A C T A U N I V E R S I T A T I S L O D Z I E N S I S
FOLIA OECONOMICA 91, 1989

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ECONOMETRIC MODEL OF FOREIGN TRADE FLOWS OF THE EUROPEAN CMEA COUNTRIES

1. Introduction

The purpose of this paper is to present the actual state of modelling of the foreign trade in the model of the CMEA countries, which has been built in the Institute of Econometrics and Statistics, University of Łódź.

The research has been concentrated on the problems of foreign trade model specification reflecting the real mechanisms operating in the intra CMEA trade and trade with the non-CMEA region. Special attention has been paid to the problems of linkage of the national models into one system through the foreign trade equations as well.

In Section 2 the basic characteristics of the intra CMEA trade with special regard to the role of foreign trade prices and its relations to the world trade prices are presented. There have been investigated some consequences of the foreign trade price bias from the point of view of exporters and importers of the CMEA market in the basic commodity groups scope.

The conclusions on the type of particular commodity market orientation have been a basis for the assumptions of constructing the intra CMEA trade model (Section 3).

Section 4 presents the assumptions of the foreign trade equations with the non-CMEA countries. In the construction of these equations some specific features of trade with the non-CMEA region have been stressed. These are the financial limits, processes of substitution between the intra CMEA and the non-CMEA trade, supply limits etc.

The basic connections with other sectors of the CMEA countries model and the problems of linkage of the national models through the foreign trade equations are presented in Section 5.

The results of estimation are discussed briefly in Section 6 and a full set of estimated equations is included in the Appendix.

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2. The Mechanism of Operation of the Intra CMEA Trade

The operation of the intra CMEA foreign trade is based on the different principles in comparison with the Western countries. The basic importance has the coordination of the national plans in the frame of mutual cooperation being a consequence of the processes of central planning and making decisions at the central level with the existing state monopoly of the foreign trade.

The significance in the process of the mutual trade has the existing system of foreign trade prices. The foreign trade prices of the mutual trade are not directly connected either with the world prices or the internal prices. Its role as the economic parameters, does not have a significant meaning which causes the necessity of application of the non-price instruments determining the level of the mutual exchange. Among the non-price instruments especially important are export and import quota constraints causing the tendency to bilateral balancing of the mutual exchange in the intra CMEA trade

The problem of price determination is connected with the currency system, especially with the lack of existing real exchange rates between the transferable ruble and the domestic devisa currency and domestic currency as well.

The characteristic of the CMEA foreign trade mentioned above follow to the modification or the refusal of the foreign trade equations specification usually applied in the econometric models of Western economies. Modelling of the mutual trade of the CMEA countries needs the formulation of hypothesis taking into account the specific conditions existing in the CMEA market.

The problem of the great importance seems to be the actually existing system of prices. At the actual stage of the economic theory there is a great difference in the approaches to the foreign trade price formulation in the intra CMEA exchange. Generally, two main theoretical concepts can be distinguished, the first that the prices of mutual trade should reflect the domestic production costs, and the second that these prices should be directly connected with the world trade prices [5].

In the practical formulation of the foreign trade prices none of these two concepts has been realized directly[1]. Until 1975 in the intra CMEA trade the constant prices of the five-year periods ("stop"

[1] Beside these two opposite concepts there is a set of mixed proposals (see e.g. [5]).

prices) were applied as the average of the world trade prices of the previous term. The great increase of world trade prices, especially for fuels and raw materials, in the years 1973-1974 caused a change of the foreign trade prices formulation in the CMEA market. "The moving" basis of the foreign trade prices has been introduced since 1975 formulating prices for a given year as the average of world trade prices for some previous years, e.g. prices of the year 1975 were based on the average world trade prices for the period 1972-1974, prices of 1976 - average world prices of 1971-1975, 1977 - average world prices of 1972-1976, etc. [15].

The statistical data including information about the foreign trade prices of the CMEA countries and the world trade prices, which had been analyzed by B a s i u k, J a r o s z y ń s k a and K r a w c z y k [3], V a n o u s [18] and B o ż y k, G u z e k [5] have shown different relations between prices of fuels, raw materials, materials, food and prices of the manufactured goods in the intra CMEA trade and the world trade. Raw materials and food have been relatively cheaper and machinery, equipment and other manufactured goods have been relatively more expensive in the CMEA market in comparison with the world market.

It seems to be interesting to analyze this fact on the background of the CMEA trade with the non-CMEA countries presented by B o ż y k and G u z e k [5].

The relatively higher prices of the manufactured goods in the CMEA market than in the world market were constituted by the existing economic and political circumstances in the past, especially in the 50-ies. The Western countries, being the main supplier of these goods applied different restrictions in trade with the socialist countries (quota limits, tariff policy, duty policy etc.). The result of those restrictions was the difficult access to the world market of manufactured goods, and the limited supply of those goods of Western origin in the socialist market. The strong tendencies to the development of own production of manufactured goods were the consequence of that fact, which resulted in the independence of the trade with Western countries.

This situation was analyzed by B o ż y k and G u z e k [5] on the basis of the Marxian theory of value. In the circumstances of the existence of two values of goods: produced in better conditions (the CMEA market) those values were not equal and if the quantity of goods produced in better conditions was a small part of the total

quantity of goods then the quantity produced in worse conditions would determine the market value. Then the prices of manufactured goods in the socialist market were on the pressure of tendency to reflect the regional production costs, stronger than the world production costs [5]. The prices formed in that way induced the development of domestic production, often with high production costs and low quality of products, as the process of substitution to imports. That situation was the consequence of a certain isolation of the CMEA market with the limited supply of goods produced in better conditions.

The price relations of raw materials and food were formed in a different way. The main suppliers of raw materials to the world market were and still are the developing countries. The CMEA trade with this group of countries was not a full alternative for the intra CMEA trade.

In the early period of existence, the socialist countries were well provided with raw materials for their own needs - practically they possessed most of raw materials with well located sources, e.g. the European part of the Soviet Union. The raw materials prices in the CMEA market were closely related to the world trade prices. The conditions and production costs of raw materials have changed over time, mainly due to the shift of raw material sources to the Asian part of the Soviet Union. The increase of the production costs has not reflected the realized prices, which remainded unchanged for a long term.

The reason for maintaining low, preference prices for goods of raw material character in the mutual trade, has been the tendency to independence of the politically unstable area of developing countries. The relatively lower prices of raw materials have been compensated by the mutual investments of the development of raw material production [2], [9]. The existing bias of the foreign trade price structure implies certain characteristic tendencies in the CMEA market.

Relatively higher prices of the manufactured goods in the intra CMEA trade in comparison with the world market, together with the difficult access to the world market of these goods, created strong tendencies to the development of the manufacturing branches of industry, especially those producing machinery and equipment, and to the exports of those goods to the CMEA market. The different situation was observed in the intra CMEA market of raw materials and food - relatively low prices caused a decrease of export development of raw materials and food to this market.

There were two additional reasons which deepened the tendencies in structure and dynamics of the intra CMEA exports, first - easily saleable commodity goods of raw material character to the non-CMEA region (lack of quality differences), second, difficulties in manufactured goods exports to this region (lower quality, worse service).

Moreover, the difficult payment situaton of most CMEA countries in trade with Western countries has created additional pressure of exports to this region to finance imports, mainly by the easily saleable raw materials. The changes in export structure of particular CMEA countries to the CMEA market are presented in Table 1.

T a b l e 1

The commodity goods structure of exports in intra CMEA trade, current prices (in %)

Country	Groups			
	manufactured goods[a]		raw materials[b]	
	1960	1980	1960	1980
Bulgaria	34.2	65.0	65.8	35.0
Czechoslovakia	63.0	73.9	37.0	26.1
GDR	67.3	87.4	32.7	22.6
Poland	42.0	77.5	58.0	22.5
Romania	29.3	54.9	70.7	45.1
Hungary	63.1	62.6	36.9	37.4
Soviet Union	22.8	32.9	77.2	67.1

[a] I group: machinery and equipment, consumer goods of industrial origin.

[b] II group: fuels, raw materials and materials, food and raw materials for food production.

S o u r c e s: Author's computations, B o ż y k [4] and Statistical Yearbooks of the particular CMEA countries.

In most of the CMEA countries the significant changes of the export structure to the CMEA region were observed in the years 1960--1980. The increase of share of the manufactured goods exports was especially large for the countries of less industrialized level: Bulgaria, Romania and Poland, significant for Czechoslovakia and GDR. Relatively low changes were in exports of Hungary and Soviet Union in that period. Respectively opposite changes are observed in the share of raw materials exports in the years 1960-1980. Table 1

shows the special role of the Soviet Union as the main supplier of raw materials to the CMEA market.

