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INDUSTRIAL PROJECTION METHODS IN HUNGARY 1/

by

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CONTENTS

I. THE APPEARANCE OF [illegible] IN HUNGARY

The role of economic projections in a centrally planned socialist economy is still a question under serious debate. It certainly cannot be argued that the utilization of publicly owned means of production must be planned. But at one time it was believed that the planning methods which developed in the socialist countries based on obligatory targets and regulations made projections superfluous /if not harmful/ as they might deviate from or contradict the obligatory targets. It took some time and much experience to realize that planning and projection were not substitutes for or preclusive to one-another. On the contrary, both are necessary, as they complement and assist each-other.

Both planning and projection look to the future, both predict the future course of economic development /or some part of it/, and sometimes they even contain similar, or identical economic indicators. But their approach, their objectives and consequently their methods are different, and this means that their results can easily turn out to be different too.

Plans of a socialist economy /be they obligatory or indicative/ express the targets and preferences of the planning authorities, as they interpret the interests of the society, and their purpose is to influence the course of economic development. Consequently they are target-oriented, and "biased" by certain social preferences. This attitude may easily lead certain planners to an optimistic assesment of the future: overestimating the possibilities and underestimating the difficultues. Plans naturally include certain courses of action to achieve their targets and in the preparatory phase they can be elaborated according to certain target-variants, or course-variant, letting the decision-makers chose among them in accordance with their social preferences.

Projections are not target- or preference-oriented. Their basic objective is to predict the future course of economic development with the greatest possible probability. They must exclude all wishful thinking, and the desires or preferences of their authors must not influence predictions. Projections are always built upon certain assumptions concerning the future behaviour of the factors regarded as exogenously influencing economic activity, or concerning the relationships of endogenous economic phenomena to exogenous factors. In many cases the probability of these assumptions determine the probability of the predictions.

Different projection variants can be elaborated, according to different assumptions allowing the users to decide which of them they regard as most probable. But here again, the choice should be based upon probability and not preference.

Both the target-oriented and the probability-oriented approach to future economic development are necessary and helpful in the operational decision-making of a socialist economy, both on macro and on micro level. The decision-making bodies are able to take into account the results achieved by different methods, they may analyse the coincidence or divergence of certain economic indicators, as well as the assumptions or preferences upon which they are built.

The preparatory phase of the planning process always used certain projection methods. Estimates of plan-fulfilment, time-trend extrapolations, unchanged or changing technological or structural coefficients are generally used in the first approximation of a plan variant. Projections are especially useful in cases of socio-economic phenomena in which the influence of central decisions or social preferences are not strong, or have a slow effect /such as democraphic development, changes on the world market, or in tastes/. The prediction of the most probable course of events are

a necessary prerequisite to planning, i.e. to socially conscious and deliberate intervention in economic development.

But the objectives and preferences of the planners and decision-makers, together with their assumptions on future trends are very important factors of economic projections in a socialist economy if it wants to achieve a satisfactory level of probability. The simple trend-extrapolations, the assumption that the influence of exogenous factors and policy variables remain unchanged is generally unacceptable in the projections of a socialist economy. Different projection variants can /and in certain cases must/ be worked out assuming different actions on the part of economic policy-makers, but certain assumptions mut be elaborated with the knowledge that they are decisive factors for some most important field of the economy.

Another difference between plans and projections is that due to the higher consistency requirement of the planning process, it is impossible to elaborate them frequently, or in many variants. Projections are generally more flexible, consequently they can be worked out more frequently taking into account the changes in the domestic, or external economic situation and in a larger number of variants corresponding to different assumptions.

One of the important jobs of economic projections is to bridge and to shorten the time-lapse between the observation of certain unforseen new phenomena and of the effect of the measures taken to deal with them. As Dr. Zala pointed out[1/] this lapse consists of a threefold time loss, first: the period from the occurance of the phenomena to statistical observation, second: the time from statistical analysis to taking the necessary measures and third: the span from the time instructions are given

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1/ J. Zala: A gazdasági előrejelzés szerepe és jelentősége /The role and significance of economic projections/ in: Korszerű Statisztikai Törekvések Magyarországon. Akadémiai Kiadó. Budapest, 1968. pp 130-138.

to the one in which [illegible] advantages of reducing this [illegible] and forming projections based upon them and upon the probable outcome of certain measures are [illegible].

The need for economic projections has grown enormously since the introduction of the new system of economic control and management to Hungary in 1968. Under the new system enterprises have become more independent and more responsible for their actions. Central plans are no longer broken-down to commodity-prescriptions and they are compulsory only for the central authorities, but not for the enterprises. Financial means and regulations are mainly used to guide the activities of the economic units in achieving the plan objectives. This change enabled the planning authorities to concentrate more thoroughly on the most important aggregates of the economy, on long-term development strategies and on the elaboration of indirect incentives to satisfy social preferences.

The increased independence of the enterprises in choosing their own production patterns, markets and inputs led to greater mobilization and more efficient use of available resources. All employees have a certain interest in increasing the efficiency of production and marketing.

But as there are less direct and detailed obligations and more indirect financial orientation from "above" together with more freedom to chose the course of action from "below" there is also an increased need to foresee how the introduction or change of certain regulations will effect the behaviour of the economic units. If the economic policy-makers want to achieve the plan targets the actual course of economic development must be watched continuously and subjected to regular analysis. If necessary the central organs must intervene at the correct moment and change certain regulations. Economic projections can be

valuable help in clarifying the alternatives and measures for intervention if they can foretell the course of events without or with the intervention and to estimate it to a high degree of probability.

This need has led several research institutes to pay more attention to projections, to develop new and to adapt known projection techniques. At present the number of short, medium and long-term economic projections are being elaborated by the Economic Research Institute /linked to the Central Statistical Office/, by the National Planning Office and its research institute, by the institutes operating in the different industrial branches /linked to the respective ministries/ and by the agricultural and foreign trade research institutes. These projections differ strongly in scope, time-horizon and methods, and it would be a hopeless task to try to give a full picture of them within the framework of this brief paper. Instead, I have selected few characteristic examples to show the major trends and problems of making projections in Hungary.

Three major fields of the methods of economic projections will be discussed below: short-term forecasts of the national economy /Chapter II/, long-term projections of certain industrial branches /Chapter III/ and finally foreign trade projection techniques /Chapter IV/.

As far as the methods are concerned, one general feature must be pointed out in advance. Following much experimentation the methods finally accepted are a combination of econometric methods and intuitive, not /or not fully/ formalized, projection techniques. In most cases it was found that the loss in elegance and the quantitative assessment of the assumptions are compensated by the gain in realism and probability. The need for this combination of projection methods is probably closely linked to the fact that the future validity of relationships observed in the past is

relatively low [illegible] structural, technological, and economic policy changes in the Hungarian economic [illegible] the high level of probability is the most important criterion for the projections econometric [illegible] must be combined in certain cases to improve the results. This does not mean renouncing the improvement of econometric projection methods, on the contrary: the combination of the two helps to show the weak points of the econometric models and can lead to continuous improvement.

II. SHORT-TERM PROJECTIONS OF THE NATIONAL ECONOMY

The Economic Research Institute is the main research center for the aggregate projections of the Hungarian economy. Its short-term projections are prepared using three different methods:

a/ global forecasts are prepared in the framework of aggregate economic balances, their components being estimated by mathematical-statistical methods;

b/ an econometric model is tested for projection purposes;

c/ forecasting tests are prepared surveying the expectations of industrial enterprises.

