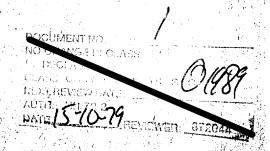# PROVISIONAL INTELLIGENCE REPORT

THE STRUCTURE OF THE SOVIET ECONOMY

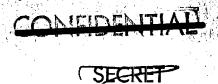CIA/RR PR-112

1 May 1955

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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7 May 1956

MEMORANDUM FOR: Chief, Liaison Division, OCR

25X1A9a

ATTENTION :

SUBJECT : Transmittal of ORR Report ⬛⬛⬛⬛ 25X1A2g 25X1A6c

REFERENCE :

25X1A6c

1. In response to referenced dispatch no. ⬛⬛⬛⬛ there
are forwarded herewith two copies of CIA/RR PR-112, The Structure
of the Soviet Economy, 1 May 1955, Secret, for transmittal to Chief of
⬛⬛⬛⬛, Attention: ⬛⬛⬛⬛ These reports
are to be passed to ⬛⬛⬛⬛

25X1A6a
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25X1A9a

25X1A2g   2. The Office of Research and Reports considers that dissemina-
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the United States, and has sanitized it in accordance with applicable CIA
disclosure policies. This report does not contain classified source in-
formation collected by other US agencies. This report is forwarded to
you for final clearance relative to MIC 206/29 (US National Disclosure
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FOR THE ASSISTANT DIRECTOR, RESEARCH AND REPORTS:

25X1A9a

Chief, Projects Control Staff
Office of Research and Reports

Attachments:
Copies #173 & #174, PR-112

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ORIGINAL DOCUMENT MISSING PAGE(S):

Attachment missing

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PROVISIONAL INTELLIGENCE REPORT

THE STRUCTURE OF THE SOVIET ECONOMY

CIA/RR PR-112

(ORR Project 10.122)

NOTICE

The data and conclusions contained in this report do not
necessarily represent the final position of ORR and should
be regarded as provisional only and subject to revision.
Comments and additional data which may be available to the
user are solicited.

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FOREWORD

As economic intelligence develops, providing a more reliable and more detailed description of the internal structure of the economy of the USSR, it will be possible to examine quantitatively and comprehensively many problems which have been left to the qualitative and highly aggregative techniques. This report is a first approximation to such a description. It represents an attempt, within the confines of currently available intelligence, to present in comprehensive form the internal structure of the Soviet economy.

Such a project is based upon the collective effort of the intelligence community. Substantial contributions to this type of analysis also have been made by ███████████████ the Bureau of Labor Statistics, whose cooperation on the present project has been of great value.

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The preliminary structural table is presented, along with a discussion of its meaning, the method of its construction, and its intelligence applications, in order to explain and illustrate the technique and to stimulate comment and criticism. Research is continuing not only in elaborating upon, revising, and documenting the present table but also in employing it in specific intelligence problems. The detailed results of this research will be published later this year.

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(ORR Project 10.122)

THE STRUCTURE OF THE SOVIET ECONOMY*

Summary

The intersectoral transactions, or structural, table for the USSR in
1951 presented in this report (Figure 1**) is a statistical view of the
entire Soviet economy in 1951. Each row in the table represents the dis-
tribution of the output of a sector in the economy. There is a row for
every sector in the economy. Each column is the distribution of the in-
puts into a sector, and there is a column for every sector in the economy.
Thus a study of the table enables one to grasp, simultaneously, all of
the interrelationships among all the sectors of the Soviet economy.

Two supplementary tables are derived from the intersectoral trans-
actions table. One (Figure 2)** is the distribution of inputs, a
percentage distribution of the components of total cost for each
sector. This table presents the intersectoral relationships within
the Soviet economy from the input, or cost, side. Thus it is possible
to observe the direct effects implied by a change in the output of a
given sector.

The second supplementary table (Figure 3)** is the distribution
pattern for each sector, a percentage allocation of output to all
consumers. This table presents the intersectoral relations of the
Soviet economy from the output side. Similarly, it is possible from
this table to visualize the direct effects of changes in the output
of sectors or the demand for products.

The intelligence applications of such an analysis of economic
interrelationships are manifold, despite the limitations of the data
available. All those studies in which it is desired to test the
capability of the economy to perform specified programs fit readily
into the intersectoral framework. Such studies would be to test the
Soviet ability to complete an announced plan successfully or to
undertake specific programs, such as a guided missile or an atomic
energy program. Soviet capabilities to conduct warfare can be
tested, and an examination of the impact of air damage on the economy
can be made.

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* The estimates and conclusions contained in this report represent
the best judgment of ORR as of 15 March 1955.
** Following p. 36.

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I. The Structure of an Economic System.

The economic system of a country is a part of its social structure.
It is the institutional framework by which the scarce resources, human,
natural, and capital, are allocated to achieve the aims of those in
control of the social structure.

In this institutional framework the aims of the decision-making
authorities are expressed as demands for specific goods, in specific
amounts and for specific consumers. The physical characteristics of
the area and of its people impose limitations on the kinds and quanti-
ties of goods which the economy can produce. To relate these limita-
tions to the demands of the decision-makers requires an economizing
process in which resources are allocated and a valuation schema is
developed within the institutional framework.

In addition to absolute limitations to kinds and amounts of goods
which can be produced, there is imperfect substitutability in the
economic system. In order to produce goods of specific characteristics,
particular kinds of raw materials, fuels and power, capital equipment,
and manpower are required. Likewise, a grouping of goods, a sector of
the economy, must have inputs of specific amounts and types. Substi-
tution of other inputs is limited both by the physical nature of the
sector and by the valuation schema, by which is determined the most
valuable use for every resource.

The entire economic system can be disaggregated into sectors,
each one producing an output and requiring in its production process
certain inputs. The magnitude of the inputs is controlled by the
level of output, the nature of the goods produced, the technical
structure of the sector, and the price system.

A given demand for the output of the various sectors of the economy
is transmitted through the institutional framework, generating outputs
not only of the products desired but also of the products which enter,
directly or indirectly, into the production of the desired goods and
services. Thus the electric power sector buys coal, equipment, and
manpower. The steel sector buys manpower, equipment, iron ore and
other raw materials, electric power, and coal. All sectors of the
economy buy and sell among themselves in order to facilitate the
production of the outputs which are demanded.

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Each purchase and sale constitutes a transaction. Each transaction is made necessary by the structure of the economy and the manner in which resources are allocated. The magnitude of the transactions will depend upon the structure, the price system, and the demand schema. Many of the transactions are a transfer of resources from one producing sector to another. Electric power buys coal in order to convert it into electricity which is sold in turn to the aluminum sector; steel buys ore in order to make sheets and bars. On the other hand, some transactions are a transfer of goods from the producer to some final consumer. When a household buys electric power, it represents final consumption: that is, the electric power is not used in the production of other goods. The defense sector buying sheets and bars in order to make tanks and guns, which are final products and are not used in further production, also represents final consumption.

The transactions among various sectors of the economy constitute a reflection of the activities of the economy for any given period. When something is produced, the activity is indicated by the types and amounts of the transactions. A complete knowledge of the transactions of an economy thus provides an indication of the operation of the economic system.