The situation in the intra CMEA market from the point of view of the importing countries can be described as follows. In the circumstances of biases of the price structure for the manufactured goods and raw materials, mentioned above, the importing countries are interested in possibly maximum increase of raw material imports from the CMEA market which offers lower prices and savings in hard currency expenditures simulatenously. The importing countries tend to limit purchases of manufactured goods from the CMEA market causing - by the relatively high prices of this commodity group and the existing similarities of the economic structures of the CMEA countries - the competitive processes between imports and domestic producton. The existence of similarities in the economic structure of CMEA countries which had been formed in the past by the development of similar manufacturing industries caused a decrease of interest in imports of manufactured goods from the CMEA region with simultaneously occurring strong tendencies to the modern technology imports from Western countries. The factors concerning the interests of exporting and importing countries in the intra CMEA trade caused the next characteristic feature of this trade - tendencies to balance the mutual trade.

The considerations presented above concerning the character and tendencies in the intra CMEA trade operation allow to formulate certain assumptions of the intra CMEA foreign trade modelling.

It was assumed that the intra CMEA market of raw materials and food had been in a persistent excess of demand and the intra CMEA market of manufactured goods had been in an excess of supply. This assumption is a result of the characteristic features of the intra CMEA market, first of all of the price relations between the manufactured goods and raw materials. Under these assumptions the raw material market (fuels, raw materials, materials and food) is supply-oriented and the manufactured goods market (machinery, equipment and consumer goods of industrial origin) is demand-oriented.

The process of trade for goods of the raw material character can be presented in the following way.

The supply functions in particular CMEA countries models determine the exports to the CMEA region. The sum of such determined exports forms the total exports of all CMEA countries, which is equal to the total imports of all CMEA countries[2]. Imports of individual CMEA

[2] This approach is called the pool approach, see [18], [6], [7].

countries are determined by the allocation functions of the total CMEA imports. The total values of individual countries are less than the import requirements of these countries (the assumption of excess demand in this market).

The process of exchange in the manufactured goods market is formed in a different way. In the individual country models of the CMEA economies, the imports are determined by the demand functions. The sum of imports forms the total demand for imports which is less than the total supply of exports in this market (the assumption of excess supply in the manufactured goods market). Exports of individual countries are determined by the allocation functions of the total imports of all CMEA countries in this market.

3. Specification of the Intra CMEA Trade Equations

Foreign trade of the CMEA countries has been divided into four commodity groups in the model of intra trade[3]:

1) fuels, raw materials and materials,
2) food with raw materials for food production,
3) machinery and equipment,
4) consumer goods of industrial origin.

The first two groups belong to the group of raw material character, the next two - to the group of manufactured goods character. The assumptions of the supply oriented market of raw materials and the demand oriented market of manufactured goods imply the specification of the foreign trade equations.

The essential role in the raw material market description is played by the supply export equations in individual country models.

The basic variable determining the export possibilities of this commodity group is the value of production respectively for a given group of goods. It has been assumed that the values of exports are determined proportionally to the values of production. The second important factor which determines the export supply function of raw materials and food to the CMEA market is a level of exports of these groups to the non-CMEA countries. The existing financial problems of most CMEA countries being a result of the foreign debt in Western countries causes a tendency to increase exports of raw materials and food to the non-CMEA countries. Then the export supply

[3] This division has been done according to the classification of the foreign trade statistics of the CMEA countries.

to the intra CMEA market is limited by the exports of this commodity group to the non-CMEA region. There is an exception in the case of the Soviet Union being the main supplier of raw materials to the intra CMEA market. The value of exports of the Soviet Union to the non-CMEA region is limited by the export priority to the CMEA countries.

The important role in export determination of this commodity group is played by the tendency of the mutual trade balancing, being the consequence of the relatively low prices and deficit character of this commodity group. The element reflecting this tendency is value of raw materials and food imports from the intra CMEA market. The increase of imports of this commodity group causes a pressure to increase the export supply to the CMEA countries. The weather conditions have been introduced by the IOWA type index in equations of food exports[4].

The export equations of the raw materials, fuels and materials and food with raw materials for food production to the CMEA region can be presented by relations (1) and (2):

$$ESF = f(XQ, ENF, MSF, U_{ESF}) \quad (1)$$

$$ESR = f(XR, ENR, MSR, IOWA_{-1}, U_{ESR}) \quad (2)$$

where:

ESF - exports of fuels, raw materials and materials to the CMEA countries;

ESR - exports of food and raw materials for food production to the CMEA countries;

XQ - output of industry;

XR - output of agriculture;

ENF - exports of fuels, raw materials and materials to the non-CMEA countries;

ENR - exports of food and raw materials for food production to the non-CMEA countries;

MSF - imports of fuels, raw materials and materials from the CMEA countries;

MSR - imports of food and raw materials for food production from the CMEA countries;

$IOWA_{-1}$ - weather index of the IOWA type, value of the previous year;

V_{ESF}, V_{ESR} - dummy variables.

[4] The weather index of the IOWA type is the index describing the influence of weather conditions on crop production, see [12].

The import neds of the individual CMEA country are not satisfied by the export deliveries from the CMEA region (assumption of the persistent excess of demand in this market). Part of the non-satisfied imports has to be covered by the imports from the non-CMEA region.

Imports of raw materials and food from the CMEA countries have been determined by the allocation type functions of the total CMEA exports of those commodity groups. There have been introduced additionally the lagged endogenous variables to reflect the inertia process in imports of those commodity groups from the CMEA region.

Imports of raw materials and food for a given CMEA country from the CMEA region can be presented by the following allocation type equations:

$$MSF = f\ (ESFW,\ MSF_{-1},\ U_{MSF}) \tag{3}$$

$$MSR = f\ (ESRW,\ MSR_{-1},\ U_{MSR}) \tag{4}$$

where:

MSF - imports of fuels, raw materials and materials from the CMEA countries;

MSR - imports of food and raw materials for food production from the CMEA countries;

ESFW - total exports of fuels, raw materials and materials in intra CMEA trade without exports of this group of the given CMEA country;

ESRW - total exports of food and raw materials for food production in intra CMEA trade without exports of this group of the given CMEA country;

U_{MSF}, U_{MSR} - dummy variables;

"-1" - denotes one year lag.

In a part of the model describing the intra CMEA trade of manufactured goods the key role is played by the specification of import demand equations, being a result of the assumption of demand orientation of this market. The import demand equations of machinery and equipment are determined by the level of investment outlays. The increase of investment outlays determines an increase of import needs for machinery and equipment. The import demand equations of consumer goods of industrial origin are determined by the level of consumption, the increase of consumption influences the increase of imports of consumer goods.

The important elements correcting the demanded imports of these two commodity groups are factors reflecting the tendencies of trade balancing in the intra CMEA market. These factors have been introduced as the one-year lagged values of exports for respective com-

modity groups. Additionally the lagged endogenous variables have been introduced representing elements of planning of mutual trade through the trade agreements.

The form if import equations of machinery, equipment and consumer goods of industrial origin from the CMEA countries is presented by relations (5) and (6):

$$MSM = f(I, ESM_{-1}, MSM_{-1}, U_{MSM}) \quad (5)$$

$$MSC = f(C, ESC_{-1}, MSC_{-1}, U_{MSC}) \quad (6)$$

where:

MSM - imports of machinery and equipment from the CMEA countries;

MSC - imports of consumer goods of industrial origin from the CMEA countries;

I - investment outlays;

C - consumption;

ESM - exports of machinery and equipment to the CMEA countries;

ESC - exports of consumer goods of industrial origin to the CMEA countries;

U_{MSM}, U_{MSC} - dummy variables.

The specification of export equations of machinery, equipment and consumer goods of industrial origin is a result of assumption of permanent excess of supply of these commodity groups in the CMEA market. The main explanatory variable is total imports of these commodity groups in the intra CMEA market. The lagged endogenous variables have been introduced to reflect the inertia processes of exports to the CMEA countries.

These equations are presented in relations (7) and (8):

$$ESM = f(MSMW, ESM_{-1}, U_{ESM}), \quad (7)$$

$$ESC = f(MSCW, ESC_{-1}, U_{ESC}), \quad (8)$$

where:

ESM - exports of machinery and equipment to the CMEA countries;

ESC - exports of consumer goods of industrial origin to the CMEA countries;

MSMW - total imports of machinery and equipment in intra CMEA trade without imports of this group of the given CMEA country;

MSCW - total imports of consumer goods of industrial origin in intra CMEA trade without imports of this group of the given CMEA country;

U_{ESM}, U_{ESC} - dummy variables.