We shall discuss these methods one after the other, but it must be emphasized in advance that the global forecasts are aided by the two other methods and their results are taken into account as starting points.

a/ Global short-term forecasts

The global forecasts of the Hungarian Economic Research Institute are prepared for the use of the major economic decision making organs in April, in August and in October each year. The methods are not formalized and are not published. The following description is based on interviews with the experts preparing them.

The global projections present the probable future

development of the [illegible] forecasting process is [illegible] seasonally adjusted indices and regression equations of the most characteristic economic indicators, [illegible] years time series. These indices are [illegible] or reflecting the growth of the GDP such as output in different industries, investments, sales of [illegible] products, employment, private consumption and income, sales in retail trade, imports and exports etc. Regression analysis is prepared to quantify the relationship - among others - between production and productive and final consumption and between production and available resources /manpower and fixed assets/. Both the time-trends, the seasonally adjusted indices and the regression equations are used for extrapolations, time-trends being used for the extrapolation of the exogenous variables of the regression equations.

However the extrapolations based on trend and regression functions are only the first and in a certain sense the easier step in the forecasting process. The results have to be reviewed, analysed and corrected taking into account a large mass of information and sometimes the value or decision which must be made on the direction and degree of the correction is fully intuitive. The information used in this forecasting phase is manifold: latest changes in the economic indicators, effects of the new or expectable state measures, new regulations or changes in the existing ones, changes in the order-books or stocks of the enterprises, trade-agreements with the major foreign markets, world market projections, and financial information especially regarding credit grants and savings for investments etc.

The next major step is to attain consistency in the forecasts. An aggregated input-output model is used for this purpose. In it industrial output is broken-down in three branches /basic materials, capital goods and consumer goods/, the other sectors are agriculture including the food industry, and the

services. On the right side of the frame private and public consumption, investments, changes in inventories and exports and on the lower side, the flows from depreciation, wages and net revenue. Consistency tests are prepared to confront available resources with the expected change in demand using these input-output balances and taking into account all the information mentioned above.

The growth of the resources, such as manpower and investments are easier to project than the change in their productivity, which is affected by many factors. Productive consumption /i.e. material flows within the inner matrix/ is the major part of total consumption, where changes are generally more gradual, than e.g. in exports. The share of exports is much smaller but its fluctuation is stronger and less predictable. Changes in the foreign trade balance have of course, a strong influence on the resources-side also.

The above mentioned steps in the forecasting process do not simply follow one after the other for there is a certain interaction and iteration among them. In the final version of the forecasts the Institute tries to concentrate attention on some of the major topical problems in the economy, especially where policy changes seem to be desirable. On several occasions their projections tried to trace the economic consequences of different policy-measures.

These short-term economic projections have been prepared regularly since 1968 and methods crystallized and improved considerably. Their results have shown a rather good coincidence with statistical data, even if actual facts differed from the forecasts in several instances. These differences are partly due to unforseen events and partly to changes in central policy measures, such as changes in investment or credit-policy, in foreign trade promotion, or in wage and price regulations.

While the first type of difference is regarded as an error of the forecast, even though an unfavourable change, the second type is not necessarily erroneous. If the course of economic events follow a different path than the forecasted one, due to unpredictable policy changes, then this cannot be regarded as an error.

b/ Econometric model for macro forecasts

The macroeconomic model developed in the Hungarian Economic Research Institute[27] analyzes the past structure of the most important national economic interrelations. This is regarded as the starting point for forecasting; taking into account the estimated changes in the most important factors it is possible to draw conclusions on the character and rate of economic development and on the expected effects of various policy decisions.

The model is still in an experimental stage, for changes are continuously introduced to the structure and assumptions, and its forecasting performance is tested.

Some of the characteristic features of the model are as follows: a/ it deals with "gross" value, i.e. with the contributions of the different sectors to gross production and with its distribution on the utilization side; b/ the model is "open", i.e. foreign trade is included; c/ besides expressing the simultaneous relationships of the aggregates of the economy, some of the variables are included with time-lag because their subsequent effect appeared to be important.

The model consists of a simultaneous linear equation system where a stochastic relationship is determined between

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27/ For more details see: An Experimental Macroeconomic Model of the National Economy. Economic Research Institute, Budapest, September 1971.

the exogenous and endogenous variables. The model endeavours to quantify the most important relationships in the economy's reproduction process. The major interrelations of the model can be seen in the diagram in Appendix I. The variables and structural equations can be found in Appendix II.

Production is regarded as a function of the following two factors: the numbers employed and fixed assets. The latter explanatory variable is used with a time-lag, the extent of the delay in the different branches are determined by experiment. Total production is broken-down into five sectors: 1/ basic materials, 2/ capital goods, 3/ consumer goods, 4/ agriculture and food and 5/ services. The sectoral break-down was intended to constitute relatively homogeneous sectors without excessively increasing the number of equations.

An identity ensures the distribution of the material goods and services produced among the eight items shown on the diagram. Further equations in the model explain the interrelations of investments, fixed assets, the numbers employed in the different branches, the consumption of the population and foreign trade. The explanatory variables for investments are the total volume of accumulation, the lagged investment of the previous year in the given branch and the lagged balance of foreign trade with the non-socialist countries. The increase in fixed assets is explained by their previous value and by investment.

In the equations regarding the numbers employed, demand is expressed by the production of the given branch, and supply by the number of those employed in agriculture, which is still the major manpower reserve of the economy.

Total private consumption is broken-down into three major commodity groups: foodstuffs, manufactured goods and services. It is explained by the per capita real income of the different strata of the population, where real income is a function of nominal

income of the economically active population and real income is further explained by the real wage of the employed, the numbers employed in industry and by state purchases of agricultural goods /the latter, in the case of the agricultural population/.

The constructors of the model originally intended to treat trade with the socialist countries as endogenous variables and trade with capitalist countries as exogenous. They failed however to find a regression equation which adequately explains the Hungarian export flows to the socialist countries. Imports coming from the socialist markets are represented as a function of total material consumption and of total investments.

Finally there is an identity in the model defining the GDP as the difference between gross output and total material consumption.

There are altogether 35 structural equations in the model of which 27 are regression equations. The number of endogenous variables equals the number of equations and they are explained by 13 exogenous, i.e. predetermined variables. In the process of quantifying the model the assumptions concerning the interdependence of the economic aggregates were tested and the regression equations were accepted only under strict mathematical qualifications. If it was found that the standard error of certain parameters was high, or that the multi-correlation among variables was too strong, certain equations or some of their variables were omitted or substituted by others. The parameters were determined by the two-stage least squares method, because it is less sensitive to errors in specifications and its computation easier, than the other methods considered.

Thus the macroeconomic model described above is used for projection purposes: the future value of the endogenous variables

are determined under certain constraints. The results naturally are strongly dependent on the structure of the forecast or predetermined values of the exogenous variables and on the assumption that there will be no structural change compared to the observation period /expressed by the interrelations of the equations and by the parameters of the explanatory variables/. In forecasting the exogenous variables different alternatives can be used, which extrapolate on the basis of certain time-trends, or central decisions /eventually plan targets/ can also be used. The assumptions of no structural change are closely linked to the span of the projections, the shorter the forecast period the less the structural changes in the economy. One way of checking the validity of this assumption is to complete ex-post forecasts, which have shown a rather good fit to actual data.