II. The Intersectoral Framework.

Many forms of description and analysis exist for the study of an economic system. Among the general-purpose techniques, national income accounting and intersectoral accounting have been the most rewarding. A study of national accounts provides an aggregative view of the economy in terms of gross national product and its end uses, such as consumption and investment; its origin in terms of wages and other factor payments; its industrial origin; and the interrelationships among all these aggregates.* National accounts omit intersectoral transactions and measure only the income generated in production and the final consumption of output. Intersectoral accounting contains all the information which is in a set of national accounts and, in addition, gives in detail the interrelationships among the sectors of the economy in the form of intersectoral transactions.**

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* An example of this type of analysis is Construction of Soviet Gross National Product Accounts for 1950-55, CIA/RR 55, 19 Jan 55, S.
** This approach is described in The Role of Interindustry Studies in Economic Intelligence, CIA/RR RA, ORR Project 13.4, 29 Jan 54, C.

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The systematic study of the interrelationships within the economy was begun in the early 1930's in the US by Professor Wassily Leontief of Harvard University. He called the technique input-output analysis. In the US Government, it has come to be called interindustry or intersectoral analysis. A great deal of theoretical work, empirical research, and analysis of structural interdependence has been done in the past 20 years in the US and also in other countries.*

The starting point of intersectoral accounting is a description, of each sector of the economy in the form of a balance equation where X_i is the total output of the ith, or typical, sector and x_{ij} is the amount of the output of this sector allocated to sector j:

$$1. \quad X_i = x_{i1} + x_{i2} + x_{i3} + x_{i4} + x_{i5} + \ldots + x_{in}$$

This is simply a distribution pattern for the output of sector X_i. It says that so much of X_i was allocated to sector 1, so much to sector 2, so much to sectors 3, 4, 5, and so on to sector n.

The same type of balance equation can be set up for every sector of the economy. A complete set of balance equations thus describes the entire economy. When numbers are substituted for the symbols above and put in tabular form, the result is called a structural or intersectoral transactions table, which shows the disposition of all of the output of all of the sectors of the economy for a given time period. The structural table for the USSR is presented in Figure 1.**

One feature of the balance equations and the table which results from them is the dual nature of every entry in the table or term in the equations. The balance equation shows the distribution of output to all other sectors. Every table entry is at once a sale and a purchase, or a revenue and a cost. That is, the construction of a complete set of balance equations to describe the allocations of the output of the sectors of the economy generates a second set of equations which describes the cost of each sector in the economy.

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* See Allen, Robert Loring, and Riley, Vera, A Comprehensive Bibliography of Interindustry Research, BRS-2, vol II, parts 1 and 2, Operations Research Office, Johns Hopkins University /spring 1955/. U. This is an annotated bibliography of the field along with a discussion of the techniques, research, and literature of interindustry economics.
** Following p. 36.

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Hence the two sets of balance equations or the table which is derived from them may be regarded as a double entry accounting system in which each row describes the allocations of resources and each column represents the breakdown of costs for any given sector.

Each term in the balance equation, or each cell in the table, is called a transaction. Each transaction is simultaneously an allocation (a part of the output along the row) and an input (a part of the costs of the sector in the column). The nature of the transaction depends upon the type of schema which is established and the kind of classification system which is adopted. The classification system will depend upon the purpose of the study and upon the data available. In addition, it is possible to differentiate the transaction in other ways. Thus a distinction between current account and capital account transactions and regional differences among transactions may be established.

In general, intersectoral analysis has dealt with only current transactions for each sector, and all capital transactions have been subsumed into one sector. All transactions which are for the purpose of capital formation have been segregated so that the funds accumulated for capital formation appear as "savings" (explicitly or implicitly) in one sector for the entire table. Similarly, all capital purchases are represented by a single column.

There are other specific kinds of transactions which are segregated generally in the intersectoral analysis. For instance, the labor account is handled in a single row as a cost charged to each sector. Household consumption is listed in a single column. In addition, government expenditures including defense expenditures (columns) and government receipts (row) are listed as separate parts of the economy, as are many of the services which are performed in the economy.

These special segments of the economy are grouped together under the heading of final demand, by which is meant that capital formation, household consumption, governments, exports, services, and so on, are final consumers. The allocations which this special sector receives from other sectors are treated as if they were not used in the production of goods and services which are in turn used in the economy.

The final demand sectors are regarded as standing outside the internal structure of the economy, consuming final production. Because they are defined as final consumers, rather than processors

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in the economy, the balance equation stated earlier is modified to take account of them. The recasting of the balance equation renders them as follows:

$$2. \quad X_i = x_{i1} + x_{i2} + x_{i3} + x_{i4} + \cdots + x_{in} + x_{ia}$$

In this equation the x_{ia} represents the final demand sectors.

Since certain sectors have been excluded from the internal structure of the economy on the demand side, it is likewise necessary to exclude these sectors on the cost side. Hence the costs which correspond to the final demands are treated as exogenous costs.

In this manner, the transactions of an economy may be segregated into four groups. First, and most numerous, are the transactions among producing sectors; second, the producing sector-final demand transactions; third, the producing sector-exogenous cost transactions; and fourth, the exogenous cost-final demand transactions. These groups are identified separately in Figure 1.*

The division of the economy proceeds from an assumption that, for analytical purposes, the transactions of an economy may be classified as those which are structurally related (that is, endogenous) and those which are nonstructurally related (that is, autonomous). The first are characterized by the purchases (sales) of processing sectors from (to) other processing sectors, which are related to the output of the purchasing sector.

Autonomous transactions -- that is, sales to final demand and payments to exogenous costs -- are those which are subject to forces outside the immediate structure of the economy. For example, changes in government tax and expenditure policy will influence directly final demand purchases and exogenous costs. These autonomous transactions, or sectors, are, in effect, parameters of the economy. (The term param-eter is used in this case to refer to those elements of the economy to which arbitrary values may be assigned.)

The type of intersectoral accounting system which has been set up in the preceding paragraphs is called a static open-end system. The type of analysis which can be performed with such a system is referred to as the analysis of parametric change. It is the purpose of analysis with an open intersectoral system to trace through the economy the

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* Following p. 36.

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consequences corresponding to a given set of parametric values. Changes in the allocation to final demand may be selected as an example of such analysis.*

The interdependence of modern economies, as depicted in intersectoral accounts, is such that any change in final demand initiates a complicated round of indirect effects. Intersectoral analysis is oriented toward determining quantitatively the magnitude of the indirect effects of such a change on the output of all sectors.

An increase of 10 million rubles in final demand for the output of the aluminum rolling and drawing sector, for instance, induces an increase in the output of that sector. This in turn results in an increased demand for all inputs feeding into that sector. Aside from labor, taxes, profits, services, and other exogenous costs, these inputs are (according to Figure 1) logging, lumber, wood, and paper; chemicals; petroleum products; coal; coke and products; blast furnaces; iron and steel foundries and forgings; aluminum refining; nonferrous metallic refining; fabricated metal products; electric power; rail, road, and inland water transport; and communications.

Since the demand for aluminum is up, these supplying sectors must expand their operations and their output. The expanded output of these sectors means that the inputs into them must also increase. In turn, the sectors supplying inputs to the sectors which supply inputs to the aluminum sector must expand. Again, the sectors producing inputs for the second-round suppliers must expand and demand more inputs. This process goes on in an unending stream of transactions. The transactions gradually dwindle, however, and become so small as to be insignificant. Nonetheless, the reciprocal and indirect effects are a substantial demand upon the economy, not immediately apparent when only considering the direct effects. For example, in the instance of aluminum rolling and drawing, the total indirect effects of a 10-million-ruble final demand purchase amount to about 5 million rubles, so that the indirect effects are half as large as the direct effects.** The process outlined above is referred to as iteration.