4. The Structure of Foreign Trade Equations of the CMEA Countries with the Non-CMEA Region

The CMEA trade with the non-CMEA countries plays a considerable role in the process of economic development of this region. The trade with the Western countries is important from the point of view of technical progress level by imports of modern technology, raw materials of a deficit character in the CMEA region, necessary for the economic operation. Trade with the non-CMEA countries allows to participate in the international labour division determining better adjustment of production structure to the existing resources of productive forces.

The essential difference between the trade of CMEA countries with the non-CMEA countries and the intra CMEA trade is performed by the system of foreign trade prices. In the trade with the non-CMEA region, foreign trade prices are directly based on the levels and relations of the world trade prices. The foreign trade prices determine the values of this trade.

An important characteristic feature of the trade with the non-CMEA region is the lack of trade balancing, especially observed in the last decade. The high rate of economic growth and investment outlays realized in the seventies caused an increase of import demand from Western countries. The increased imports were mainly realized through the active credit policy running which in the circumstances of a relatively low proexport character of socialist economies and economic recession in Western countries, inflation processes, unfavourable terms of trade led to the situation of a high level of foreign debt of most CMEA countries. The level of foreign debt has an influence for the limits of import increase from the Western countries (except the case of the Soviet Union), however, in different scale for different CMEA countries[5].

The import equations from the non-CMEA countries have been constructed under the assumption that the main explanatory variable had been the domestic demand of production, investments and consumption respectively to the imported commodity goods. Imports of fuels, raw materials and materials are determined by the level of non-agricultural production in the material sector, imports of machinery and

[5] The highest level of foreign debt in 1979 was reached in Poland - 21.1 billion of dollars (gross), the lowest - by Czechoslovakia - 4.02 billion of dollars, see [14], [16].

equipment are determined by the level of investment outlays. In the import equations of consumer goods and food the main explanatory variables are consumption and consumption of food, respectively.

In the import equations from the non-CMEA countries the influence of foreign trade prices has been introduced; it has been constructed as the variable being the relation of intra CMEA trade prices to the world trade prices for all commodity groups distinguished in the equations, respectively. The limits of the import needs from the non-CMEA countries have been taken into account by introducing variables as the relation between the level of the foreign debt in Western countries to the level of exports to this group of countries. The higher level of foreign debt in relation to exports, the stronger import limits.

There have been introduced some elements of substitution processes of imports from two areas - the CMEA region and the non-CMEA region. These processes have been expressed by the variable constructed as differences between the rates of growth of imports from the CMEA region respectively for commodity groups and the ratio of values reflecting the level of economic activity (production, investments or consumption).

The general form of import equations from the non-CMEA countries can be written as follows:

$$MN(L) = f\,(A)L,\ (PRG(L)/PHS(L)),\ (ZDLP/ENP)_{-1},\ MS(L),\ (MS(L)/MS(L)_{-1} - A(L)(A\,(L))_{-1},\ U_{MN(L)}) \qquad (9)$$

where:

L = F, M, C, R - commodity groups (grouped analogically to the export classification) and respectively variables of the economic activity, prices;

MN(L) - imports of commodity group L from the non-CMEA countries;

A(L) - economic activity level of country respectively for commodity group L;

PRG(L) - price index of intra CMEA trade for commodity group L;

PHS(L) - world price index for commodity group L;

ZDLP - foreign debt in Western countries, current prices;

ENP - total exports to the non-CMEA countries, current prices;

MS(L) - imports of commodity group L from the CMEA countries;

$U_{MN(L)}$ - dummy variables.

Exports to the non-CMEA countries of a given commodity group are determined by the foreign demand expressed by the exports of the world

trade of these commodity groups. The higher level of world exports the higher the level of exports to the non-CMEA region. There has been assumed that values of exports of a given commodity group to the non--CMEA region are determined by the price relations between foreign trade prices of the CMEA countries and the world prices as well. In export functions factors determining limits on the supply side of the goods exported to the non-CMEA region have been introduced additionally. That variable has been constructed as a difference between the rate of growth of exports to the CMEA market and the rate of growth of the respective type of production. The rate of growth of exports of a given commodity group to the CMEA countries higher than the rate of growth of production is a limit in the exports to the non-CMEA countries. The lagged endogenous variables have been introduced in export equations to take into account the inertia processes of this trade.

Export equations to the non-CMEA countries for a given commodity group L, L = F, M, C, R, can be presented in the following form:

$$EN(L) = f(EKN(L), (PRG(L)/PHS(L)), EN(L)_{-1}, (ES(L)/ES(L)_{-1} - XQ(L)/(XQ(L))_{-1}, U_{EN(L)}) \quad (10)$$

where:

EN(L) - exports to the non-CMEA countries of commodity group L;
EKN(L) - world exports of commodity group L;
PRG(L) - intra CMEA price index of commodity group L;
PHS(L) - world price index of commodity group L;
ES(L) - exports to the CMEA countries of commodity group L;
XQ(L) - domestic production respectively for commodity group L;
$U_{EN(L)}$ - dummy variables.

5. Foreign Trade Submodel in the System of Models of the CMEA Countries

The foreign trade sector in the model of the CMEA countries performs two basic functions:

1^{o} description of export and import equations in the national models of the CMEA region

2^{o} linkage of the national models of the CMEA region into one comprehensive system of models.

The structure of foreign trade equations is presented in Sections 3 and 4 of this paper. A simplified scheme of the foreign

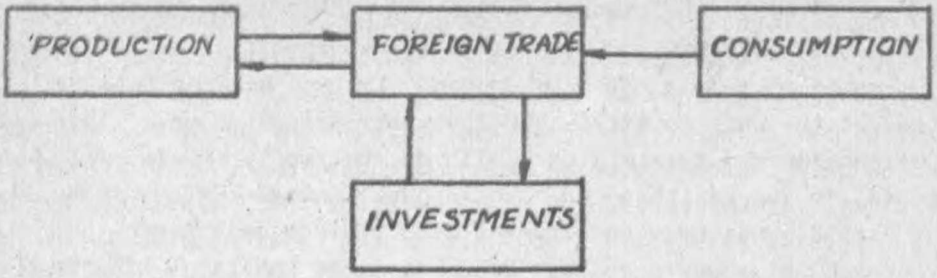

Fig. 1. The simplified scheme of connections between the foreign trade and other sectors

trade connections with other sectors in country models of the CMEA region is shown in Figure 1.

The second, important function of the foreign trade sector is the possibility of linkage of national models into one comprehensive system. There are presented two types of approaches in practical salutions, first based on the trade share matrix approach, applied in models LINK. (K l e i n [11], H i c k m a n [10]), EPA(A m a n o, K u r i h a r a [1]) and second using the pod approach (V a n o u s [18], [19], C z y ż e w s k i, T o m c z y k [6], [7]). In the actually presented version the second approach has been applied[6].

The application of the pod approach is connected directly with the assumptions of the foreign trade submodel construction of the intra CMEA trade, presented in Sections 2 and 3. The assumptions of the supply orientation of the intra CMEA market for the raw material character goods and the demand orientation of the manufactured goods market in the intra CMEA trade imply the formation of some pools as a result of aggregation of exports or imports for a given commodity goods and the application of allocation functions follows for the linkage of the individual country models into one common system. These processes are presented in Figure 2 and 3.

The main differences between Figure 2 and 3 are based on the distinct hypothesis regarding the processes of trade in the raw material market (assumption of demand excess) and the manufactured goods market (assumption of supply excess)[7].

[6] Simultaneously the research on the application of the trade share matrix approach to the linkage of country models into one system of the CMEA countries was conducted. See [8].

[7] See Sections 2 and 3.