Experience gained since 1970 when the model was first tested shows that the model is a useful and promising tool for completing the short-term projections of the Hungarian economy. The reliability of the results, i.e. of the different endogenous variables are naturally different, some of them - especially those of the production variables - are quite good, while others, e.g. those of consumption and of foreign trade are somewhat weaker. When structural change is caused by government intervention /e.g. the restriction of investments in 1972/ then an alteration is made in the model, which in this case treated investments as exogenously given. This greatly increased the forecasting power of the model.

Finally it should be mentioned that one of the great advantages of such a stochastic econometric model is that it can indicate the probability of occurence with regard to the forecast values of the endogenous variables.

c/ Forecasting tests by managers of industrial enterprises

A third short-term projection method of the Hungarian Economic Research Institute is based upon the interviews in which questionnaires are sent to the managers of the industrial enterprises once a year asking their opinion on expected changes in their production, sales, inventories, prices, manpower, and wages. The weighted and aggregated information gives a clear picture of the growth expectations which the central organs can use. It is also of use to the enterprises, as it shows the expectations of the other firms, their competitors as well as their business partners. It can also serve as feedback to the policy makers in the sense that they can check the probable reactions of the enterprises to the newly introduced measures, or policy changes.

This interview method has been used by the Institute since 1968, the results are regularly published in aggregate form. Representation is sufficiently good not only for the whole of the industry, but for the individual branches also: the enterprises regularly replying to the questionnaires represent about 85 per cent of the labour force employed in industry and about 95 per cent of the value of total industrial output.

The questionnaires /see: Appendix II./ are sent in August of each year to the managers of industrial enterprises. Their opinions are requested on expected changes for the current and following year. This means that two estimates are available on expected results of each year, one from the previous year and one based on the results of the first half on the current year.

The major issue is how the enterprises judge the development of demand for their products both on the domestic

and export markets, now will [illegible] their
output, inventories and prices over with their employment and
average wages change. These questions require only qualitative
answers, marking one out of the six categories:

"decline", if the expected drop is more than 1 per cent;
"unchanged", if the change is less than 1 per cent;
"slight increase", if the rise is between 1 and 5 per cent;
"moderate increase", if it is between 6-10 per cent;
"strong increase", if it is above 10 per cent.

The qualitative answers are quantified by using the mean values of the growth rates of the intervals and by weighting them according to the data of the enterprises /value of production, employment, etc./ for the previous year. This method of quantification is naturally only approximate, and leaves room for subjective judgement in the case of the two extreme categories too.

The expectations of the managers are influenced of course by a number of factors: by their knowledge of the circumstances of production and marketing, and by conscious and unconscious reasons which may orientate their answers. The experience of the five year survey showed a considerable improvement in the projective value of the replies, they gradually approximated reality more closely. This certainly shows an increase in their knowledge of the market behaviour and enterprise reaction and an improved understanding of the operation of financial measures and incentives.

Understanding the aggregated results is aided significantly by graphic illustration /see some examples on figures 1-5 in Appendix III/. This kind of curve generally shows a log-normal distribution. The actual shape of the curve is determined by the density of the estimates at certain intervals. The curves showing the expected changes in production are in most cases pointless, because most enterprises forecast a small or medium rate of increase

/Fig. 1-3./, i.e. their enterprises are distributed between two categories. Figure 4. shows the distribution of the expected growth of sales on the domestic consumers' market in 1971. The curve is pointed because competitive enterprises nearly unanimously expected [illegible]. The distribution of expected sales on the capitalist markets in 1970 are mixed, as a consequence the curve has a double pointed shape /Fig. 5./, showing that competitive enterprises expect a significant increase in their exports, while the uncompetitive ones will have to withdraw.

The development of enterprises expectations can be followed by comparing the curves of consecutive years. Figures 1-3. of the production estimates show e.g. that an increase of the growth rate was expected for 1972 with a slackening for 1973 compared to the previous year.

III. LONG-TERM PROJECTION METHODS FOR SOME MANUFACTURING BRANCHES AND COMMODITIES

In addition to the short-term forecasts of the national economy, discussed in the previous chapter, there are a great, and rapidly increasing, number of projections which are prepared by individual industrial branches, large scale enterprises and industrial research institutes. We cannot present a full review of all these analytical and forecasting activities, which of course differ vastly in nature, so instead we shall select some typical ones of them.

Many of the projection preparation started up for industrial branches, or certain commodity groups were related to the preparations of the long-term /15 year/ planning process, which began about 3-4 years ago. In most cases the work started by estimating the growth in demand for major commodity groups, using extrapolation

techniques and interpret [illegible] review a few of them.

a. Long-term [illegible] for the chemical industry

The long-term planning of the Hungarian chemical industry was preceded by a preparatory projection process. One part of this was to test different time-trend and regression functions in order to choose those which best suit the forecasting of the different sub-branches and commodity groups.

By choosing the functions showing the best coincidence with past data and extrapolating them endeavours were to present the planners with a preliminary view of future development without changing growth rates and structural relationships. A comparison of the ex post analyses for the different sub-branches revealed their behaviour in the different development stages. This can be of help in long-term planning enabling estimation of the duration of the different development stages in the individual sub-branches in the future and the type of growth function they will follow.

The chemical industry was subdivided into six sub-branches: synthetics, rubber, pharmaceutical products, dyes, man-made fibres and fertilizers. Different types of time-trend functions were adjusted to the ten year production data, exports, imports, fixed assets and employment. They included linear, quadratic, power, exponential, logarithmic etc. functions. Regression equations were computed on the consumption and production of the sub-branches using GNP and electricity consumption as exogenous variables. Production functions were also computed where fixed assets and employment were used as explanatory variables.

The analysis of the results showed e.g. that that the total consumption of chemical products and three commodity groups /synthetics, fertilizes, and man-made fibres/ are on the upswing. Their development follows an exponential fuction, while growth in the pharmaceutical and dye industry is slower and it is approximately linear in the rubber industry. Production trends differ, the most rapid growth was observed in the rubber and pharmaceutical industry. The divergence was partly due to export possibilities and to lags in investments in certain sub-branches which could not keep pace with the rapid growth of consumption.

Electricity consumption was used because of the need to avoid the valuation problems inherent in GDP computations. In general it showed a closer relationship then did the GDP, especially to production variables.

It was found that even if trend and regression analysis is a very useful tool in preparing long-term projections, the great divergence in the extrapolations of the different functions and the wide interval in their probable future values means that they are not too stable. It was therefore considered necessary to combine these extrapolations with experts' opinion when large numbers of factors difficult to quantify were taken into account.

b. Industrial projections based on input-output analysis

In independent long-term projections for individual industrial branches consistency could not be attained, because the inter-industry relationships were not taken into account. One of the first experiment in Hungary to use disaggregated input-output matrices for the consistent long-term projections of an industrial branch was completed by the research institute /NIMIGÜSZI/ of the Ministry for Heavy Industry.

The computations were based on an input-output matrix for 1965 corrected by recent price changes. Committees of experts prepared the projections of the technological coefficients to

the years 1975, 1980 and 1985. Total utilization of chemical products was elaborated in three versions with different treatments of imports, i.e. in addition to total utilization, use according to domestic and import origin were also projected.

One of the major objectives of the projections was to estimate the demand for chemical products in production and final consumption. Two basic information factors was needed for this purpose: the growth of output in the different branches of the economy and the projected technological coefficients, especially the share of chemical industry products in total material consumption. The chemical industry was disaggregated into 17 sub-branches in the input-output tables, which gave a detailed picture of the structural change within the increase in total demand for chemical products.