It is to be noted that in order to determine the extent of the indirect effects, it is necessary to make some sort of an assumption

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* See p. 30 ff., below, for a description of other parameters of interest in economic intelligence and an explanation of how changes in them may be used in analysis.
** See The Role of Interindustry Studies in Economic Intelligence, p. 5, C.

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about the relationship between the input into a sector and its output. In order to see just how the input per unit output enters, the balance equation given earlier can be stated again, not in terms of transactions, but rather in terms of the output of the sector times the input per unit output of this sector. This is truly just rewriting the equation, since the product of the input per unit output and the output is the transaction given in the first equation. The balance equation is now written as follows:

3. $X_i - (a_{i1}X_1 + a_{i2}X_2 + \ldots + a_{in}X_n) - x_{ia} = 0$

In this equation the signs have been changed so that the total output of X_i is absorbed by other sectors in the system and by the final demand sectors. This is a means of accounting for the total output of sector i.*

Referring again to the structural table, it can be seen that the a_{ij}'s can be derived from Figure 1 simply by dividing every number in the first column by the total of the first column. This operation has been performed in Figure 2.**

There are two ways of looking at these numbers, or input-output coefficients. First, they are descriptive of the technical structure of the economy. They say that if one wants "P" percent more output from a given sector, it is necessary to have "P" percent times each one of these coefficients to support the higher level of output. In another way, a column of the coefficients is a detailed percentage allocation of the costs of that sector.

Many factors influence the input-output coefficient. One is obviously the technology itself. If technology changes, then the coefficients will change. Changes in the relative prices of inputs and outputs, changes in the amount of capital in the sector, changes in the scale of output of a sector, and changes in the product mix of the sector all will change the coefficient. Frequently these changes are quite small, and in those instances where the change in coefficient is large, it is possible to make special allowance for that fact.

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* The symbol a_{i1} represents the value of the output of sector i necessary to produce one unit of the value of sector 1. The symbol X_1 represents the value of output of sector 1. The combined symbol $a_{i1}X_1$ represents the total value of inputs into sector 1 from sector i and is equivalent to the symbol x_{i1} in equations 1 and 2, above.
** Following p. 36.

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Analysis generally proceeds on the assumption that the input per unit output is fixed. This need not be the case. If sufficient data are available, it is possible to take variable coefficients into account. The fact is, however, that paucity of data usually prevents anything except the simplest assumption -- that the coefficients are fixed.

The process of iteration indicated above is the method by which the indirect effects of any change in final demand are traced through the economy. This is a long and expensive process. It is possible to work out a simpler solution so that all of the interrelationships are taken into account simultaneously. This involves the numerical solution to the set of balance equations of the type of equation 3, above. With such a solution, it is not necessary to iterate each time one wishes to determine indirect effects; rather, it is possible simply to refer to a table and read off the results.*

It must be remembered that the technique is not in itself a predictive device. The predictive element enters through the parametric changes which are imposed on the economy. It is a vehicle for completing conditional statements of the form "If A, then B." The "A" is a prediction about a change in final demand or a hypothesis to be tested. "Then" is the analytical framework by which it is possible to derive conclusion "B," which is also a prediction of the implications of a hypothesis. "B" may be a schedule of sector outputs, to be compared with previous outputs determined before "A" was specified, to be compared against an estimated capacity, or to be used in further analysis. Intersectoral techniques simply carry the prediction along or reveal the implications of a hypothesis and render them in a way which would not otherwise be obvious. Since the analysis embodies information about the economy, it influences the derived conclusion "B." To the extent that data are unreliable, this basic unreliability remains in the derived conclusion. In any event, however, if "A" is an inaccurate forecast or uninformed hypothesis, then "B" will be helpful only if it reveals that "A" is not appropriate.

III. Construction of the Soviet Structural Table.

The problems of conducting an intersectoral flow table may be summed into two headings: (1) the classification of the economy into meaningful

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* For such a table, see The Role of Interindustry Studies in Economic Intelligence, Table 3, p. 25, C.

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sectors and (2) the quantification of the resulting table. The classi-
fication system employed in the current study stems from two primary
considerations. The first of these is the detail of the model. Too
detailed a table would have seriously overtaxed the available facilities
in terms of detailed information about the structure of the Soviet
economy. Too small a table, while reducing the burden on data sources,
would have the disadvantage of concealing more than it revealed.

The second consideration was to classify the Soviet economy in such
a way as to permit the maximum exploitation of existing intelligence
estimates and, where necessary, US analogy. The usual procedure within
the intelligence community has been to make estimates on a product basis.
Thus the largest share of available data was in this form. The classi-
fication system as it evolved represents a sectoring of the Soviet
economy by product activity rather than by processing activity or industry.

The final classification system adopted divided the Soviet economy
into 61 producing sectors and 5 nonproducing sectors. (In the case of
final demand there are seven sectors.) The scale of the quantification
problem is indicated by the 4,488 cells in the table. The procedure
employed was, wherever possible, to piece together the table, using
intelligence data as basic controlling information and analogous data
to fill the gaps.

In order to obtain a balanced table, it was necessary to express
table values in terms of a numeraire. For this reason, the values
employed in the table are expressed in terms of 1950 rubles.* This
procedure has the advantage of using, where data exist, Soviet relative
prices and thus appropriately weighting the outputs of the various
sectors. At the same time, it necessitated, where data were not available,
the construction of fictitious prices. Every effort was made to construct
these fictitious prices in such a manner as to approximate the relative
weights extant in the Soviet economy.

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* The use of 1951 prices would be more appropriate in the study of the
Soviet economy in 1951, but the use of 1950 prices (for which there are
better data) is believed to have produced practically the same results.

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The methodology is described below under the following headings:

a. <u>Estimates of the value of total supply</u> for each sector.
b. <u>Estimates of exogenous costs</u>, that part of costs not represented by purchases from other producing sectors of the economy (for example, wages, taxes, and profits).
c. <u>Estimates of endogenous costs</u>, the purchases from other producing sectors, by sector, for the sector in question.
d. <u>Estimates of final demand</u>, the distribution of each sector's output among the nonproducing sectors (for example, households, government, and investment).
e. <u>Adjustments</u>, the balancing and reconciliation of the final structural table.

A. <u>Estimates of the Value of Total Supply.</u>

The concept of total supply employed in the present report is the sum of net domestic output and imports. This varies from the conventional total supply concept in that it excludes intrasectoral consumption. These transactions were omitted in order to reduce the impact of differences in organizational structure between the US and the USSR, which would be felt whenever applying US analogy.

The estimates of the net output of a given producing sector proceeded from the accumulation of available data regarding the output of products included in the sector. Where these data included all the products of a given sector, the process was complete. Where available intelligence provided information for only a portion of the products of a given sector, it was necessary to inflate the estimate. If possible, this inflation was performed on the basis of Soviet data, supplemental intelligence, the 1941 Plan, or other information. In the absence of any other data, final resort was to US analogy. Where the latter was used for inflation, the effect was to force the Soviet sector product mix to approximate the product mix of a corresponding US sector.