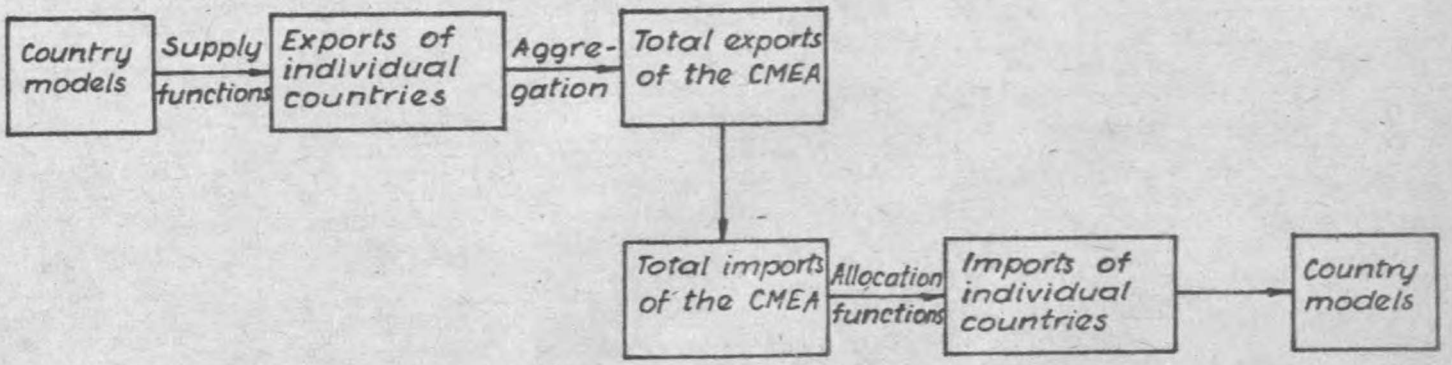

Fig. 2. The scheme of linkage of the individual country models of the CMEA countries through the intra CMEA trade equations for commodity groups of raw material character (fuels, raw materials, materials and food with raw materials for food production)

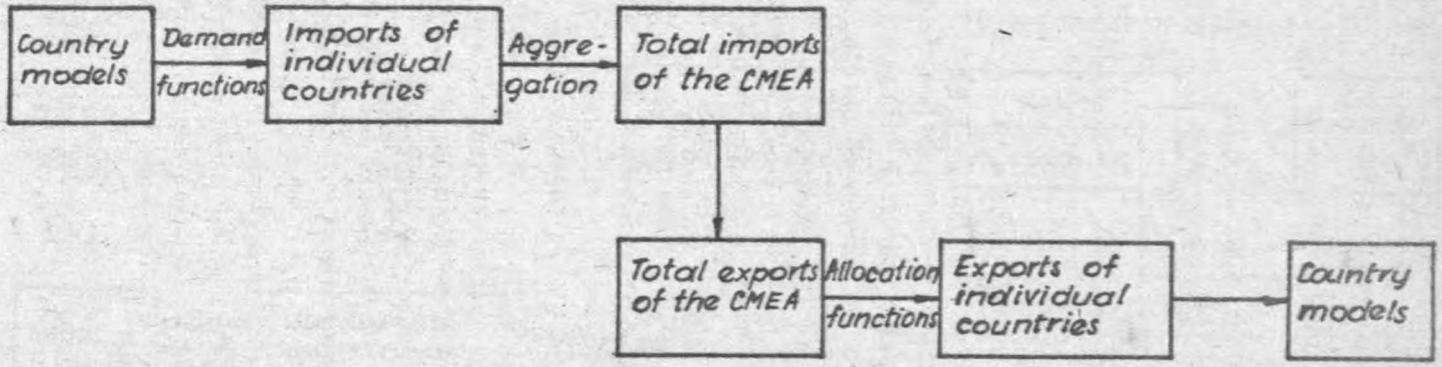

Fig 3. The scheme of linkage of the individual country models of the CMEA countries through the intra CMEA trade equations for commodity groups of manufactured goods character (machinery, equipment and consumer goods of industrial origin)

6. Results of Estimation of the Foreign Trade Equations

Estimation of the foreign trade sector in the division of two directions of trade and four commodity groups (112 stochastic equations) has been performed on the time series of 1963-1980 using the OLS method[8].

The results of estimation confirm generally the formulated hypothesis in the specification of import and export equations. The high level of fitness of the equation has been obtained with significant parameters of equations from the point of view of statistical and economic theory.

In the intra CMEA trade equations for some countries the hypothesis of tendency to mutual trade balancing for the same commodity group has been substituted by the total exports (imports) of a given country. This fact has the justification in the commodity structure of the intra CMEA trade, e.g. in the case of Romanian imports of machinery and equipment form the CMEA region the total Romanian exports to this region determines the level of these imports, not the relatively low level of exports, of machinery and equipment to the CMEA countries (equation R6 of the Appendix).

In most export equations of the raw material character to the CMEA countries the values of parameters of variables describing the level of exports of these commodity groups to the non-CMEA region seem to be interesting. The parameters express the tendency to reduce the export supply to the CMEA countries in favour of exports to the non-CMEA countries because of the difficult financial situation and bias of foreign trade price structure. The values of these parameters are in the interval from 0.58464 (Bulgarian exports of fuels, raw materials and materials) to 0.31262 (Czechoslovak exports of fuels, raw materials and materials)[9].

In the import equations from the non-CMEA countries the results describing the influence of financial limits expressed through the variable being the relation of the foreign debt to the total level of exports to the non-CMEA countries seem to be interesting. The values of these parameters are significant in most equations.

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[8] Results of the estimation are presented in the Appendix.

[9] The hypothesis of the competitiveness of raw material exports has not been tested in the case of the Soviet Union because of the priority character of these exports to the CMEA region, see Section 2.

Satisfactory results have been obtained in the estimation of export equations to the non-CMEA countries as well. The assumptions about the influence of the world trade circumstances with the simultaneous introduction of the supply limits have been confirmed by the empirical validation.

Appendix

List of Variables

1. General remarks:

The first letter D of a symbol denotes that variable is expressed in the form of the first differences, the last P - that a variable is expressed in current prices.

Symbol "-1" - variable one year lagged.

First letter U - dummy variables, next number denotes year, when the variable has the value 1.

2. Foreign trade variables

a) endogenous variables

- first letter:

E - exports;

M - imports,

- second letter:

S - trade with the CMEA countries;

N - trade with the non-CMEA region,

- third letter (trade of commodity groups):

F - fuels, raw materials and materials;

H - machinery and equipment;

C - consumer goods of industrial origin;

R - food and raw materials for food production;

b) other variables of foreign trade:

PCRG, PFRG, PMRG, PRRG - price indexes of the intra CMEA trade for commodity groups C, F, M, R, respectively;

PCHS, PFHS, PMHS, PRHS - world trade price indexes for commodity groups C, F, M, R, respectively;

EKNC, EKNF, EKNM, EKNR - world exports for commodity groups C, F, M, R, respectively;

ENS - total world exports;

$ESFW_i$, $ESRW_i$ - total exports of intra CMEA trade without the exports of i country for commodity groups F, R, respectively;
$MSCW_i$, $MSMW_i$ - total imports of intra CMEA trade without the imports of country i for commodity groups C, M, respectively.
ZDLP - foreign debt.

3. Other variables:

C - total consumption;
CSZ - consumption of food;
I - investment outlays;
RY - personal income, index;
X - total output;
XNRL - non-agricultural output;
XRL - output of agriculture and forestry;
XR - output of agriculture;
XQ - output of industry;
IOWA - weather index of the IOWA type;

Identities of the Model

EN = ENF + ENM + ENC + ENR
ES = ESF + ESM + ESC + ESR
ENP = EN x PEN
ESP = ES x PES
E = EN + ES
EP = ENP + ESP
MN = MNF + MNM + MNC + MNR
MS = MSF + MSM + MSC + MSR
MNP = MN x PMN
MSP = MS x PMS
M = MN + MS
MP = MNP + MSP

Foreign Trade Equations

BULGARIA

(B1) $ESF = -2.2 + 0.3998\ XQP - 0.58464\ ENF - 28.1\ U78 + 50.0\ U73$ $R^2 = 0.922$, $DW = 1.52$
(6.8) (3.4) (1.45) (2.8)

(B2) $ESM = -137.3 + 0.04980\ MSMW1 + 0.65364\ ESM_{-1} + 147.47\ U77 - 95\ U79$ $R^2 = 0.997$, $DW = 1.38$
(6.6) (10.7) (3.35) (1.9)

(B3) $ESC = 27.5 + 0.03412\ MSCW1 + 0.60759\ ESC_{-1} - 52.8\ U79$ $R^2 = 0.971$, $DW = 1.52$
(2.32) (3.54) (2.1)

(B4) $ESR = -99 + 0.19446\ XRP + 0.1155\ MS - 153.4\ U66 - 112.8\ U77 - 106.6\ U80$ $R^2 = 0.910$, $DW = 1.30$
(1.7) (1.9) (1.8) (1.3) (1.2)

(B5) $MSF = -126.3 + 0.0526\ ESFW1 + 0.7506\ MSF_{-1} - 102.2\ U74 + 125.9\ U77$ $R^2 = 0.997$, $DW = 2.87$
(5.52) (16.4) (4.1) (4.97)