In projecting the technological coefficients the effects of different factors had to be reckoned with. These included the increasing use of chemical products in industrial processes, the substitution of chemical products for traditional materials, the changing pattern of production in the industries using chemical products and technological changes in industrial production processes. The assumptions were prepared and discussed by committees of experts in order to reduce the failures of subjective opinions and errors.

On the basis of the exogenous information mentioned above many-sided results were obtained on the projected growth of total use of chemical products as well as on use in break-downs of domestically produced and imported products. It also showed the repartition of total demand according to the 17 sub-branches of the chemical industry as well as the share of the different branches of production and categories of final consumption within total use.

[illegible] input-output tables have the great advantage of being consistent, i.e. the growth of production and [illegible] branches must satisfy production and final demand. A comparison of the consistent solution with [illegible] projections of the branche or commodity groups reveal the major contradictions. The corrections may naturally involve the revision of both the final output figures and the technological share coefficients. The possibility of computing different consistent projection variants is an additional advantage of using the input-output method. By changing the level and structure of final demand, or the share of domestic production and imports, different consistent solutions can be obtained and compared. This is very helpful both to planning and projections. Varying selection can be made from among the many variants according to the aims of approach dependent on whether certain targets and preferences are kept in mind, or whether the most probable variant is sought for.

c. Experimental projections of lifespan-curves for manufactured products

A relatively new method for projecting future consumption, output or imports of rapidly changing industrial products are based on the extrapolated lifespan-curves. The rapid structural change in the commodity pattern is especially characteristic in the engineering and chemical industries. The reason behind the changing commodity pattern of these branches is that many of their products follow a certain lifespan-curve, which could be broken-down to four periods: introduction, upswing, maturity and decline.

Fig. 6. in Appendix IV. shows a sample sales diagram, or lifespan-curve of a product, with the rate of change and its profit/loss curve. The introduction or starting up period is marked by an increasing sales rate and declining loss. Sales

increase rapidly in the upswing phase, but the rate of increase slows down once the peak has been attained. The shape of the profit-curve is similar because prices decline more rapidly than costs. This turning point coincides in most cases with the introduction of a competitive product. The volume of sales culminates in the period of maturity, the end of which is the saturation phase/, when the rise gives way to a decline and profits diminish. In the period of decline sales fall as losses increase and product fades out.

The lifespan-curves of different commodities in the same industrial branch have different shapes, points of introduction, and the length of the upswing periods etc. are also different. As the different wave-like curves of the individual products are added together to form total production /or sales/, they determine the shape of the total curve of the commodity group or of the industrial branch. It can also have a shape somewhat similar to the lifespan-curves of individual commodities /see: curve A on Fig. 7./, if the products on the decline are not replaced sufficiently by other products /like B/ of the same branch. But the innovation-replacement process can continue on an increasing scale, e.g. introducing product b, consequently the production of the given branch does not reach the saturation phase, at least not in the projection period /curve B/.

Analysis of the growth rates of exports in the different industrial sub-branches or commodity groups shows a very distinct difference: some develop most rapidly, others grow at a more or less average rate and others stagnate or decline. Within the total of engineering industry exports by the major exporting countries some commodity groups grow faster than 18 per cent p.a. /such as computers, cars, telecommunication equipments, electronics etc./ and are apparently in the upswing phase. A similar dynamic increase in international demand can be found in certain commodity groups of chemical products, like new

synthetics, dyes, or pharmaceutical products. The great majority of exported engineering and chemical industry products mature more slowly and in [illegible] of cases. Railway vehicles belong to the stagnating commodity group / [illegible] per cent average annual growth/, while agricultural machinery exports rise but slowly. /The absolute decline in the exports of a commodity group is rather exceptional./

Observations of the lifespan-curves of some major products and commodity groups in foreign trade and output in the developed countries can greatly contribute to the projection of domestic and export demands. In the correction of time-trend extrapolations it is particularly helpful to estimate the length of time of the rapidly rising upswing phase and the gradual decline in the growth rate. International analogies are helpful as Hungarian technological development is in many respects in a time-lag in comparison to industrially more advanced economies. But this must be done carefully: there is great variety in the consumption, production and substitution patterns of the developed countries themselves and it is by no means necessary for an economy with a certain time-lag in industrialization to follow the same path as those who started earlier. This is especially true regarding the details of the sub-branches.

Elaboration of the long-term projection of an industrial branch, or sub-branch based on the expected lifespan-curves of the major products requires a lot of work, much caution, foresight and well considered assumptions but it can be an important device in approximating the most probable outcome of development. It draws attention to the important relationship between growth and the continuous innovation-replacement process, and to the efforts of research and development in the different branches of the economy.

IV. FOREIGN TRADE [illegible]

Foreign trade projections in Hungary are prepared in the Institute for Economic and Market Research. Short-term forecasts have been presented to the Ministry of Foreign Trade annually since 1968 and the first experimental long-term projections are under elaboration in co-operation with the other CMEA countries.

a. Short-term foreign trade forecasts

Following the introduction of the new system of economic control and management in 1968 the Ministry of Foreign Trade realized the need for short-term forecasts of the export and import performance of the major commodity groups and markets. The Hungarian economy is especially sensitive to foreign trade, and fluctuation is sometimes quite significant. This affects the growth and equilibrium of the whole economy through the balance of trade.

Short-term foreign trade forecasts are regularly prepared at the end of the first quarter, at a time when the results of the previous year and of the first months of the forecasted year are already known, and when most of the policy changes exerting an influence on the given year have also been decided upon.

The forecasts are prepared for five commodity groups /fuels, materials, machinery, manufactured consumer goods, and agriculture/, regarding both exports and imports and a further distinction is made between the socialist and non-socialist markets.

A great amount of information, statistics and computed extrapolations are used in the elaboration of the forecasts. Linear and exponential time-trends are adjusted to 10-15 years time series and extrapolated, producing a forecasted interval. Other extrapolation are obtained from regression equations and through using estimated propensity parameters of projected GDP, industrial and agricultural output, investments and consumption.

[illegible] variety of forecasts most of which are very interesting with respect to the various assumptions on which they are based. Nevertheless, they [illegible] in the projection process, if intentions are to achieve a satisfactory level of probability.

Information is collected on developments on the major commodity markets, especially concerning changes in Hungarian export possibilities. The expected growth in demand on the major export markets are of primary importance. Estimates are prepared on how the newly introduced trade policy measures, changes in the international monetary situation and in world market prices will affect Hungarian exports and imports. Changes in bilateral trade, and industrial co-operation agreements, as well as the possibilities for establishing mixed enterprises are carefully studied from the point of view of their probable influence on trade-flows.

Another important source of information in forecasting foreign trade, especially imports, is the development of the domestic economy. In close co-operation with the Institute of Economic Research they prepare forecasts for the main economic indicators and their expected effects on foreign trade performance. Such factors e.g. as investment activities and changes in material inventories have a strong influence on imports. However, both of these factors are affected by the balance of trade of the previous year: a positive balance is generally followed by increased investments and a more liberal import policy, while a negative one may have the opposite effect.

The managers of the foreign trade enterprises are regularly interviewed by the Ministry of Foreign Trade with regard to their expectations. The aggregated and weighted replies are indispensable assistence to the short-term forecasts, as the enterprises have the closest contacts with both the external markets and the domestic

firms. As their [illegible] experience [illegible], their foresight has shown remarkable improvement too.