Transactions within the table are valued f.o.b. producer, including the wholesale trade margin. In the case of consumer goods, however, the retail trade margin has been deducted and a retail trade sector has been established. Ideally, transactions between sectors would be recorded in terms of producer's value. The lack of sufficient detailed information, however, prevents the establishment of a

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separate wholesaling sector, forcing the integration of the wholesaling function with the producing function. The general procedure of estimating the value of a sector's output is indicated in the following tabulation for coal:

Product	Net Domestic Output (Thousand Metric Tons)	Price f.o.b. Producer (Rubles per Metric Ton)	Total Value (Million Rubles)
Anthracite	39,500	90.3	3,567
Bituminous coal	165,500	88.4	14,630
Lignite	77,400	54.2	4,195
Peat	41,600	49.7	2,067
Imports (including customs)			1,525
Total			25,984

B. Estimates of Exogenous Costs.

An important distinction in intersectoral analysis is between those flows which are structurally interrelated (endogenous) and those which are nonstructurally related (exogenous) to the output of other industries within the classification employed. The exogenous (or autonomous) sector in intersectoral analysis is similar in nature to the gross national product sector accounts. That is, final demand is similar in nature and may under some conditions be equal to gross national product computed on the basis of final product. In the same fashion, exogenous costs are similar to gross national product computed on the basis of charges against final demand -- that is, from the income side of the economy.

The distinction between structurally related and exogenous (autonomous) costs shows clearly in the theoretical representation of the intersectoral system as a set of n linear equations of the form

$$X_j - a_{1j}X_j - a_{2j}X_j - \ldots - a_{nj}X_j = x_{ej}$$

where X_j is the total cost (value of the output of the jth sector, the a_{ij} terms represent the linear input coefficients for the endogenous (structurally related) sectors, and X_{ej} those costs which are not

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assumed to be structurally related. It may be seen from the above that the greater the costs assumed to be structurally related to output, the smaller will be x_{ej}. If all costs were assumed to be structurally related, then x_{ej} would be zero.

In the light of the above, a survey of those costs, assumed in the present report to be exogenous, is in order. There are five major categories, including household income, government receipts, imports, services, and trade. The selection of these costs as exogenous rests upon two considerations. First, the structural relationship between these costs and the output of a consuming sector is frequently not readily apparent, nor may it be as appropriate to represent these relationships as linear. A brief glance at the government row will indicate the nature of the relationships between a sector's payment to the government and the output of that sector. Policy decisions which change the level of taxes and/or the character of taxes will have a direct impact upon the share of total costs going to government. In the USSR, for example, a shift from the turnover tax to a personal income tax would have the effect of reducing sharply that portion of the costs of, say, the consumer goods sector going to the government, independent of the output of those sectors. Changes in the nature of these exogenous costs are frequently the result of policy decisions of this type, and such changes are outside the direct purview of the model. They are, in effect, parametric changes.

The second consideration finds its basis in the lack of data about the economic structure of the USSR. The absence of information regarding the structural relationships among sectors in the Soviet economy forces the use of US analogy. This procedure admittedly introduces error, but to use US analogy to estimate the share of total costs going to these nonprocessing sectors would increase that error substantially.

For these reasons, it was felt to be appropriate to calculate the total of these exogenous costs and distribute them among the various sectors independent of the estimates of the particular endogenous costs for a given sector. The data from which a great many of these estimates were derived were developed in research on Soviet national accounts and the Soviet budget. The items included in these sectors and the method whereby these costs were allocated among the various sectors are outlined below.

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1. Household Income.

Household income (in the present report) includes the following:

	Billion Rubles
Nonagricultural income	387.6
Agricultural money income	79.7
Agricultural income in kind	79.7
Wages and income in kind of forced labor	52.5
Transfer payments	49.4
Total	648.9

Nonagricultural income was distributed among the sectors in the following manner. Estimates of Soviet employment by industry group (for example, machine building, ferrous metallurgy, and construction) for 1951 were weighted by wages derived from the 1941 Plan. The resulting index permitted the calculation of wage estimates for the industry groups. This was further disaggregated among the various sectors included within the industry groups.

Agricultural money income was distributed among the sectors as follows: the share attributed to sovkhoz employees was largely allocated to those sectors producing industrial crops (such as oil-bearing crops), Machine Tractor Station (MTS) wages were allocated to the agricultural services sector, and kolkhoz money payments were distributed among the agricultural producing sectors on the basis of output. Income in kind* was distributed on the basis of the sector distribution of the crops produced.

Forced labor income was derived from estimates of the numbers involved, valued by a "minimum scale of living" budget. This total was distributed among the sectors in a manner which reflects opinions with regard to the industrial distribution of this resource. The largest shares were attributed to mining, logging, and construction, with lesser amounts distributed among the agricultural and manufacturing sectors.

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* The present estimate of income in kind differs from that used in constructing gross national product accounts because different valuation procedures were used.

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2. Government Receipts.

Estimates of government receipts include the following:

	Billion Rubles
Tax receipts	
Turnover tax	247.8
Personal taxes	44.3
Income taxes	7.6
Social insurance taxes	21.4
Miscellaneous revenues	45.9
Nontax receipts:	
Enterprise expenditures for training and education	8.7
Gross enterprise profits	114.6
Total	490.3

Government receipts which have been omitted include MTS revenues (5.2 billion rubles), reparations (estimated to be approximately 6 billion rubles), and sale of bonds (37.0 billion rubles). MTS revenues have been excluded, and correspondingly all government expenditures for MTS operations, except the estimated subsidy, in order to treat the agricultural services sector in a manner comparable with the other sectors and to disassociate it from the government. Reparations and the sale of bonds have been excluded because they represent capital transfers. The sale of bonds is treated as savings in the economy.

Where information was available, government tax receipts were distributed among the various sectors in conformity with Soviet tax procedure. Thus the turnover tax was assumed to be paid by those sectors producing the commodity taxed. The general procedure was to calculate the tax payment by commodity, subject to the control imposed by the independent estimate of the total turnover tax payment.

The income tax is levied on cooperative and kolkhoz actvities and was distributed largely among the agricultural sectors in the same manner as kolkhoz money payments. Social insurance taxes

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(to borrow a term from US procedure) and enterprise expenditures for
training and education were distributed on the basis of wage payments.
Miscellaneous revenues include import duties and a large number of
All-Union and republic taxes. Where information was available, these
were distributed on the basis of Soviet data. Where it was not
available, these taxes were distributed on the basis of sector output.

The rationale for the inclusion of all profits in the
government sector is inherent in the nature of the Soviet decision-
making machinery. To include profits of enterprises in the household
sector, as is done for the US, or to place them in a separate sector
would imply a degree of private control over their disposition which
does not occur in the USSR. Total profits allocated to the govern-
ment include:

	Billion Rubles
Profits paid to state budget	47.8
Retained profits	33.0
Capital consumption allowance	29.8
Purchase of bonds by enterprises	4.0
Total	114.6

Profits were distributed among the sectors in the
following manner. Estimates of the planned profits, by broad Soviet
industry categories, were available for several postwar years. Sectors
were grouped to correspond, as closely as possible, to these cate-
gories. Profits were then distributed among the sectors on the basis
of output. Similar information (in slightly more detailed form) was
available for investment. This was employed in a similar manner to
distribute capital consumption estimates among the sectors.

3. Imports.

Estimates of Soviet imports from the West are available
in the form of detailed commodity breakdowns. Additional information
in lesser detail is available for Soviet imports from the European
Satellites and China. The valuation of these commodity estimates is
subject to substantial limitation. Two sets of data are available:
Soviet official announcements of the ruble value of total imports and
calculations of the value of goods shipped to the USSR from the Western

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nations. The Soviet official announcements apparently are presented in terms of a foreign trade ruble, which has a value substantially greater than the domestic ruble. Similarly, estimates of the value of shipments from the Western nations are converted to rubles at official rates, which once again understate the value of imports relative to domestic production. Where there were no estimates of value, as was generally the case for Soviet trade with the European Satellites and China, it was necessary to construct fictitious prices. The control for this procedure was the announced value of Soviet imports. Imports generally were allocated to the competing domestic sectors. Where no competing domestic sector existed, they were channeled to the consuming sector.