(B6) $MSM = 58.8 + 0.4350\ JP + 0.21278\ ES_{-1} + 0.43476\ MSM_{-1} + 151\ U73$ $R^2 = 0.983$, $DW = 1.98$
(0.67) (1.5) (2.0) (2.0)

$- 149.6\ U69\ 70$
(2.6)

(B7) $MSC = -14.4 + 0.00592\ CP + 0.32779\ ESC_{-1} - 17.2\ U70 + 23.9\ U7475 - 24\ U79$ $R^2 = 0.987$, $DW = 2.27$
(2.0) (3.9) (2.2) (4.1) (2.8)

(B8) $MSR = -40.3 + 0.071\ ESRW1 + 0.02322\ (ESRW1\ U7475) - 0.0272\ (ESRW1\ U7680)$ $R^2 = 0.922$, $DW = 1.89$
(4.7) (3.0) (4.2)

$- 14.7\ U76 - 22\ U80$
(1.1) (1.7)

(B9) $ENF = 6.8 + 0.00033\ EKNF + 0.93742\ ENF_{-1} - 120.4\ (ESF)ESF_{-1} - XQP(XQP_{-1})$ $R^2 = 0.990$, $DW = 3.00$
(1.65) (12.8) (5.0)

$- 9.5\ U63 - 59\ U75 + 40.9\ U79$
(1.9) (5.5) (3.8)

(B10) $ENM = 206 + \underset{(3.8)}{0.00093}\ EKNM - \underset{(4.5)}{204.0}\ (PMRG/PMHS) - \underset{(1.9)}{57.3}\ (ESM)ESM_{-1} - XQP(XQP_{-1})$ $R^2 = 0.976$, $DW = 1.56$

$- \underset{(2.5)}{28}\ U6667 - \underset{(4.4)}{51.7}\ U7879$

(B11) $ENC = -1.4 + \underset{(14.7)}{0.000507}\ EKNC - \underset{(1.5)}{17.6}\ (ESC)ESC_{-1} - XQ(XQ_{-1}) - \underset{(3.6)}{11.1}\ U6668$ $R^2 = 0.979$, $DW = 1.37$

$- \underset{(2.6)}{13.1}\ U74 + \underset{(2.9)}{13.7}\ U80$

(B12) $ENR = -19.2 + \underset{(10.8)}{288}\ (EKNR/EHS)_{-1} + \underset{(6.6)}{0.9978}\ ENR_{-1} - \underset{(2.6)}{181.4}\ (ESR)ESR_{-1}$ $R^2 = 0.799$, $DW = 1.57$

$- XRP(XRP_{-1}) - \underset{(3.0)}{79}\ U7374 - \underset{(0.8)}{28}\ U78$

(B13) $MNF = 329 + \underset{(2,2)}{0.02875}\ DXNRP - \underset{(3.2)}{131.3}\ (PFRG/PFHS) - \underset{(7.4)}{64.3}\ (ZDLP/ENP)_{-1}$ $R^2 = 0.907$, $DW = 2.89$

$- \underset{(0.5)}{0.01566}\ MSF - \underset{(2.0)}{0.01566}\ MSF - 65.8\ U80$

(B14) $MNM = 191.6 + \underset{(4.3)}{0.03283}\ JP - \underset{(3.87)}{100.8}\ (ZDLP/ENP)_{-1} - \underset{(1.6)}{134.2}\ (MSM/MSM_{-1} - JP/JP_{-1})$ $R^2 = 0.776$, $DW = 1.82$

$+ \underset{(2.9)}{122.6}\ U76 + \underset{(0.9)}{37.2}\ U77 - \underset{(1.5)}{67.8}\ U80$

(B15) $MNC = 97.6 + \underset{(1.25)}{0.01082}\ DCP - \underset{(2.8)}{75.3}(PCRG/PCHS) + \underset{(2.5)}{16}\ U64 + \underset{(1.5)}{9.4}\ U76 - \underset{(0.5)}{1.3}\ U80$ $R^2 = 0.883$, $DW = 2.30$

$- \underset{(1.0)}{0.11854}\ MSC$

(B16) $MNR = 105.8 + \underset{(9.05)}{5.7496}\ CSZ - \underset{(0.7)}{6.60748}\ (MSR)MSR_{-1} - XRL(XRL_{-1}) + \underset{(2.3)}{43}\ U68 - \underset{(1.2)}{22.3}\ U75$ $R^2 = 0.866$, $DW = 1.10$

CZECHOSLOVAKIA

(C1) $ESF = 282.1 + \underset{(1.7)}{0.0063}\ DXQ + \underset{(7.5)}{0.4168}\ MSF - \underset{(2.0)}{0.4358}\ ENF + \underset{(1.4)}{95}\ U72 - \underset{(2.6)}{132}\ U7980$ $R^2 = 0.882$, $DW = 1.46$

(C2) $ESM = \underset{(7.3)}{74.4} + \underset{(4.0)}{0.10304}\ MSMW2 + \underset{(2.6)}{0.37845}\ ESM_{-1} + \underset{(2.7)}{182.7}\ U70 - 214\ U79$ $R^2 = 0.994$, $DW = 1.86$

(C3) $ESC = \underset{(4.5)}{-83.9} + \underset{(1.8)}{0.19561}\ MSCW2 + \underset{(1.0)}{0.29069}\ ESC_{-1} + \underset{(0.9)}{65.8}\ U63 - 42.5\ U7980$ $R^2 = 0.970$, $DW = 2.32$

(C4) $ESR = \underset{(1.1)}{-27.8} + \underset{(4.9)}{0.00098}\ XRL_{-1} + \underset{(1.7)}{0.01703}\ MS + \underset{(3.6)}{14.9}\ U63 + \underset{(2.0)}{30.5}\ U76 + 17.4\ U80$ $R^2 = 0.929$, $DW = 2.33$

(C5) $MSF = \underset{(2.2)}{-46.9} + \underset{(2.5)}{0.10231}\ ESFW2 + \underset{(2.5)}{0.5029}\ MSF_{-1} + \underset{(2.4)}{134.2}\ U73 - 114.9\ U80$ $R^2 = 0.990$, $DW = 1.20$

(C6) $MSM = \underset{(1.1)}{-218.1} + \underset{(1.48)}{0.00314}\ J + \underset{(2.0)}{0.37768}\ ESM_{-1} + 0.51966\ MSM_{-1} - \underset{(4.36)}{401.5}\ U76 - 428.8\ U7980$ $R^2 = 0.982$, $DW = 1.40$

(C7) $MSC = \underset{(2.8)}{-185.8} + \underset{(2.67)}{0.0012}\ C + \underset{(1.2)}{0.5331}\ ESC_{-1} + \underset{(3.6)}{28.7}\ U73 - \underset{(1.4)}{58.7}\ U7980 - 34.6\ U78$ $R^2 = 0.974$, $DW = 1.23$

(C8) $MSR = \underset{(2.31)}{104.6} + \underset{(2.40)}{0.02123}\ ESRW2 + \underset{(2.5)}{0.51958}\ MSR_{-1} - 49\ U74 - 75\ U78 - 71.3\ U80$ $R^2 = 0.763$, $DW = 1.89$

(C9) $ENF = \underset{(2.41)}{-33.2} + \underset{(2.52)}{0.00134}\ EKNF + \underset{(0.8)}{0.38387}\ ENF_{-1} + \underset{(4.0)}{38.9}\ U80 + \underset{(1.6)}{147}\ U6970 - 91.9\ U75$ $R^2 = 0.863$, $DW = 2.94$

$+ \underset{(1.1)}{0.00343}\ DXQ$

(C10) $ENM = \underset{(1.8)}{213.3} + \underset{(3.3)}{0.0045}\ DEKNM + \underset{(1.3)}{0.6193}\ ENM_{-1} - 232\ (ESM)ESM_{-1} - XQ(XQ_{-1})$ $R^2 = 0.637$, $DW = 1.86$

$- \underset{(0.6)}{35.3}\ U7980$

(C11) ENC = 186 + 0.00078 EKNC - 11.2 (ESC)ESC_{-1} - XQ(XQ_{-1}) - 68.6 U73 - 23.4 U72 R^2 = 0.876
(7.8) (0.4) (4.0) (1.9) DW = 2.42

(C12) ENR = 139.3 + 0.00203 EKNR + 0.16625 ENR_{-1} + 0.00058 DXRL - 42 U7576 + 44 U80 R^2 = 0.935
(4.7) (0.9) (0.6) (4.8) (3.3) DW = 3.03