It is of course difficult to describe how and this informati data, and extrapolation is used in the actual elaboration of foreign trade forecasts as it is not /and probably cannot be/ formalized in an econometric model. In weighting the different estimates and factors influencing the trade-flows detailed knowledge of the operation of the economy is essential. Gaining experiences by preparing the forecasts several times and then analysing the causes of the deviations and coincidences with actual facts contributed significantly to the improvement of the forecasts.

b. Medium and long-term foreign trade projections prepared in the CMEA countries

The member countries of the Council for Mutual Economic Assistance /CMEA/ are presently working on common medium and long-term economic and foreign trade projections*/. A working group of experts was convened to prepare the methods, the targets and the organisational aspects of the foreign trade projections. The methodological and organisational questions have been elaborated in the past three years. The first projection variants of the member countries have already been exchanged and a joint final version will be worked out until this year.

Economic policy makers in the socialist countries attach great importance to the development of long-term foreign trade projections which will be used in planning production and foreign trade. The changes in the internal and external conditions of development in the recent decades have been carefully examined, including the different development trends in international

*/ See: A Szocialista Világpiac Hosszútávú Kereskedelmi-Gazdasági [illegible] dr. Zsert Mihály /On the Methods of Long-Term Economic and Trade Forecasting for the Socialist World Market/, [illegible] 1977.

trade. The purpose of the projections is to provide the leading economic organs of the socialist countries with a broad range of information concerning the main lines of future development in the socialist world market. This in turn may contribute to the efficient accomplishment of the economic tasks of the respective countries and may serve as a [illegible] means of co-operation.

It was clearly stated that the projections differ from the plans in their origins. They are not pre-established targets, but endeavours at advance determination of probable trends in development based on well-defined assumptions. Thus, the projections usually precede the elaboration of plans. They are not binding and may contain alternative versions. Working out the projections helps in the co-ordination of national economic plans for development, co-operation in the expansion and modernization of the principal branches of economy, and in aligning the plans aimed at the efficient utilization of science and technology. Based on objective conditions and development trends, the projections may indicate possible disproportions emerging in the course of economic growth and the same time they may be instrumental in removing bottlenecks, the lack of equilibrium, and other undesirable phenomena.

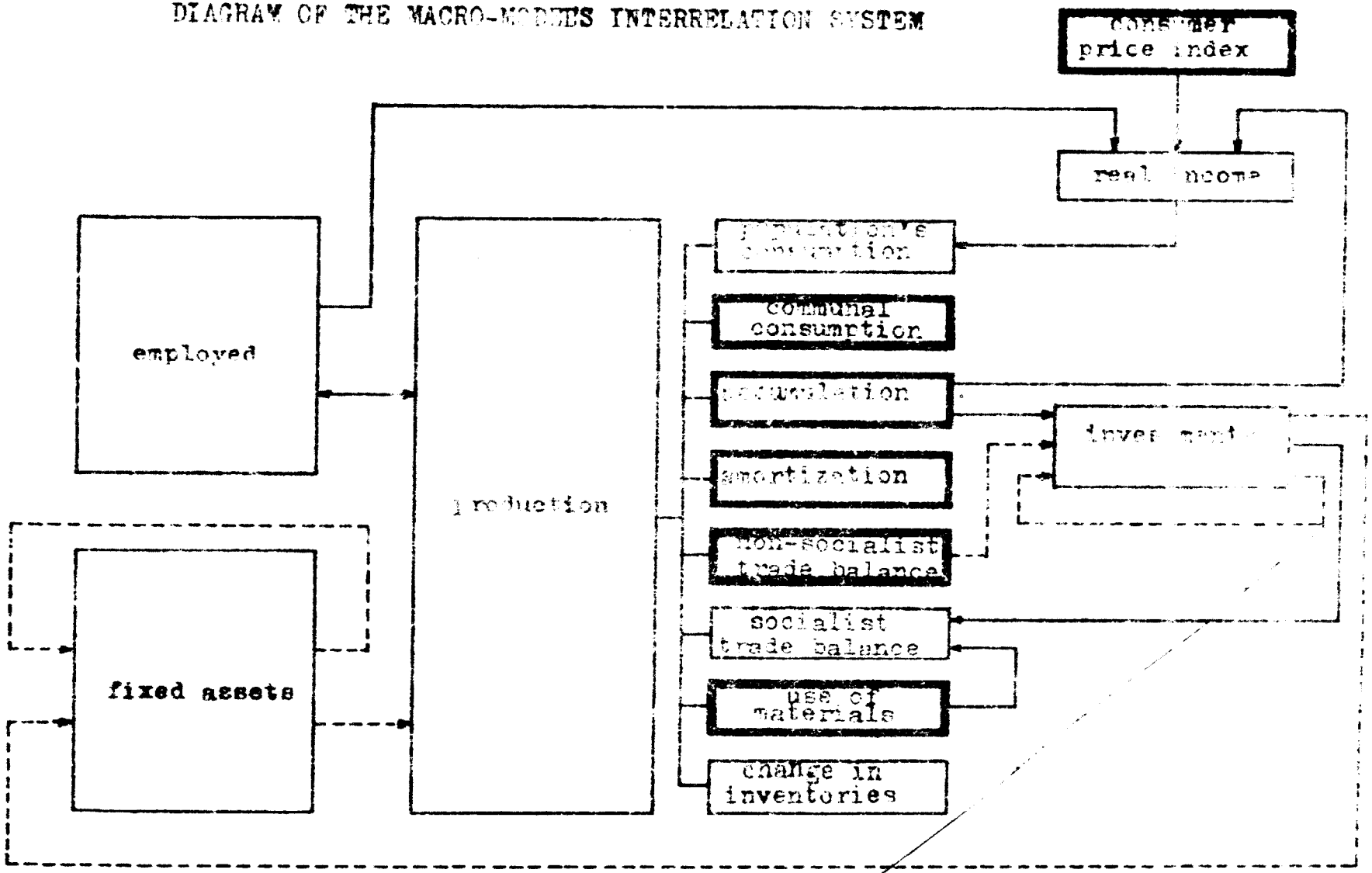
The principal factors determining the rate of growth and trends in exports and imports are explored in the projection process. In determining the volume and structure of exports, both the production potential of the exporting country and the demands of the importing country are taken into account. Likewise, in the development of imports not only are internal requirements considered but so are conditions of purchase on the external markets. Therefore, the analysis of factors like national and productive consumption are used for both the export and the import projections. At the same time, the factors influencing or shaping conditions on the external markets, such as the intensification of the division of labour, perfection of the various forms of financial and trade relations, etc., are also considered.

The research [illegible] in the projection process [illegible], expert estimates/ to more [illegible] functional relationships [illegible] between the growth of exports and imports and certain [illegible] variables, such as the national income, industrial and agricultural output, investments and consumption. On the basis of past data the computed functions give elasticity coefficients which show how the explanatory variables influence developments in both exports and imports.

In Hungary a trade-flow model is also used to analyse the past formation of world trade and it enables the preparation of experimental forecasts in a consistent manner. Foreign trade projections, prepared independently in each country, may easily be contraditory, often one country does not project a similar amount or kind of product pattern for exports to another country to the one it plans to buy from that market. Such contradictions between national projections may naturally be illuminating, because they direct attention to most of the tension which must be dissolved. But it is necessary to find methods designed to eliminate these contradictions and enabling the elaboration of consistent projection variants for world trade, especially for trade among the CMEA countries, based on various assumptions.

The foreign trade projections are worked out according to the major commodity groups /on the one digit level of CMEA commodity classification/. The time-horizon of the projections is 1980 and it may be extended later.

