechoslovakia, m. Kr.	85.7	101.4	172.9	172.7	
Ethyl alcohol						
	Hungary	-	80	144	135	...
	USSR	24.6	24.6	18.2	20.7	20.7
Hylene						
	Bulgaria	11.2 a/	16.8	1.3	0.6	...
	USSR	29.1	80.4	38.7	19.5	21.3
Methanol						
	Poland	14.9	36.4	32.8	50.3	...
	Romania	3.7	3.4	16.3	20.3	
	USSR	164.5	156.6	258.6	286.1	252.3
Phenol						
	Poland	7.3	5.7	...	...	...
	Romania	30.1	30.1	2.4	3.5	...
	USSR	38.4	32.7	22.6	23.1	30.5
Plastics						
	Hungary	9.7	21.5	107.0	112.6	
	Romania	43.9	59.2	138.9	167.4	
	USSR, M. Roubles	36.0	52.0	137.7	148.2	177.2
	Czechoslovakia	2.4	7.0	10.0	6.5	

(continued)

Appendix 2

Exports of petrochemicals from the CMEA countries
(1000 tons) (continued)

	1970	1975	1980	1981	1982
Polyethylene					
Bulgaria	4.3 a/	2.4	12.6	6.5	
Poland			14.4	25.5	
Romania		10.3	10.4		
Polyvinylchloride					
Hungary	3.2	9.3	98.9	103.3	
GDR	8.8	14.1	64.0	110.2	
Poland	17.9	...	14.6	10.4	
Romania	...	11.8	66.8	102.0	
Polystyrene					
Bulgaria	5.5 a/	3.3	1.0	0.1	
Synthetic fibres					
Bulgaria	9.7 a/	3.3	3.0	2.9	
Hungary	4.2	3.0	4.1	3.8	
Poland b/	3.0	8.9	13.8	11.0	
Czechoslovakia b/ M.Kr.	84.0	92.3	276.0	295.2	
Synthetic dyes					
Bulgaria	0.8*	0.8	0.6	0.5	
Hungary	4.9	9.6	8.5	10.5	
GDR, million Marks	92.9	70.9	98.9	107.4	
Poland	6.9	9.6	8.4	6.6	
Romania	2.3	9.6	8.4	6.6	
Czechoslovakia, m. Kr.	142.7	227.1	397.1	465.3	
Toluene					
Bulgaria		21.2	43.8	43.6	...
Hungary		19	57	69	...
Romania	46.9	49.1	38.3	43.2	...
USSR	76.0	124.3	119.0	72.2	66.9

a/ 1973
b/ Chemical fibres

Source: Foreign Trade Statistics of the above-mentioned countries.

Appendix 3

Imports of petrochemicals by the CMEA countries
(1000 tons)

	1970	1975	1980	1981	1982
Acetone					
Hungary	...	10.3	10.4	14.8	...
Benzene					
Hungary	...	5.4	11.7	...	...
Poland	24.3	11.4	3.6	1.0	...
Caprolactam					
Poland	1.1	7.9	1.5		...
Detergents					
Poland	3.6	1.8	15.7	15.9	...
USSR		54.1	104.7	134.2	...
Czechoslovakia, m. Kr.	77.2	170.6	226.4	278.4	...
Ethylene					
USSR	-	-	-	40.0	43.9
Ethylene glycol					
Poland	12.7	9.2	6.0	4.2	...
USSR, M. Roubles	2.9	9.4	16.1	7.9	...
Methanol					
Hungary	32.6 a/	37.3	53.3	45.9	...
Plastics					
Hungary	82.4	117.9	92.0	96.8	...
Romania	22.4	52.2	90.6	88.6	...
USSR, M. Roubles	78.0	216.0	504.2	500.2	390.0
Czechoslovakia	2.5	10.2	29.7	24.9	...
Polyamide resins					
Hungary	0.8	0.8	1.9	3.4	...
Poland			1.4	1.1	...
Polyethylene					
Bulgaria	5.3 b/	9.9	7.3	4.5	...
Hungary	26.2 a/	36.1	1.2	2.6	...
Poland	6.2	31.7	21.8	15.7	...
USSR, M. Roubles	1.8	10.8	44.9	52.9	4.9

(continued)

Appendix 3

Imports of petrochemicals by the CMEA countries
(1000 tons) (continued)

	1970	1975	1980	1981	1982
Polyvinylchloride					
Bulgaria	9.3 b/	7.7	18.8	6.8	...
Hungary	12.2 a/	16.7	11.0	13.0	...
Poland	4.9	20.9	53.6	37.0	...
USSR, M. Roubles	11.0	11.5	18.8	26.9	21.9
Polypropylene					
Hungary	7.2	10.6	...	...	...
Poland		8.3	4.1	1.3	...
Polystyrene					
Bulgaria	4.2 b/	0.5	7.6	10.6	
Hungary	10.4 a/	22.2	32.7	35.5	...
Poland	0.7	8.7	24.0	15.7	...
USSR, M. Roubles		30.4	9.2	2.6	8.9
Synthetic fibres					
Bulgaria	1.9	0.6	1.2	2.0	...
Hungary	22.2	19.2	23.5	26.2	...
Poland c/	40.6	59.4	64.0	46.1	...
Romania	0.5	0.2	3.1	4.2	...
USSR	22.5	25.3	44.5	30.3	...
CSSR c/, M.Kr.	114.7	213.2	386.9	483.6	...
Synthetic dyes					
Bulgaria	1.8	2.2	2.3	3.5	...
Hungary d/	2.1	4.4	7.7	7.2	...
GDR, million Marks	5.5	5.7	3.7	3.2	...
Poland	1.9	3.3	2.5	1.6	...
Romania	1.9	2.1	2.4	3.2	...
USSR		15.5	18.8	22.7	20.3
CSSR d/, M. Krs.	65.0	140.7	257.6	242.3	...
Toluene					
Bulgaria	...	21.2	43.8	43.6	...
Hungary		19	57	69	...
Romania	46.9	49.1	38.3	43.2	...
USSR	76.0	124.3	119.0	72.2	66.9
Xylene					
Poland	24.3	11.4	3.6	1.0	...

a/ 1972
b/ 1973
c/ Chemical fibres
d/ Varnishes and paints

Source: Foreign Trade Statistics of the above-mentioned countries.