(C13) MNF = -190 + 2499 (XNRL/X) - 0.08956 MSF - 51.95 U67 - 68.4 U69 R^2 = 0.769
(3.6) (2.8) (2.3) (3.0) DW = 1.99

(C14) MNM = -204 + 0.00886 J = 440.9 $(ZDLP/ENP)_{-1}$ - 108.7 U75 + 118 U77 + 15 U7879 R^2 = 0.966
(7.7) (4.9) (2.1) (2.3) (0.3)' DW = 2.59

- 0.12742 MSM
(1.8)

(C15) MNC = -90.0 + 0.00116 C + 0.40148 MNC_{-1} - 129.4 $(ZDLP/ENP)_{-1}$ - 0.21191 MSC R^2 = 0.969
(2.9) (1.8) (3.3) (2.3) DW = 2.08

- 29 U77 + 17.2 U79
(2.7) (1.5)

(C16) MNR = 443.7 + 0.00318 CSZ + 0.24801 MNR_{-1} - 2.08497 $IOWA_{-1}$ - 94.2 U75 - 153.9 R^2 = 0.930
(5.5) (1.8) (3.1) (4.5) (4.3) DW = 2.49

$(ZDLP/ENP)_{-1}$ - 82.2 U79
(3.6)

GERMAN DEMOCRATIC REPUBLIC

(G1) ESF = 183 + 0.04634 DXQ + 0.25818 MSF - 114 U72 - 154 U80 - 190 U7879 R^2 = 0.852
(1.2) (2.2) (1.7) (2.1) (3.4) DW = 1.32

(G2) ESM = 153.4 + 0.24528 MSMW3 - 111.3 U80 R^2 = 0.987
(32.16) (0.8) DW = 0.95

(G3) ESC = 100.5 + 0.21445 MSCW3 - 63.12 U7980 R^2 = 0.981
(26.8) (2.36) DW = 0.46

(G4) ESR = -163.3 + 0.00263 DXRL + 0.01842 MS + 1.37962 IOWA$_{-1}$ - 32.4 U73 R^2 = 0.959
(1.05) (12.07) (4.7) (3.80) DW = 1.65

- 30 U79 - 27.1 U69 + 8.6 U80
(3.53) (3.05) (1.1)

(G5) MSF =39 + 0.1768 ESFW3 - 72.7 U79 + 0.21972 MSF$_{-1}$ R^2 = 0.992
(6.8) (1.5) (1.86) DW = 1.35

(G6) MSM = -947 + 0.4247 J + 0.49865 ESM$_{-1}$ + 246.4 U73 - 728.9 U7980 - 366.1 U76 R^2 = 0.992
(5.6) (6.0) (2.4) (7.9) (3.2) DW = 1.97

(G7) MSC = -16.9 + 0.02588 C + 0.22857 ESC$_{-1}$ - 45.46 U7071 + 41.1 U73 - 89 U7980 R^2 = 0.958
(1.95) (2.0) (2.2) (1.4) (3.3) DW = 1.37

(G8) MSR = 54.9 + 0.02185 ESRW3 + 0.77553 MSR$_{-1}$ - 80.9 U68 - 92.3 U80 - 90.9 U78 R^2 = 0.860
(1.0) (5.5) (2.5) (2.8) (3.1) DW = 2.30

(G9) ENF = 27.9 + 0.00072 EKNF + 0.79354 ENF$_{-1}$ - 38.5 U6667 - 96 U75 - 52.8 U80 R^2 = 0.972
(1.6) (6.13) (2.6) (4.3) (2.46) DW = 1.70

(G10) ENM = 259 + 0.00259 EKNM - 345.4 (ESM)ESM$_{-1}$ - XQ(XQ$_{-1}$) - 104 U63 - 145 U75 R^2 = 0.832
(5.5) (1.9) (1.5) (2.3) DW = 0.87

(G11) ENC = 149.7 + 0.00185 EKNC - 65.5 (ESC)ESC$_{-1}$ - XQ(XQ$_{-1}$) + 34.2 U69 - 46 U72 R^2 = 0.943
(9.3) (1.03) (1.65) (2.2) DW = 1.15

(G12) ENR = 149.4 + 0.01043 EKNR - 203 (PRRG/PRHS) - 109 U77 + 121 U76 - 267 U7980 R^2 = 0.914
(3.2) (1.0) (2.5) (2.9) (4.5) DW = 1.45

- 1.01373 ESR$_{-1}$
(1.4)

(G13) MNF = 339.4 + 0.00419 XNRL - 293.95 (PFRG/PFHS) - 143.5 (ZDLP/ENP)$_{-1}$ R^2 = 0.927
(2.59) (2.23) (2.13) DW = 2.08

- 94.7 U68 - 141.2 U75 - 158.2 U80
(1.75) (2.48) (2.7)

(G14) MNM = 47 + 0.02284 J - 337 (PMRG/PMHS) - 0.18873 MSM + 77 U76 - 104 U78 R^2 = 0.938
(4.53) (1.9) (2.42) (1.56) (2.02) DW = 1.95

- 153 U80
(2.3)

(G15) MNC = 12.4 + 0.04320 DC + 0.63647 MNC_{-1} + 44.3 U71 + 13.5 U73 + 54.5 U7879 R^2 = 0.948
(1.1) (6.7) (2.2) (6.5) (3.3) DW = 2.23

+ 42 U80
(1.7)

(G16) MNR = 40.8 + 4.49695 CSZ - 1.02916 MSR - 316 $(ZDLP/ENP)_{-1}$ + 455 U76 - 290 U80 R^2 = 0.966
(8.8) (3.4) (4.2) (6.4) (3.2) DW = 1.49

POLAND

(P1) ESF = 182 + 2.3246 DXQ + 0.37681 MSF R^2 = 0.973
(11.7) (18.8) DW = 1.50

(P2) ESM = -227 + 0.12317 MSMW4 + 0.4607 ESM_{-1} - 275.7 U80 R^2 = 0.998
(10.45) (8.0) (4.03) DW = 2.56

(P3) ESC = -65.6 + 0.09541 MSCW4 + 0.66757 ESC_{-1} + 29 U67 - 88.0 U7980 R^2 = 0.991
(4.5) (7.1) (0.97) (2.9) DW = 2.50

(P4) ESR = -4.87 + 3.78801 XRL - 0.44548 (XRL U6668) - 0.56386 ENR + 58 U76 R^2 = 0.845
(6.5) (4.17) (2.67) (1.2) DW = 2.01

+ 80 U79 + 105.9 U80
(1.74) (2.1)

(P5) MSF = -287.5 + 0.15872 ESFW4 + 0.15933 MSF_{-1} - 41.8 U64 - 22.3 U79 R^2 = 0.994
(6.42) (1.25) (1.18) (0.6) DW = 1.98

(P6) MSM = 42.8 + 2.36406 J + 0.27113 ES_{-1} + 352.4 U73 R^2 = 0.990
(4.3) (3.73) (3.58) DW = 2.02

(P7) MSC = -175.3 + 0.53446 C + 0.13513 ESC_{-1} + 32 U6364 - 115.9 U7980 - 58.9 U76 R^2 = 0.989
(4.7) (1.4) (2.2) (7.1) (3.1) DW = 1.27

(P8) MSR = 1.5 + 0.11088 ESRW4 - 24.5 U66 + 83.9 U71 - 47.8 U76 - 45.3 U79 R^2 = 0.946
(11.48) (1.5) (5.5) (3.1) (2.9) DW = 2.67

(P9) ENF = -24.3 + 0.00225 EKNF + 0.7593 ENF_{-1} - 45.2 U65 - 117.5 U7980 R^2 = 0.968
(1.9) (5.1) (1.0) (3.24) DW = 2.14

- 122.7 U76
(2.6)

(P10) ENM = 592 + 0.000198 EKNM - 436.1 (PMRG/PMHS) - 63.2 U70 - 290 $(ESM)ESM_{-1}$ R^2 = 0.978
(3.9) (4.7) (1.6) (3.1) DW = 1.63

- $XQ(XQ_{-1})$ + 108.4 U77
(3.2)

(P11) ENC = -80.4 + 0.00292 EKNC + 66.6 $(ZDLP/ENP)_{-1}$ + 1.2034 DXQ R^2 = 0.978
(12.8) (4.6) DW = 1.98

(P12) ENR = 210.8 + 0.00291 EKNR + 0.1986 ENR_{-1} - 74.4 $(ESR)ESR_{-1}$ - $XRL(XRL_{-1})$ R^2 = 0.923
(4.57) (1.83) (3.6) DW = 1.60