DIAGRAM OF THE MACRO-MODELS INTERRELATION SYSTEM



Appendix I.

Appendix II.

EXPECTATIONS OF THE INDUSTRIAL ENTERPRISES

Expected changes compared to the previous year:	for 1972					for 1973				
	decrease	unchanged	increase: slight	increase: moderate	increase: strong	decrease	unchanged	increase: slight	increase: moderate	increase: strong
1. in production										
2. in sales to:										
a. domestic market										
b. export markets										
c. exports to socialist countries										
d. exports to capitalist countries										
e. investments										
f. all others										
3. in inventories by the end of the year in:										
a. materials										
b. finished products										
4. in prices										
a. domestic										
b. socialist exports										
c. capitalist exports										
d. investments										
e. all others										
5. in the total number employed at the end of the year										
6. in the average income of the employees										

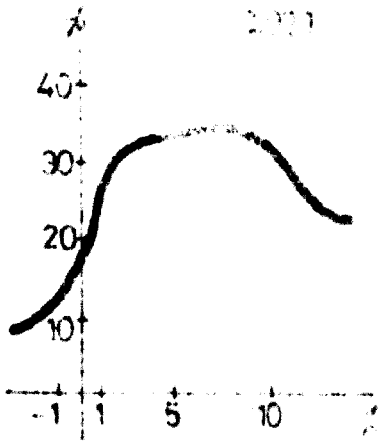


Fig. 1.

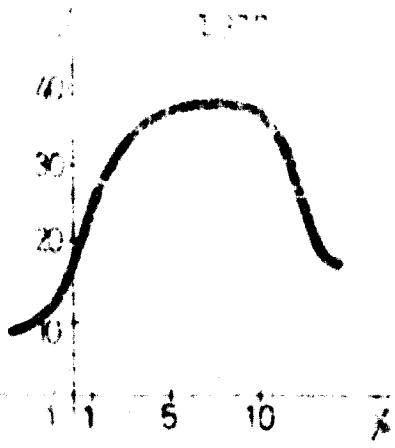


Fig. 2.

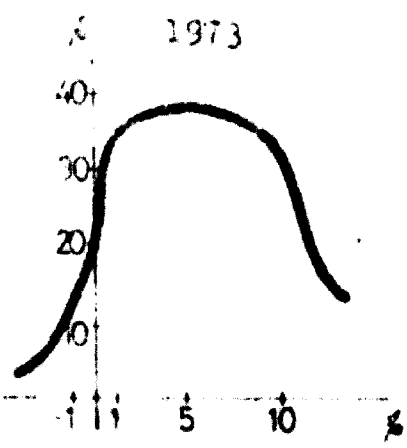


Fig. 3.

SALES FOR DOMESTIC CONSUMPTION

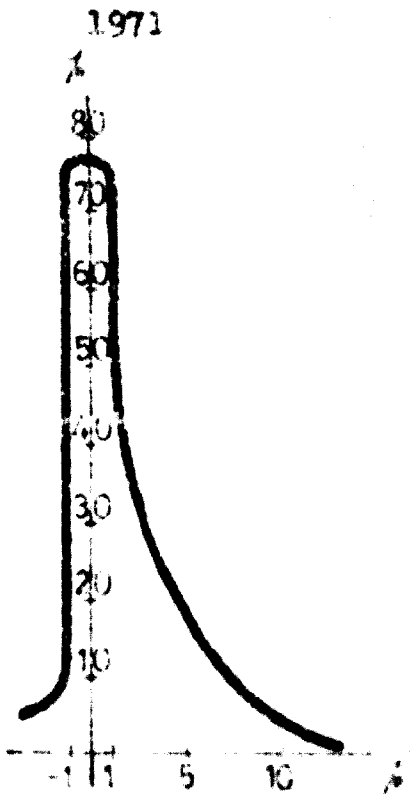


Fig. 4.

EXPORTS TO CAPITALIST COUNTRIES

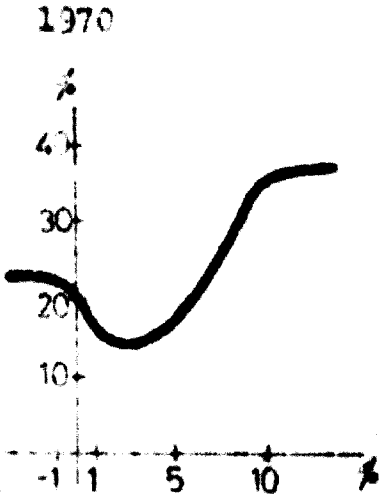


Fig. 5.

Appendix IV.

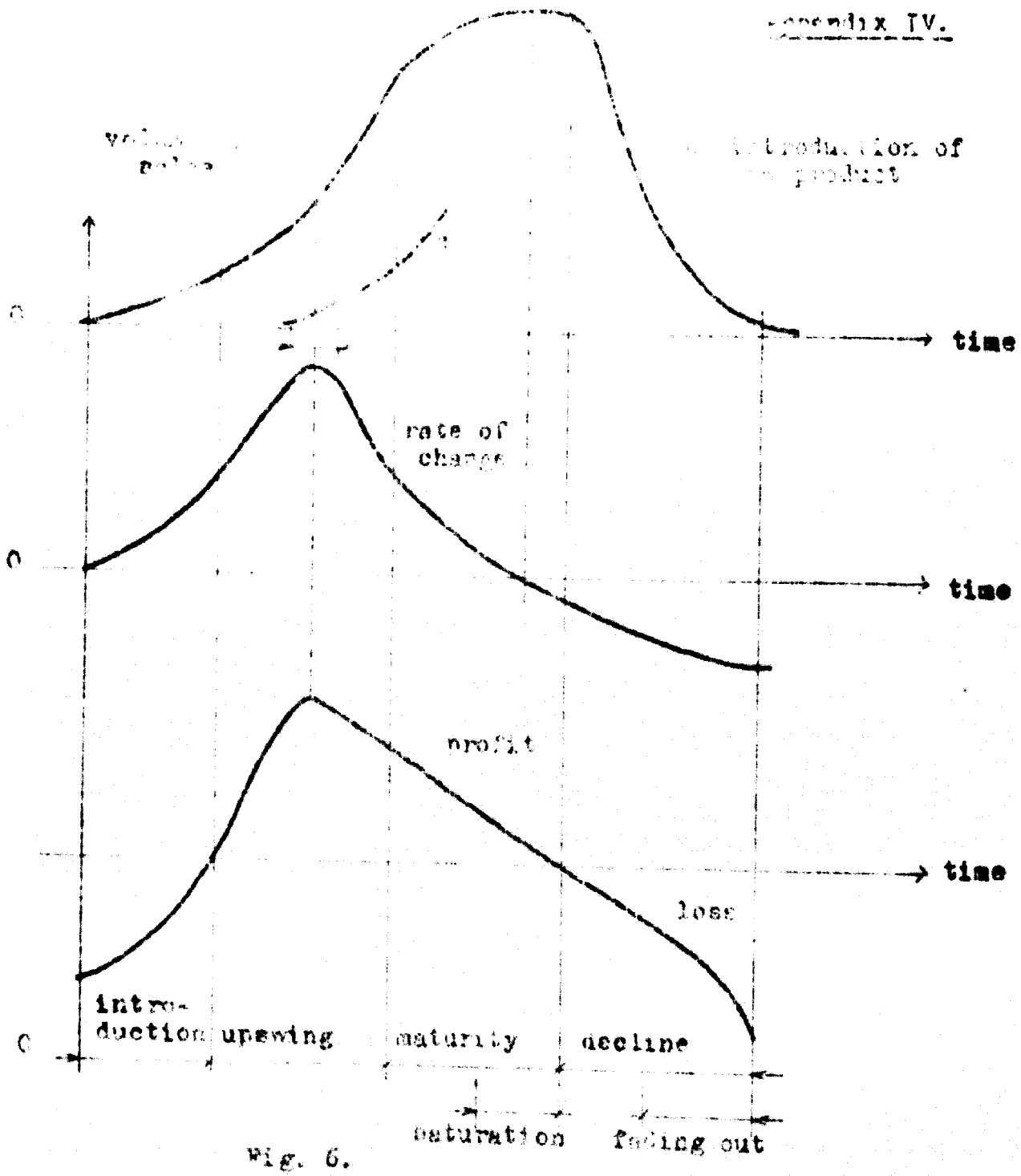


Fig. 6.