4. Services.

The services sector represented in this report consists largely of educational, health, and personal services, including housing. Purchases of the endogenous sectors directly from services are limited by the structure of the Soviet economy and are largely estimated on the basis of modified US analogy. As may be observed from the table, the largest purchasers from this sector are households and the government.

5. Trade.

Trade is an artificial sector, constructed to perform the function of retail distribution of commodities to the final consumers. It is a direct result of the valuation procedure employed -- f.o.b. producer. By its nature the only sale of retail trade is to households. The total of this sector was determined from Soviet announcements of the cost of trade.

C. Estimates of Endogenous Costs.

The nature and method of allocating exogenous or nonstructurally related costs are outlined above. Attention is now turned to the structurally related costs -- those costs which vary as a function of changes in the level of output of the producing sector. These costs, for the present report, are presumed to vary in direct proportion to output. It must be noted that this assumption is dictated by the available data rather than by the method of analysis.

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If each of the 61 processing sectors were to purchase from every other sector, there would of necessity be 3,660 entries in the intersectoral part of the table. In many instances the estimate is zero, but, even so, a formidable statistical problem remains in making the other entries. Three methods are available by which estimates of the purchases of a given sector from the other producing sectors may be derived. The first would be to prepare a detailed distribution of the output of the various sectors. The second would be to construct a detailed input pattern for each sector of the Soviet economy. The third method would be to use such US data as are available to approximate Soviet input or output patterns. Because existing intelligence and collateral information are not adequate to permit the derivation of detailed input, or output, patterns for these sectors of the Soviet economy, it is necessary to resort to US data, modifying the US experience where information about the Soviet economy is available.

US input (or output) patterns are available from the series of interindustry studies which have been conducted for the US economy. The use of these data, however, is subject to severe limitations, some of which are indicated below. One is the problem of industry technology. The direct use of US interindustry data to approximate Soviet input patterns would imply the assumption of identical industrial technologies and structures. A second limitation is that to use unadjusted US interindustry data would force upon the Soviet sectors the US industry's product mix. That is, the distribution of commodity outputs within a Soviet sector would have to be identical with the distribution within the corresponding US sector. A third limitation is that the use of US data, unadjusted, would force upon the Soviet economy the US pattern of relative prices.

In order to reduce the impact of the first two limitations, US input (or output) patterns should be derived on the basis of the productive process employed rather than by using the patterns of inputs required for a given industry to produce a product -- that is, by process analysis rather than by industry analysis. Sufficient data, however, are not now available to permit the construction of a processing model of adequate detail for the US economy. The input coefficient (input pattern) study employed in this report represents a point midway between industry analysis and process analysis. The so-called primary product study is an attempt to estimate for the US the input patterns required to produce a given list of commodities or groups of closely related commodities.

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The primary product study was employed in the following manner. The commodity input patterns were aggregated into sectors corresponding to those for the USSR. Endogenous costs were derived as a residual by subtracting the exogenous costs from total cost. Endogenous costs were then distributed among the sectors on the basis of the input patterns derived from the primary product study.

D. Estimates of Final Demand.

Endogenous costs represent the distribution among the various producing sectors of the cost of producing a given output. That is, viewed as columns, they represent expenditures by the sector being analyzed. Conversely, endogenous costs also represent the distribution of output among the various sectors. Thus each row represents the distribution of the output of a given sector among the other sectors. When the processing sectors do not consume the total product of a sector, as is the case for most sectors, the residual is consumed by the final demand sector. This may be formalized as follows: the commodity flows of an economy can be represented by a series of n equations,

$$X_i - a_{12}X_2 - a_{13}X_3 - \ldots - a_{in}X_n = x_{ia}$$

where X_i is the total value of the output of sector i, each $a_{ij}X_j$ represents the purchase by sector j from sector i, and x_{ia} represents the purchase by the autonomous, or final demand, sector from sector i.

The formal relation of final demand to exogenous costs may be seen by comparing this set of equations with the one presented earlier. Thus it may be seen that total exogenous costs equal total final demand:

$$\sum_{i=1}^{n} x_{ia} = \sum_{i=1}^{n} x_{ei}$$

It may be noted from the data presented in Figure 1 that for particular categories of the autonomous sectors the column and row sums are not equal. Indeed, the investment column, which sums to 240 billion rubles, has no row counterpart. In total, the receipts of the autonomous sectors (exogenous costs) equal the expenditures of the autonomous sectors (final demand), as is the case for all other sectors of the economy. For expositional purposes, however, the categories used to describe final demand are slightly different from those used to describe exogenous cost. This relationship is presented below:

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Exogenous Costs	Billion Rubles	Final Demand	Billion Rubles
Household income	649.0	Household expenditures	609.0
Government receipts	490.3	Government administrative expenditures	211.2
		Defense expenditures	90.4
Imports	13.5	Exports	10.0
Services	152.0	Service expenditures	143.9
Trade	22.9	Trade expenditures	22.9
		Investment	240.3
Total	1,327.7	Total	1,327.7

Estimates of the expenditures of each final demand category proceed from data developed in analyzing Soviet national accounts, with modifications occasioned by the nature of the current study. Investment, the one column without a row counterpart, has the following relationship with the other categories:

"Savings"	Billion Rubles	Investment	Billion Rubles
Household savings	40.0		
Government savings	188.7		
Service savings	8.1	Gross domestic investment	236.8
Net import balance	3.5	Net foreign investment	3.5
Total	240.3	Total	240.3

The purchases of the final demand categories were distributed among the various sectors, where possible, on the basis of information about the Soviet economy -- such as estimates of output patterns, budget studies for Soviet households, the Soviet government budget, and estimates of military force levels and activities. In other cases the nature of the commodity in question indicated the final demand purchaser -- for

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example, agricultural, construction, and building machinery, with the exception of replacement parts, are almost solely investment goods. Finally, where no other approach was available, US analogy was employed.

E. Adjustments.

In order to approximate more closely the structure of the Soviet economy, it was necessary to introduce some changes into the model computed as indicated above. These changes were occasioned by the variance of the model from known features of the Soviet economy. In effect, the model was economically out of balance -- it was allocating improper amounts of some commodities to the various sectors. For example, initially, as a result of the procedures outlined in the preceding sections, more than 50 percent of the total value of the output of petroleum products was being allocated to the agricultural sectors (including fisheries, hunting, and trapping). This result is in sharp contrast with intelligence estimates of the use of petroleum products, which indicate that roughly 25 percent of the total value is allocated to agriculture.

Imbalance in the current report is generated by five primary sources: (1) inconsistencies among the estimates of total output, (2) errors in the calculation and distribution of exogenous costs, (3) technological differences between the US and the USSR, (4) product mix differences between the US and the USSR, and (5) differences in the structure of prices between the US and the USSR.

The process of adjustment was to analyze the model, first row by row and then column by column, using existing knowledge and estimates of Soviet output and cost distributions to introduce corrections. In some cases, when information regarding the Soviet structure was lacking, the nature of the product itself provided, by inspection, the basis for change. The fact that the table is balanced does not mean that inconsistencies do not remain, concealed either in the structural relationships or in the autonomous sector.