- 51.8 U63 - 110.8 U7475 - 78.7 U80
(2.36) (6.97) (3.15)

(P13) MNF = 156.4 + 1.04806 XNRL - 0.32445 MSF - 162 $(ZDLP/ENP)_{-1}$ + 157.9 U73 R^2 = 0.993
(8.9) (2.7) (7.75) (5.66) DW = 2.41

- 114.6 U80
(3.76)

(P14) MNM = -142.6 + 2.48051 J - 62.4 $(ZDLP/ENP)_{-1}$ - 0.24458 MSM + 74.3 U63 R^2 = 0.987
(4.58) (1.3) (2.03) (1.2) DW = 2.84

+ 351 U7376 + 195 U77 - 101 U7980
(5.99) (2.7) (1.3)

(P15) MNC = -92 + 0.4094 C - 51.8 $(ZDLP/ENP)_{-1}$ + 24.8 U63 - 61.8 U75 - 18.5 U78 R^2 = 0.976
(17.6) (6.9) (1.8) (4.3) (1.3) DW = 2.09

(P16) MNR = 697 + 2.98251 CSZ − 676.8 (PRRG/PRHS) − 1.0196 MSR
(6.0) (3.4) (4.0)
R^2 = 0.979
DW = 1.92

ROMANIA

(R1) ESF = -12.5 + 0.00029 XQ − 0.3162 ENF + 0.93288 MSF − 83 U77 + 29.2 U80
(1.5) (2.8) (9.3) (3.2) (1.53)
R^2 = 0.936
DW = 2.48

(R2) ESM = -106.7 + 0.04227 MSMW5 + 0.21245 ESM_{-1} + 76.8 U73 − 64.9 U76
(5.9) (1.45) (2.3) (2.2)
R^2 = 0.992
DW = 1.93

− 41.1 U79
(1.2)

(R3) ESC = -21.9 + 0.6125 MSCW5 + 0.42146 ESC_{-1} − 58.1 U79
(2.25) (2.0) (1.4)
R^2 = 0.977
DW = 1.95

(R4) ESR = -47.1 + 0.00387 XRL + 0.29815 MSR + 119.1 U77 + 65.3 U78
(13.1) (1.81) (8.66) (4.7)
R^2 = 0.971
DW = 2.36

(R5) MSF = 147.4 + 0.04261 ESFW5 + 46.1 U73 + 69.7 U77 − 56.9 U78
(13.5) (2.1) (3.1) (2.5)
R^2 = 0.957
DW = 2.59

(R6) MSM = -145.8 + 0.0039 J + 0.3063 ES_{-1} + 117.8 U6364 + 75 U73 − 190 U80
(4.4) (3.1) (3.3) (1.7) (3.4)
R^2 = 0.989
DW = 1.76

(R7) MSC = -33.3 + 62.7 RY + 0.0363 ES_{-1} + 12.6 U77 − 38.1 U7980 − 16 U75
(2.4) (4.1) (2.5) (4.7) (3.3)
R^2 = 0.989
DW = 2.30

(R8) MSR = -30.4 + 0.03638 ESRW5 + 45.6 U74 − 19.4 U75 + 21.9 U80
(10.16) (7.7) (3.1) (4.02)
R^2 = 0.958
DW = 2.09

(R9) ENF = -170 + 0.00364 EKNF + 0.62525 ENF_{-1} − 81 (ESF)ESF_{-1} − XQ(XQ_{-1})
(5.0) (6.8) (1.4)
R^2 = 0.988
DW = 1.84

− 60 U77 + 95 U79
(2.2) (4.7)

(R10) ENM = -120 + 0.00394 EKNM - 158 (ESM)ESM_{-1} - XQ(XQ_{-1}) - 123 U74 + 22 U76 R^2 = 0.981
(21.9) (3.6) (4.7) (0.8) DW = 1.44

- 83 U79
(2.9)

(R11) ENC = -151 + 0.0030 EKNC - 62.6 (PCRG/PCHS) + 0.00354 DXQ + 27 U63 + 36 U76 R^2 = 0.992
(11.1) (1.0) (2.5) (1.4) (2.1) DW = 2.19

+ 35.8 $(ZDLP/ENP)_{-1}$
(2.1)

(R12) ENR = -9.14 + 0.00488 EKNR + 0.6709 ENR_{-1} - 123.6 U75 - 169.4 U7879 - 101 U80 R^2 = 0.865
(1.98) (3.6) (2.5) (3.5) (1.2) DW = 1.79

(R13) MNF = -20.2 + 0.00196 XNRL - 43.4 $(ZDLP/ENP)_{-1}$ + 0.00045 (XNRL U7880) R^2 = 0.987
(7.38) (1.5) (3.3) DW = 1.94

+ 63.8 U70 - 109.8 U77 + 96.2 U80
(1.4) (2.1) (1.55)

(R14) MNM = 961 + 0,00281 DJ - 294.7 $(ZDLP/ENP)_{-1}$ - 0.25975 MSM - 109.8 U76 R^2 = 0.928
(1.28) (9.6) (4.37) (2.5) DW = 1.89

+ 123.1 U79
(2.3)

(R15) MNC = 20.36 + 48.2 RY - 11.18 $(ZDLP/ENP)_{-1}$ - 12.5 U71 - 13.8 U76 R^2 = 0.921
(6.2) (3.58) (2.3) (2.6) DW = 1.92

(R16) MNR = 440 + 0.37423 CSZ - 323.8 (PRRG/PRHS) - 23.9 $(ZDLP/ENP)_{-1}$ R^2 = 0.979
(4.3) (3.2) (1.2) DW = 2.64

+ 49 U63 + 60 U80
(1.7) (2.2)

HUNGARY

(H1) ESF = 60 + 0.0030 DXQ + 0.21272 MSF - 53 U76 - 34.2 U7880 - 38.3 U77 R^2 = 0.883
(1.3) (6.2) (2.0) (1.9) (1.5) DW = 1.43

(H2) $ESM = 147 + 0.0473\ MSMW6 + 0.14498\ ESM_{-1} - 203.5\ U80 + 383.9\ U7275$ $R^2 = 0.966$, $DW = 2.72$
(5.7) (1.32) (0.65) (7.6)

(H3) $ESC = -5.0 + 0.3093\ MSCW6 + 0.94024\ ESC_{-1} - 406.2\ U76 - 130.4\ U7980 - 105.4\ U78$ $R^2 = 0.974$, $DW = 1.75$
(1.5) (7.08) (8.5) (4.3) (2.6)

(H4) $ESR = -757.3 + 0.01232\ XRL + 3.68762\ MSR + 2.0094\ IOWA_{-1} - 146\ U76 - 111\ U78 - 83.0\ U79$ $R^2 = 0.942$, $DW = 0.97$
(4.75) (7.8) (1.27) (2.56) (2.4) (1.6)

(H5) $MSF = 20 + 0.01723\ ESFW6 + 0.90186\ MSF_{-1} - 503.1\ U76 - 138\ U7980$ $R^2 = 0.955$, $DW = 3.00$
(1.07) (7.43) (7.6) (2.8)

(H7) $MSC = -132 + 0.000416\ C + 0.42219\ ESC_{-1} - 138.9\ U76 - 36.7\ U6365 - 27.6\ U6970$ $R^2 = 0.954$, $DW = 1.71$
(2.54) (7.81) (5.3) (2.0) (1.6)

(H6) $MSM = 260.9 + 0.00064\ JP + 0.36468\ ES_{-1} + 171\ U80 - 561.6\ U76 - 116.8\ U69$ $R^2 = 0.957$, $DW = 1.80$
(1.2) (8.1) (2.4) (6.54) (1.5)

(H8) $MSR = -39.6 + 0.06173\ ESRW6 + 0.14462\ MSR_{-1} - 4.6\ U63 + 18\ U78 + 54.8\ U76$ $R^2 = 0.951$, $DW = 2.49$
(5.1) (1.0) (0.5) (1.8) (5.3)

(H9) $ENF = -34.1 + 0.00184\ EKNF + 0.26015\ ENF_{-1} + 71\ U6970 + 63.2\ U79$ $R^2 = 0.889$, $DW = 1.93$
(3.0) (1.43) (3.22) (1.9)

(H10) $ENM = 238 + 0.00056\ EKNM - 174.8\ (PMRG/PMHS) - 268.6\ (ESM)ESM_{-1} - XQ(XQ_{-1}) + 17.6\ U68 - 28.4\ U78 - 82.9\ U7374$ $R^2 = 0.959$, $DW = 2.51$
(2.37) (3.5) (1.2) (1.1) (1.7) (6.9)