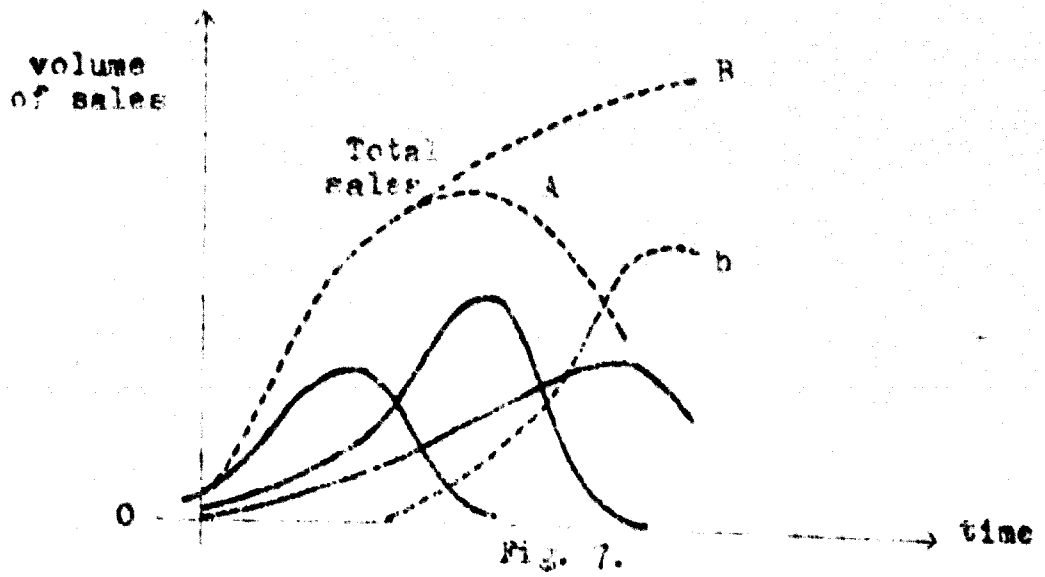


Fig. 7.

ANNEX V.

VARIABLES AND STRUCTURAL SIMULTANEOUS EQUATIONS OF THE MACRO-MODEL

The Endogenous Variables of the Model

T_a production of the branches producing basic materials,

T_b production of the branches producing investment goods,

T_f production of the branches producing consumption goods,

T_m joint production of agriculture and the food industry,

T_{sz} gross performance of services,

$T_ö$ gross output,

K_v change of stocks /without the change of stock of unfinished investments/;

GDP gross domestic product /net material product, amortization and non-productive services added/;

B_a investments of branches producing basic materials,

B_b investments of branches producing investment goods,

B_f investments of branches producing consumption goods,

B_m investments of agriculture and the food industry,

B_{sz} investments of branches of services,

$B_ö$ total of investments;

$Á_a$ stock of the fixed assets in the branches producing basic materials,

$Á_b$ stock of the fixed assets in the branches producing investment goods,

$Á_f$ stock of the fixed assets in the branches producing consumption goods,

$Á_m$ stock of the fixed assets in agriculture and in the food industry,

$Á_{sz}$ stock of the fixed assets in branches of services;

L_a strength of employees in branches producing basic materials,

L_b strength of employees in branches producing investment goods,

L_f strength of employees in branches producing consumer goods,

L_{sz} strength of employees in branches of services,

L strength of employees in non agricultural branches;

$F_ö$ food-stuff consumption,

F_i commodity consumption,

F_{sz} utilization of services,

$F_ö$ total consumption of the population;

R_{ma} workers' and employees' personal real income per capita,

R_p real value of peasantry's personal consumption per capita,

N_{ma} workers' and employees' personal nominal income per capita,

N_p peasantry's personal nominal income per capita;

I_{sz} import from socialist countries,

$I_ö$ total of imports,

Kk_{sz} balance of socialist foreign trade.

The Exogenous Variables of the Model

A_g total of material consumption,

Fh accumulation,

Am total of amortization,

L_m strength of agricultural employees,

$L_é$ strength of food industry employees,

F_k public consumption,

X_{ma} workers' and employees' consumer price index,

X_p peasantry's consumer price index,

F strengthening producing - capacity of soil per cadastral yoke,

Fv agricultural buying up,

E_{sz} exports to socialist countries,

E_t exports to non-socialist countries,

I_t imports from non-socialist countries.

The Structural Simultaneous Equations*/

1. $T_a = -31,0233 + 0,5487\ A_a^{-1} + 0,1306\ L_a$ $R = 0,9914$
/0,0438/ /0,0330/

2. $T_b = -42,6042 + 1,7358\ A_b^{-1} + 0,1064\ L_b$ $R = 0,9834$
/0,3188/ /0,0438/

3. $T_f = -14,4898 + 1,1244\ A_f^{-1} + 0,0926\ L_f$ $R = 0,9935$
/0,1963/ /0,0215/

*/ The explanatory variables used with a time-lag are marked with a negative upper index. The number in brackets under the parameters of the explanatory variables are the standard error of the given parameter.

4. $T_m = 291,8274 + 0,3482\ \acute{A}_m - 0,0996\ /L_t + L_g/ + 0,4219\ P$ $R = 0,944$
/0,3764/ /0,0507/ /0,4162/

5. $T_{sz} = -117,0064 + 0,3071\ \acute{A}_{sz}^{-1} + 0,0634\ L_{sz}$ $R = 0,9925$
/0,0393/ /0,0176/

6. $T_{\ddot{o}} = T_a + T_b + T_f + T_m + T_{sz}$

7. $T_{\ddot{o}} = Ag + Fh + Am + Kv + F_{\ddot{o}} + F_k + Kk_{sz} + E_t - I_t$

8. $B_a = 2,5156 + 0,3846\ Fh - 0,2667\ B_a^{-1} - 0,6994\ /E_t^{-1} - I_t^{-1}/$ $R = 0,9851$
/0,0324/ /0,1084/ /0,1015/

9. $B_b = 0,1174 + 0,1165\ Fh + 0,3622\ B_b^{-1} + 0,1824\ /E_t^{-1} - I_t^{-1}/$ $R = 0,9430$
/0,0272/ /0,1950/ /0,1106/

10. $B_f = 0,1309 + 0,0838\ Fh - 0,0553\ /E_t^{-1} - I_t^{-1}/$ $R = 0,9402$
/0,0069/ /0,0370/

11. $B_m = 0,7057 + 0,1958\ Fh + 0,4151\ B_m^{-1}$ $R = 0,9274$
/0,0758/ /0,2145/