IV. Limitations.

Limitations imposed upon the application of a general equilibrium model in the USSR stem primarily from the lack of accurate data expressing the meaningful structural relationships of the Soviet economy. This is at once a classification problem and a data accumulation problem.

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It would be possible, employing an ideal classification system and possessed of adequate data, to construct a nonlinear dynamic model, which would closely approach the reality of the economic system analyzed. Thus it may be seen that the limitations of the current model of the Soviet economy are a direct result of the classification system employed and the nature of the data enclosed within this framework.

The sectoral structure employed in the current report is, as stated before, a compromise between the limits of available information and the need to establish a system of sectors which is revealing for analytical purposes. Within this classification structure the data employed are made up of direct estimates derived from Soviet data or are estimates derived from US analogy. The points at which error may be introduced into the model are listed below: (1) estimates of physical output; (2) estimates of prices; (3) estimates of exogenous costs, both in total and for the sectors; and (4) estimates of the structural relationships between sectors. Unfortunately, the nature of the techniques employed prevents a definitive statement of the extent to which errors of estimate will influence the final results. That is, errors may be cumulative or they may be offsetting or cancelling. In general, however, it may be assumed for operational purposes that the final results will be no more reliable than the initial estimates, and may, in fact, be considerably less reliable. It is apparent, then, that the model itself is only a first approximation to the structure of the Soviet economy and as such should be employed with circumspection and that any conclusions drawn from its applications are subject to broad qualification.

V. Applications to Economic Intelligence.

Soviet intersectoral information and the analysis of the Soviet economy using intersectoral techniques apply directly to the solution of many economic intelligence problems. Whenever a question arises concerning the operation and structure of the economy or the impact on the economy of any event, hypothetical or real, the structural table is useful.

There are three general classes of uses of the intersectoral study in economic intelligence. The first use is the direct application of intersectoral information concerning a sector of the economy to the analysis of that sector and its relations with the rest of the economy. The second use is an organizational use and revolves about the fact that a double entry accounting system for the economy makes the organization, handling, use, and presentation of data more prompt and

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systematic and less subject to error. Analysis is the third use of intersectoral study and is the one toward which all research efforts are eventually directed. Analysis with intersectoral techniques makes it possible to examine a wide range of "impact" problems and to take into account explicitly all the complicated interrelationships in the economic system.

A. Direct Use of Data.

The structural table serves highly significant uses in presenting information about each sector of the economy. This information consists of (1) the use pattern and (2) the input, or cost, pattern. In other words, the table shows the allocation of the total output of the sector among all the various consuming sectors or, alternatively, the purchases of the various consuming sectors from the sector in question. In addition, the table shows the allocation of the various producing (supplying) sectors to the sector in question or, alternatively, the purchases of that sector from all the producing sectors. Needless to say, such a breakdown of costs and output is an essential ingredient in the analysis of any sector of the economy and is basic to an understanding of the place of the sector in the economy as a whole as well as of its own characteristics and capabilities.

For instance, the structural table shows what purchases the petroleum sector makes from other sectors, as shown in Table 1, in which these purchases are expressed as percentages of the petroleum sector's total costs and as percentages of the supplying sector's output.

Table 1

Input Pattern of the Petroleum Products Sector in the USSR
1951

		Percent
Supplying Sector	Proportion of Total Costs of the Petroleum Products Sector	Proportion of Total Output of Supplying Sectors
Logging, lumber, wood, and paper products	0.28	0.13
Industrial inorganic chemicals	0.06	0.13

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Table 1

Input Pattern of the Petroleum Products Sector in the USSR
1951
(Continued)

Percent

Supplying Sector	Proportion of Total Costs of the Petroleum Products Sector	Proportion of Total Output of Supplying Sectors
Chemicals, n.e.c.	0.29	0.14
Vegetable and animal oils	0.06	0.05
Crude petroleum	14.60	89.36
Coal	0.02	0.01
Coke and products	0.03	0.04
Nonmetallic mineral mining, n.e.c.	0.03	0.09
Nonmetallic mineral manufacturing, n.e.c.	0.06	0.12
Fabricated metal products	0.20	0.08
Industrial equipment, n.e.c.	0.06	0.06
Electric power	3.00	3.21
Rail transport	0.16	0.08
Road transport	0.02	0.01
Inland water transport	0.25	1.40
Communications	0.03	0.07
Households	15.97	0.47
Government	58.15	2.28
Imports	6.65	9.51
Services	0.08	0.01
Total cost	100.00	0.74

From Table 1, one can readily see the importance, in value terms,
of the output of the various sectors to the petroleum sector. This is
demonstrated not only as proportions of the total costs but also in terms

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of the proportion of the total output of these other sectors being absorbed by the petroleum sector. This information is vital to any analysis of the impact of a change in the output of the petroleum sector or the impact on the petroleum sector of a change in some of its supplying sectors.

In addition to the input pattern, one can, through the structural table, examine the distribution pattern of the petroleum sector. Table 2 presents the distribution of the output of the petroleum sector as a percentage of total petroleum output and also in terms of the percentage of total costs of the consuming sectors represented by petroleum purchases.

Table 2

Distribution Pattern of the Petroleum Products Sector in the USSR
1951

Percent

Consuming Sector	Proportion of Total Output of the Petroleum Products Sector	Proportion of Total Costs of Consuming Sectors
Animal, poultry, and dairy products	0.18	0.08
Food grains and feed crops	0.07	0.03
Cotton	0.34	0.31
Vegetables	0.32	0.07
Oil-bearing crops	0.38	0.32
Agricultural services	21.63	15.33
Fisheries, hunting, and trapping	4.33	3.38
Agriculture, n.e.c.	0.39	0.48
Meat	0.18	0.05
Grain, mill, and bakery products	0.46	0.08
Canned and other products	0.81	0.13
Textiles	1.68	0.49
Apparel and house furnishings	0.16	0.08
Logging, lumber, wood, and paper products	0.76	0.37

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Table 2

Distribution Pattern of the Petroleum Products Sector in the USSR
1951
(Continued)

Percent

Consuming Sector	Proportion of Total Output of the Petroleum Products Sector	Proportion of Total Costs of Consuming Sectors
Industrial inorganic chemicals	1.37	3.08
Rubber	1.94	6.45
Chemicals, n.e.c.	5.44	2.58
Vegetable and animal oils	0.09	0.08
Crude petroleum	0.61	3.75
Coal	0.35	0.26
Coke and products	0.16	0.26
Rubber products	0.76	0.76
Leather and leather products	0.31	0.11
Cement and concrete products	0.16	1.05
Structural clay products	0.52	9.17
Nonmetallic mineral mining, n.e.c.	1.92	6.79
Nonmetallic mineral manufacturing, n.e.c.	1.14	2.32
Iron ore mining	0.21	1.80
Blast furnaces	0.34	0.57
Steel rolling and drawing	3.17	2.83
Iron and steel foundries and forgings	0.75	1.95
Nonferrous metallic mining	1.36	3.57
Copper refining	0.10	0.92
Copper rolling and drawing	0.04	0.31
Aluminum refining	0.36	2.80
Aluminum rolling and drawing	0.08	0.75
Nonferrous metallic refining, n.e.c.	0.64	1.24
Nonferrous metallic fabrication, n.e.c.	0.04	0.41

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Table 2

Distribution Pattern of the Petroleum Products Sector in the USSR
1951
(Continued)