(H11) $ENC = 135 + 0.00179\ EKNC - 90.3\ (PCRG/PCHS) - 0.0905\ ESC - 56\ U74 + 0.0026\ XQ$ $R^2 = 0.975$, $DW = 2.20$
(4.3) (1.2) (2.1) (3.2) (1.7)

(H12) $ENR = 101 + \underset{(1.0)}{0.00108}\ EKNR + \underset{(3.6)}{0.59491}\ ENR_{-1} - \underset{(1.2)}{40}\ U63 + \underset{(2.1)}{65}\ U72 + \underset{(1.7)}{53}\ U78$ $R^2 = 0.884$, $DW = 2.49$

(H13) $MNF = -148 + \underset{(2.9)}{0.00192}\ XNRL - \underset{(1.9)}{55.4}\ U67 - \underset{(2.7)}{81.8}\ U68 - \underset{(1.03)}{0.14669}\ MSF$ $R^2 = 0.954$, $DW = 1.40$

(H14) $MNM = -50 + \underset{(17.93)}{0.00264}\ JP - \underset{(0.6)}{14.3}\ (ZDLP/ENP)_{-1} + \underset{(1.8)}{72}\ U79 + \underset{(1.4)}{50}\ U80$ $R^2 = 0.967$, $DW = 1.90$

(H15) $MNC = -51 + \underset{(7.0)}{0.00112}\ C - \underset{(3.4)}{0.38951}\ MCS - \underset{(2.5)}{44.8}\ U76 + \underset{(1.9)}{35.1}\ U78 - \underset{(1.8)}{40}\ U74 - \underset{(2.8)}{29.6}\ (ZDLP/ENP)_{-1}$ $R^2 = 0.901$, $DW = 1.90$

(H16) $MNR = 229.4 + \underset{(11.2)}{0.00297}\ CSZ - \underset{(3.5)}{45.5}\ (ZDLP/ENP)_{-1} - \underset{(1.8)}{40.8}\ U80 + \underset{(2.4)}{51}\ U75 - \underset{(3.1)}{67.4}\ U76$ $R^2 = 0.933$, $DW = 2.44$

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(S1) $ESF = 570 + \underset{(6.1)}{0.01361}\ XQ + \underset{(1.6)}{0.08392}\ MS - \underset{(1.0)}{151.5}\ U74$ $R^2 = 0.991$, $DW = 2.04$

(S2) $ESM = -16.3 + \underset{(13.32)}{0.36791}\ MSMW7 + \underset{(2.6)}{0.16185}\ ESM_{-1}$ $R^2 = 0.996$, $DW = 1.32$

(S3) $ESC = -4.06 + \underset{(8.98)}{0.23435}\ MSCW7 + \underset{(2.08)}{0.19576}\ ESC_{-1} - \underset{(1.6)}{33.7}\ U79$ $R^2 = 0.989$, $DW = 1.60$

(S4) $ESR = 68.4 + \underset{(1.6)}{0.01746}\ XR_{-1} - \underset{(1.2)}{0.04483}\ MNR_{-1} - \underset{(3.0)}{339.9}\ U80 - \underset{(1.4)}{174.4}\ U76 - \underset{(3.9)}{388.4}\ U78$ $R^2 = 0.836$, $DW = 1.07$

(S5) $MSF = 288.4 + \underset{(11.2)}{0.32626}\ ESFW7 - \underset{(1.58)}{112.8}\ U76 - \underset{(2.79)}{200}\ U78$ $R^2 = 0.902$, $DW = 1.29$

(S6) $MSM = 150 + \underset{(1.4)}{0.01827}\ J + \underset{(3.5)}{0.89307}\ ESM_{-1} + \underset{(2.3)}{769.6}\ U73 - \underset{(0.5)}{144.5}\ U80 + \underset{(3.2)}{113.3}\ U78$ $R^2 = 0.982$, $DW = 1.98$

(S7) $MSC = 61.6 + \underset{(1.34)}{0.02651}\ DC + \underset{(11.9)}{0.83708}\ MSC_{-1} + \underset{(2.13)}{314.4}\ U77$ $R^2 = 0.966$, $DW = 1.26$

(S8) $MSR = -269 + \underset{(5.2)}{0.56388}\ ESRW7 + \underset{(6.8)}{0.55487}\ MSR_{-1} - \underset{(2.1)}{308.6}\ U78 + \underset{(6.0)}{632}\ U75$ $R^2 = 0.990$, $DW = 2.54$

$+ \underset{(5.05)}{410.2}\ U7980$

(S9) $ENF = -1133 + \underset{(4.6)}{0.04877}\ EKNF + \underset{(1.0)}{0.19684}\ ENF_{-1} - \underset{(4.2)}{1031}\ U74 + \underset{(2.0)}{760.6}\ U80$ $R^2 = 0.987$, $DW = 2.16$

(S10) $ENM = 271 + \underset{(5.8)}{0.00372}\ EKNM + \underset{(1.0)}{0.15795}\ ENM_{-1} - \underset{(3.6)}{763}\ (ESM)ESM_{-1} - XQ(XQ_{-1})$ $R^2 = 0.868$, $DW = 2.29$

$- \underset{(1.8)}{139}\ U78 - \underset{(4.6)}{335}\ U75 - \underset{(3.2)}{233.3}\ U7980$

(S11) $ENC = -67 + \underset{(26.4)}{0.00315}\ EKNC - \underset{(4.9)}{151.5}\ (ESC)ESC_{-1} - XQ(XQ_{-1}) + \underset{(5.8)}{95}\ U78$ $R^2 = 0.986$, $DW = 1.51$

$- \underset{(6.2)}{115}\ U79 - \underset{(1.95)}{64.5}\ U74$

(S12) $ENR = 672 + \underset{(0.3)}{0.00127}\ (EKNR/ENS)_{-1} + \underset{(2.7)}{0.55268}\ ENR_{-1} - \underset{(0.9)}{175}\ U64 + \underset{(1.7)}{301}\ U74 + \underset{(0.3)}{1.0959}\ IOWA_{-1} + \underset{(1.6)}{285.8}\ U76$ $R^2 = 0.754$, $DW = 1.90$

(S13) $MNF = -464.2 + \underset{(19.4)}{0.00694}\ XNR + \underset{(1.93)}{254}\ U63 - \underset{(3.1)}{388.9}\ U77 - \underset{(3.0)}{382.4}\ U80$ $R^2 = 0.972$, $DW = 1.92$

(S14) $MNM = -433 + \underset{(2.4)}{0.01008}\ J + \underset{(6.43)}{0.76419}\ MNM_{-1} - \underset{(1.8)}{418}\ U71 + \underset{(3.2)}{768}\ U75 - \underset{(3.4)}{847}\ U79$ $R^2 = 0.972$, $DW = 2.56$

(S15) $MNC = -409 + \underset{(9.4)}{0.0068}\ C - \underset{(2.4)}{0.15232}\ MSC - \underset{(1.5)}{97.5}\ U65 + \underset{(2.3)}{145.8}\ U76 - \underset{(5.0)}{361}\ U79$ $R^2 = 0.977$, $DW = 1.95$

(S16) $MNR = 4855 + \underset{(1.8)}{1.7908}\ CSZ - \underset{(1.6)}{2395}\ (PRRG/PRHS) - \underset{(2.7)}{16.3}\ IOWA_{-1} - \underset{(1.8)}{677}\ U74 + \underset{(3.2)}{834}\ U7980$ $R^2 = 0.943$, $DW = 2.09$

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EKONOMETRYCZNY MODEL HANDLU ZAGRANICZNEGO EUROPEJSKICH KRAJÓW RWPG

W artykule przedstawiono zagadnienia specyfikacji równań handlu zagranicznego, odzwierciedlające mechanizmy funkcjonowania handlu krajów RWPG z krajami wspólnoty, jak i z krajami niesocjalistycznymi.

Omówione zostały podstawy konstrukcji równań, przy założeniu roli cen i relacji z cenami światowymi oraz ich konsekwencji w procesie modelowania handlu wzajemnego oraz obrotów z krajami spoza RWPG.

Zaprezentowano koncepcję odmiennej specyfikacji równań dla rynków o popytowej i podażowej orientacji w poszczególnych grupach wyrobów. Przedstawiono także metodę łączenia modeli krajowych poprzez równania handlu zagranicznego, wykorzystując podejście "pool approach". Rozważania teoretyczne i specyfikację równań uzupełniają wyniki estymacji modelu.

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