12. $B_{sz} = 9,3275 + 0,2587\ Fh + 0,9925\ E_t^{-1} - 0,5920\ I_t^{-1}$
/0,1439/ /0,4505/ /0,3299/ $R = 0,9467$

13. $B_{\ddot{o}} = B_a + B_b + B_f + B_m + B_{sz}$

14. $\acute{A}_a = 4,8627 + 0,9008\ \acute{A}_a^{-1} + 1,1986\ B_a^{-1}$ $R = 0,9942$
/0,0762/ /0,6629/

15. $\hat{A}_b = 1,8000 + 1,[illegible] A_b^{-1} + [illegible] B_b^{-2}$
/[illegible]/ /[illegible]/ R = 0,9949

16. $\hat{A}_f = 0,7196 + 0,9379\ A_f^{-1} + 1,3257\ B_f^{-2}$
/0,0122/ /0,0853/ R = 0,9954

17. $\hat{A}_m = -1,4118 + 1,0278\ A_m^{-1} + 0,5253\ B_m^{-3}$
/0,0533/ /0,2963/ R = 0,9954

18. $\hat{A}_{sz} = -1,2740 + 1,0144\ A_{sz}^{-1} + 0,5137\ B_{sz}^{-2}$
/0,0360/ /0,3461/ R = 0,9986

19. $L_a = 1652,7743 + 0,3015\ T_a - 0,6506\ L_m$
/0,3424/ /0,1489/ R = 0,9734

20. $L_b = 1877,3933 + 1,1441\ T_b - 0,7130\ L_m$
/0,4871/ /0,1844/ R = 0,9726

21. $L_f = 720,1440 + 3,5810\ T_f - 0,2415\ L_m$
/0,8205/ /0,1675/ R = 0,9741

22. $L_{sz} = 4252,7782 + 0,9387\ T_{sz} - 1,6281\ L_m$
/0,6756/ /0,2545/ R = 0,9900

23. $L = L_a + L_b + L_f + L_{sz} + L_\delta$

24. $F_é = 18,2315 + 0,2550\ R_{ma} + 0,1715\ R_p$
/0,0915/ /0,0831/ R = 0,9850

25. $F_i = -11,2650 + 0,1273\ R_{ma} + 0,1479\ R_p + 0,3654\ F_i^{-1}$
/0,0861/ /0,0769/ /0,1968/ R = 0,9879

26. $F_{sz} = -1[illegible] + [illegible] I_{me} + [illegible] B_{ö}$ R = 0,9553
/[illegible]/ /[illegible]/

27. $F_{ö} = F_{á} + F_{i} + F_{sz}$

28. $R_{ma} = 132,0004 + 0,9698\ N_{ma} - 1,3086\ X_{ma}$ R = 0,9997
/0,[illegible]108/ /0,1073/

29. $R_{p} = 132,2992 + 1,0085\ N_{p} - 1,3339\ X_{p}$ R = 0,9990
/0,1382/ /0,0057/

30. $N_{ma} = -3,6338 + 0,8794\ Fh + 0,0350\ L$ R = 0,9078
/0,5123/ /0,0179/

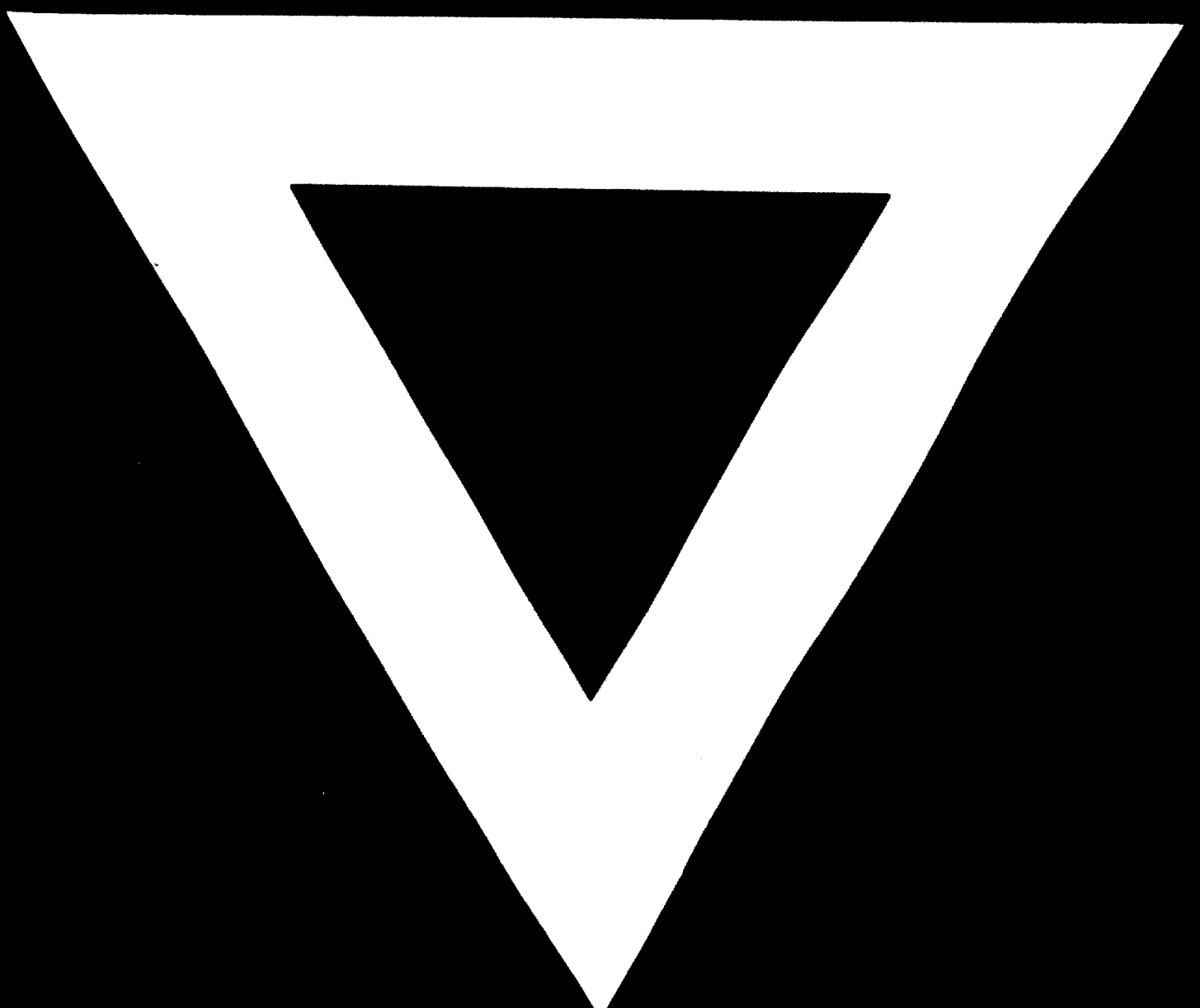
31. $N_{p} = 45,4176 + 0,7941\ Fh + 1,7279\ Fv$ R = 0,9638
/0,3128/ /0,5363/

32. $I_{sz} = -15,9584 + 0,1645\ Ag + 0,1097\ B_{ö}$
/0,0408/ /0,1556/ R = 0,9763

33. $Kk_{sz} = E_{sz} - I_{sz}$

34. $I_{ö} = I_{sz} - I_{t}$

35. $GDP = T_{ö} - Ag$



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