Percent

Consuming Sector	Proportion of Total Output of the Petroleum Products Sector	Proportion of Total Costs of Consuming Sectors
Fabricated metal products	0.43	0.17
Engines and turbines	0.07	0.58
Tractors	0.07	0.21
Agricultural, construction, and mining machinery	0.06	0.24
Machine tools and metal-working machinery	0.12	0.37
Special industrial machinery	0.07	0.20
Industrial equipment, n.e.c.	0.26	0.29
Motors, generators, and transformers	0.05	0.13
Insulated wire and cable	0.01	0.17
Radio and related parts	0.03	0.09
Electrical equipment, n.e.c	0.08	0.24
Automotive equipment	0.14	0.17
Merchant shipbuilding	0.05	0.30
Railroad equipment	0.02	0.17
Industries, n.e.c.	0.15	0.15
Electric power	1.72	1.84
Rail transport	3.11	1.51
Road transport	15.39	11.92
Oceanic transport	0.21	2.69
Inland water transport	4.71	2.59
Air transport	0.63	6.42
Communications	0.01	0.04
Households	5.34	0.17
Government administration	5.68	0.52
Defense	5.44	1.16
Exports	0.62	1.20

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Table 2

Distribution Pattern of the Petroleum Products Sector in the USSR
1951
(Continued)

Percent

Consuming Sector	Proportion of Total Output of the Petro- leum Products Sector	Proportion of Total Costs of Consuming Sectors
Services	0.26	0.04
Trade	0.26	0.22
Investment	1.46	0.12
Gross outlays	100.00	0.74

The above information also provides a basis for the analysis
of the petroleum sector in relation to other sectors. Of considerable
significance is the amount of petroleum going to so-called "weak"
sectors, those where a cutback would be felt in case a reallocation
were necessary, as in the event of war.

Thus the structure of costs and output of the petroleum sector
is of value by itself, as is such information about every sector of
the economy. The structural table highlights such data and makes them
available for direct use in the study of any given sector.

B. Organizational Uses.

Since the structural table is a double entry accounting system,
a cross reference of costs and shipments of each sector and all other
sectors, the approach naturally develops a filing system in which all
of the information about the economy can be conveniently and logically
placed. The Soviet structural table itself is in fact a filing system.
Behind the tabulations lie a much more complicated set of files. These
files encompass all the relevant data on each sector, including price
data, production information in heterogeneous units, technical inter-
relationships, cost, and shipment data, and other such information.

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The Soviet structural table presented here (Figures 1, 2, and 3*) has been balanced and frozen for purposes of this presentation. The real intersectoral file is far from being static. It is a constantly growing, changing compilation of data. It is arranged in such a manner that there are continual accretions to the basic fund of knowledge of the structure of the economy. New data are being added continually. Better information is replacing that which is less reliable. Data from various levels of product aggregation are being inserted to act as controls over disaggregated data and to fill gaps in large aggregates. New research in all sectors of the economy finds its way into the intersectoral file.

The fact that the intersectoral file is continually changing and improving implies that no structural table is final. For a specific purpose, a table can be drawn out of the files, assembled, reconciled, and used. The structural table in this report was drawn up in just this fashion. When the intersectoral file reached the point where it was believed that sufficient information existed to assemble a table, it was drawn out, collated, and organized, and the table was set up. This present table, however, is just one such table. Given an intelligence problem, another table, using all of the data in the file at that time, would be made up. Thus, in performing analysis, the latest information in the intersectoral file is used. At another time, for another purpose, another tabulation would be developed in the same manner, using the latest information in the file at the time. Thus the intersectoral file, a continuing and gradually improving digest of information, stands ready on short notice to support those estimates wherein it is useful with the latest intelligence available.

The filing system implied in the structural approach makes possible another important organizational use. This is to test the reliability of data and check their consistency. When data have been assembled in the file, it is possible to evaluate their reliability by comparing them with other information. Every sale of a product is also a cost to some other sector, and every input is part of a sector's output. Hence the data can be checked and cross-checked. Data which are inconsistent often can be weeded out, and the general level of reliability and refinement can be raised. New information can be compared with existing data, and the relative merits of each can be assessed.

In addition, the structural approach has considerable educational value in providing a simultaneous view of each sector, of its interrelationships with other sectors, and of the economy as a whole.

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* Following p. 36.

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It is all too easy to get lost in the study of individual products to
the relative neglect of their relationships with other products and
the economy. The approach also provides a guide to further research,
not only along structural lines but also in other methods. Gaps in
the data can be spotted readily, and steps can be taken to remedy them.
If price information for a particular group of products, or production
information for some sector, or any other information is needed, the
technique, backed by its organizational and data-handling system, makes
it possible to detect the missing elements. An examination of the files
makes it clear that, because of the weakness of data, some types of
analysis cannot be undertaken but that other kinds of analysis can be
profitably expanded or that other techniques should be exploited.

C. Analytical Uses.

The direct use of intersectoral information and the benefits
to be derived from its organizational system are important and
valuable adjuncts of intersectoral research. The final purpose,
however, is in the analysis of specific problems. There are many
kinds of analytical use, which can be broken down under two headings.
The primary aim of structural analysis is the examination of the impli-
cations of changes in the economy which affect sector outputs or other
characteristics of the economy. This type of analysis is generally
characterized as the analysis of parametric change. A parameter is a
nonstructurally related element of the economic system -- for example,
technology and governmental economic policy decisions. The other
analytical uses can be grouped under the heading of ancillary uses and
assist in verifying and amplifying other kinds of research.

1. Analysis of Parametric Change.

The principal parameters in structural analysis are (a) the
allocation of sector outputs to the final demand sectors (households,
government, defense, exports, trade, and investment), (b) the techno-
logical structure of particular processing sectors, and (c) the output
of specific processing sectors. These three elements are shown for
1951 in the tables. If one wishes to analyze a situation in which any
or all of these elements differ from what they were in 1951, it is
possible to do so rigorously and to determine how the economy must
adjust to the new situation. Analysis proceeds on the basis of
postulating changes in any one of the parameters and then working out
the implications of the postulated change. It is to be noted that

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the postulated change may be real in the sense that the event actually took place in the economy or hypothetical in the sense that the economy may face the necessity of having to cope with the event.

a. Final Demand.

There are innumerable examples of changes in final demand of significance in economic intelligence research. These problems are usually characterized as "impact" problems. One asks the question: What will be the impact on the Soviet economy if the Soviet leaders decide to do this or that? This or that may be a mobilization of the economy, the support of specified military activities in the field, undertaking an atomic energy or guided missile program, fulfilling Plan goals, or expanding consumption or capital goods production.

Intersectoral analysis is particularly valuable for such evaluations, since this type of analysis is explicitly designed to bring out not only the direct but also the indirect requirements of the postulated program, be it war or consumer welfare. For instance, a direct requirement for aluminum products by the military services in war might be within the economy's capabilities. But in order to satisfy such an increase in demand, an expansion of the output of the aluminum sector must be forthcoming, which in turn generates demands upon the economy. These may be referred to as indirect demands. Perhaps these indirect demands are half of the direct demands, and hence, in order to support the program, one and one-half times the direct demands must be mustered. The levy of a complete schedule of mobilization of war requirements may be consistent with the structure and resources of the economy, but the indirect requirements may make the difference between the ability of the economy to meet the new demands and the necessity of reallocating the input among the sectors of the economy.