Appendix 4

Geographical distribution of exports of petrochemicals
from the CMEA countries
(per cent)

	1970			1980			1981		
	I a/	II b/	III c/	I a/	II b/	III c/	I a/	II b/	III c/
Acetone									
Bulgaria	47	52	1	40	53	7	71	28	1
Benzene									
Hungary	-	-	-	30	70	-	50	50	-
Caprolactam									
Hungary	-	-	-	66	34	-	15	85	1
Poland	-	100	-	-	-	-	-	100	-
Detergents									
Czechoslovakia	95	-	5	87	-	13	93	-	7
Ethylene									
Hungary	-	-	-	100	-	-	100	-	-
Methanol									
Poland	-	100	-	91	-	10	90	-	
USSR	57	43	-	61	39	-	53	47	
Plastics									
Hungary	-	-	-	21	57	22	34	51	15
USSR	72	5	23	99	1	-	98	2	-
Czechoslovakia	68	19	13	52	45	3	60	33	7
Polyethylene									
Bulgaria	94	6	-	23	76	1	9	91	-
Poland	-	-	-	86	-	-	100	-	
Polyvinylchloride									
Hungary	-	-	-	22	55	23	32	52	16
Poland	43	57	-	100	-	-	95	5	-
Polystyrene									
Bulgaria	77	19	4	-	100	-	-	100	-
Synthetic fibres									
Bulgaria	47	52	1	40	53	7	7128	1	
Hungary	-	-	-	96	4	-	99	-	-
Poland d/	59	22	19	87	6	7	92	3	5
Czechoslovakia d/	86	4	10	85	14	1	79	15	6
Synthetic dyes									
Bulgaria	67	-	33	66	1	33	64	-	36
Poland	77	7	16	64	14	22	76	9	15
Czechoslovakia e/	89	5	6	82	15	3	86	9	5

a/ I = the socialist countries
b/ II = developed countries
c/ III = developing countries
d/ Chemical fibres
e/ including paint and varnish materials.

Appendix 5

Geographical distribution of imports of petrochemical products by the CMEA member-countries
(percent)

	1970			1980			1981		
	I a/	II b/	III c/	I a/	II b/	III c/	I a/	II b/	III c/
Acetone									
Hungary	-	-	-	60	40	-	35	65	-
Benzene									
Hungary	-	-	-	43	57	-	-	-	-
Poland	100	-	-	37	63	-	100	-	-
Caprolactam									
Poland	100	-	-	-	100	-	-	-	-
Methanol									
Hungary	76	24	-	98	2	-	100	-	-
Phthalic anhydride									
Bulgaria	20	80	-	33	67	-	84	16	-
Hungary	-	-		4	96	-	-	100	-
Poland	-	100	-	-	100	-	-	100	-
Plastics									
Hungary	18	81	1	80	70	-	32	68	-
USSR, M. Roubles	20	80	-	13	87	-	16	84	-
Czechoslovakia	16	83	1	32	67	1	31	68	-
Polyamide resins									
Hungary	-	100	-	-	100	-	-	100	-
Polyethylene									
Bulgaria	87	13	-	13	85	-	30	70	-
Hungary	28	72	-	91	9	-	61	38	1
Poland	50	50	-	29	71	-	55	45	-
USSR, M. Roubles	1.8	10.8	44.9	52.9	4.9				
Polyvinylchloride									
Bulgaria	87	23	-	82	18	-	89	11	-
Hungary	-	100	-	9	91	-	42	58	-
Poland	-	100	-	69	31	-	70	30	-
Polypropylene									
Poland	-	-	-	-	100	-	56	44	-
Polystyrene									
Bulgaria	79	21	-	81	19	-	66	34	-
Hungary	39	61	-	52	48	-	54	46	-
Poland	92	8	-	-	100	-	-	100	-
Synthetic fibres									
Bulgaria	-	100	-	47	53	-	65	45	-
Hungary	9	91	-	42	58	-	31	69	-
Poland e/	40	60	-	32	66	2	37	56	7
USSR	-	100	-	-	100	-	7	93	-
Czechoslovakia e/	15	70	15	40	41	19	47	33	20
Synthetic dyes									
Bulgaria	67	33	-	58	42	-	52	48	-
Poland	28	72	-	34	66	-	48	52	-
USSR	-	-	-	87	13	-	70	30	
Czechoslovakia d/	20	62	18	18	66	16	19	63	18
Xylene									
Poland	100	-	-	55	45	-	92	8	-

a/ I = socialist countries
b/ II = developed countries
c/ III = developing countries
d/ inclusive of varnish and paint materials
e/ chemical fibres

Source: Foreign Trade Statistics of the above mentioned countries.

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Q U E S T I O N N A I R E

The development of chemical and petrochemical industries in the European CMEA countries

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