The method of analysis is simple. It is necessary to estimate sector by sector the direct demands of the postulated program. These are then substituted for the program which exists in the present table (keeping in mind that the new program must also be expressed in 1950 rubles). The implications of the new final demands may be traced by the iterative process, in which the indirect demands cumulate by successive multiplications of input-output coefficients. The required output sector by sector then may be compared with independent estimates of sector outputs. Such a comparison will indicate those sectors where problems will arise, should such a program be undertaken, and the extent to which the USSR will have to amend its existing program to meet these problems, if, indeed, they can be met.

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It is always possible, however, to increase the output of a sector by building plants and facilities, employing more labor and current inputs. Thus another round of iteration is necessary after setting up that investment program which would result in providing the USSR with the facilities to produce the larger outputs. The investment program itself, however, represents a drain upon the output of the economy and requires expanded outputs not only directly, in order to support the sectors from which the capital building program makes immediate demands, but also indirectly for the immediate support of those sectors supplying the capital building program. As a result of this analysis, one can determine the capability of the USSR to support the investment program necessary to implement the original war or mobilization program. The analysis can be carried further and can become as refined as data and time permit.

Another type of analysis would be to postulate the demands of two weapons systems of equal on-target effectiveness. One might be a combination of nuclear weapons and aircraft; the other, a combination of nuclear weapons and guided missiles. Assuming equal effectiveness, the demands of these programs would have to be computed, the direct and indirect requirements determined, and the investment program for each established and likewise calculated. In this fashion, one can determine the total costs to the economy of the two programs and, further, indicate just what parts of the economy are affected by each and to what extent.

Another interesting avenue of analysis is to study the ability of the USSR to implement its announced plans. Given a program of the expansion of household consumption, the implications, direct and indirect, for all sectors of the economy can be examined as well as the investment program needed to support such a program. For instance, the expanded consumer goods program in 1953 involved not only the direct demands involved in supplying the greater quantities of output of many sectors but also indirect demands occasioned by the increased output of consumer goods sectors. In addition, it undoubtedly involved an investment program sufficient to permit the sectors to expand. The capital goods program in support of the consumer goods program similarly generated indirect demands. The analysis of the total demands and the sectors on which they fall is an important part of the study of the Soviet economy.

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The possibilities for analysis of this kind are almost endless. It is important to keep in mind that the analysis is not merely a mechanical operation in which results are cranked out on large computing machines. A great deal of work is involved in estimating the data properly, and the process of analysis is a step-by-step working through of the implications of every change.

b. Interdiction.

Closely allied to the analysis of changes in final demand is the analysis of the imposition of side conditions on total output for given sectors of the economy. This type of analysis is particularly important in assessing the effects of air damage to the economy or the consequences of sabotage.

Air strikes or the destruction of physical plant by sabotage would reduce capacity and, hence, output in many sectors of the economy. By fixing at a specific level the magnitude of the output of those sectors which have been damaged and treating the other sector outputs as fixed at the same level as before the air strike or demolition, the deliveries to final demand, consistent with these conditions, can be determined. This set of deliveries to final demand can then be matched with the set of deliveries to final demand in the existing situation and with that set of deliveries required under the conditions postulated in the study. Several final demands can be determined. The output of sectors not damaged would readjust to the new conditions. The interdiction problem gives rise to innumerable solutions rather than a unique solution, since there are many possible ways for the economy to adjust to a reduction in output for one or more sectors. With additional information, such as priorities and a plan of action, it is possible to select a series of more likely solutions but, even at this point, no unique solution.

c. Structural Change.

The third area of analysis is the consideration of structural change. Although this problem is conceptually separate, it is in fact usually coupled with changes in final demand and interdiction. The basic descriptive data -- inputs per unit output for all sectors -- usually are assumed to be fixed for analytical purposes. The coefficients are presumed to reflect technological necessity, and it is on this assumption that most analysis, including that discussed

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above, is based. Using the iterative process, however, it is not necessary to adhere slavishly to this assumption. The coefficients may be changed to reflect changed structural conditions.

Structural changes take place as a result of technological improvements and changes in the amount of capital in place. It is also possible that sudden changes might take place when the economy is under extreme stress, as in the case of mobilization, war, or the development of new industries. The analysis of such a change can be made by computing sector outputs with the new input-output coefficients. These then may be compared with the present sector outputs to see what changes have taken place.

Three types of analysis collectively represent an ideal analysis of economic capabilities. For instance, in a hypothetical war situation the economy must bear the demands of mobilization and combat and at the same time sustain foreign trade interdiction, substantial air damage, possible demolition through sabotage, and loss (or gain) of territory. While adjusting to these severe conditions, the economy would also undergo a series of structural changes. Realistic postulates for all these contingencies plus the Soviet structural table will make possible more detailed estimates of such capabilities than heretofore has been possible.

2. Ancillary Analytical Uses.

A number of ancillary analytical purposes also can be served by the Soviet structural table. Analysis by means of national aggregates likewise suffers from weak and insufficient data, and the intersectoral table offers a supplementary method of examining these national aggregates. These can be explored more completely with the structural table, which also offers some hope for the integration of indicators with aggregative analysis.

The structural table, expressed in rubles as the numeraire, also presents an opportunity for a systematic analysis of prices and the relationship of prices to opportunity costs in the Soviet economy. Such cost analysis is valuable not only in that it points to the drain of a given sector on the allocation of materials to alternative uses but also in that it may be used as a weighting system for the construction of index numbers for the economy as a whole and for various components.

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No precise outline can be made of all the ancillary analytical uses of the structural table. During the construction of the table, for instance, it was possible to check estimates made by other methods and to take into account considerations necessarily left out of the study of national aggregates. Many ancillary uses are confirmatory in nature, and they tend to buttress analysis of different kinds by providing both a confirmation (or denial) of results as well as data from a new source. Other analytical uses, such as the more detailed and indirect examination of prices and costs, break new ground. It is important not to underestimate the contribution of the ancillary analytical uses. These uses frequently result in more and better data and in improving the quality of any analysis which is undertaken.

These applications of the structural table -- direct use of data and improved organization and analysis -- must be regarded as a whole, and none must be slighted. They complement one another. The tendency might be to get on with the analytical uses and neglect the other uses. This would be dangerous, for the technique is one which improves only with the accumulation and testing of additional data. Analysis is complicated, time-consuming, and unusually difficult. It must be approached with caution and careful forethought as well as with an increasingly reliable and complete body of data. To ignore the direct use of data by all researchers and to neglect the benefits to be derived from improved organization of data and from other analytical uses would be to fail to use the framework of intersectoral study to its fullest extent.

VI. The Soviet Structural Table.

Figure 1* presents the flow patterns estimated for the Soviet economy in 1951. The rows represent the distribution of sector outputs among the other sectors of the economy. Each row represents, in 1950 rubles, the sale by the producing sector to all other sectors in the economy. The columns represent the inputs into the sectors. Each column represents, in 1950 rubles, the purchases of that sector from all other sectors in the economy.

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* Following p. 36.

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Figure 2* presents the flow patterns in a slightly modified form. Derived from Figure 1, it presents the relationship between inputs and the output of a given sector. In this case the inputs are expressed as a percentage of total cost.

Figure 3,* similarly derived from Figure 1, presents the distribution of the output of a given sector among the purchasing sectors. Thus an entry in a given row represents the share of the sector's output going to a particular purchaser.

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* Following p. 36.

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An asterisk denotes
an entry of less than
0.5 million rubles.

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