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International Comparisons of Interindustry Data - Industrial Planning and Programming Series No. 2

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Geoffrey J. D. Hewings.
14 April 1971

Industrial Planning and Programming Series No.2

International Comparisons of Interindustry Data

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA

Industrial Planning and Programming Series No. 2

INTERNATIONAL COMPARISONS
OF
INTERINDUSTRY DATA

Proceedings of the Meeting of the First Ad Hoc
Group of Experts on Industrial Programming
Data, held in New York, November, 1965

UNITED NATIONS
New York, 1969

ID/SER. E/2

UNITED NATIONS PUBLICATION

Sales No.: E. 68. II.B. 14

Price: $U.S. 3.50
(or equivalent in other currencies)

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FOREWORD

The degree of availability of appropriate data very often sets a serious limit to the practice of programming. Methodological elaborations not founded on sufficient identification of available data can be of little practical use. Indeed, the formulation and evaluation of possible alternatives in the context of planning involve many elements of conjecture. Such is especially the case with certain stages of programming where the pre-selection of industries, feasibility studies, interindustrial resource balances, and so forth play a crucial role. In many developing countries where experience of industrial development is relatively recent, and where fundamental changes in the economic structure need to be envisaged for the future, it is likely that relatively little indigenous development experience can be utilized for extrapolation purposes. Under such circumstances programming tends to have frequent recourse to data representing experience in other countries, if only for the purpose of setting limits to expected developments. Such procedures, seldom made explicit in official documentation but frequently apparent from worksheet-level information, would no doubt constitute a serious weakness in today's planning and programming machinery unless efforts were made to obtain as a basis a collection of relevant reference data from a sufficiently wide range of sources, and also to carry out a careful analysis of their applicability to various conditions.

A PROJECT FOR INDUSTRIAL PROGRAMMING DATA

With a view to filling the gap now existing in programming techniques in this respect the United Nations Centre for Industrial Development (CID) has incorporated in its work programme a series of inquiries and studies collectively referred to as the Industrial Programming Data Project. The specific terms of reference of this project describe its objective as "establishing extensive catalogue data of operational use for industrial planning and programming on the basis of the existing statistical and technical information in various countries and examining the adaptability of such catalogue data to the practical need of developing countries".

The project is of a long-term nature and at the present stage concentrates on initiating pilot work along several lines designed to bring to light certain important potentialities in this relatively unexplored area. This particular publication concerns only one of the themes being pursued under the project: the adaptability of existing interindustry data of various countries to the needs of developing economies. Even for this particular theme this volume is intended as a point of departure rather than as an end product. The articles collected in it constituted the main part of the proceedings of a meeting of an *Ad Hoc* Group of Experts convened at the United Nations Centre for Industrial Development in November 1965 to review various technical problems and experiences relevant to the issue and to formulate a concrete scheme of work to be carried out in this field by the Centre. The special studies initiated after this meeting will be published in a separate volume at a later date. The results of other lines of work being undertaken under the project, such as the intercountry interestablishment comparisons of the structural and functional characteristics of various specific manufacturing plants, will be published in subsequent issues of this series scheduled in connexion with the project.

INTERINDUSTRY RELATIONS TABLES AS A SOURCE OF PROGRAMMING DATA

Industrial planning and programming has many different facets ranging from the formulation of individual projects to consistency and optimality considerations in broader contexts involving iterative processes of mutual adjustment between microscopic and macroscopic requirements, and between short-run policy measures and long-run perspectives. Knowledge of the profile of industries or sectors constitutes an important part of programming data. One of the most important applications of more or less detailed industry-level programming data arises in connexion with the techniques of tracing the direct and indirect interdependence between input and output flows of goods and services. This interdependence governs the interindustrial balance of an economic system and influences the choice of industrial development strategies.

During the past decade there has been a pronounced increase in efforts to compile interindustry data as a tool for efficient projection and planning, or as an integral part of the system of national accounts. A quick review indicates that about 55 (and possibly more) countries have now compiled their own interindustry tables with either governmental or private resources. More than half of these countries are developing countries. The tables compiled in different countries for various years are however far from comparable. Some are more detailed than others; the quality of basic data, compilatory precision, classification of industries and commodities and other factors vary a great deal among the tables. Those of the developing countries are on the whole of a rudimentary nature; they reflect the lack of detailed and comprehensive statistics in these countries. In view of the rapid pace of structural changes in their economies the cost involved to developing countries in the compilation of complete, detailed interindustry relations hardly seems justifiable to them. Unfortunately the usefulness of such rudimentary tables for practical purposes connected with industrial programming is generally extremely limited.

To meet the pressing need for good reference data for perspective planning purposes at least three different measures may be suggested: (*a*) strengthen the existing statistical data, (*b*) borrow, wherever appropriate, technological coefficients from countries that have well-organized, detailed interindustry data, or (*c*) do without the special programming methods which presuppose the availability of a full-fledged input-output table.

It is clear that any serious attempt to increase the stock and availability of reliable data necessarily involves provisions for the improvement of statistical organs within each country. The concept of catalogue or reference programming data pursued under the CID project should by no means be taken as a substitute for a programme of indigenous statistics. On the contrary, the relationship between reference data and national data is essentially complementary in the sense that the former can serve as checkpoints for the reliability and projectability of the latter, especially when national data are of only a rudimentary nature and also when insight into future potentialities is called for in order to make choices among feasible alternatives.

The second and third of the measures mentioned above are, in a way, two sides of the same coin. It is only within certain limits that we can transplant the interindustry relationships observed within one country to another. This possibility is, in most cases, limited to that part of interindustry data which can be relatively safely considered as being of "technological" origin, i.e. individual column of input coefficients indicating the composition of material inputs of each specific industry. The transplantation of these so-called technical coefficients occurs most frequently in connexion with marginal adjustments needed for projection purposes. The raw material for this "cooking recipe" does not have to relate to the productive system of a national economy as a whole, but can concern any particular aspects and branches of the system which are considered as being of strategic importance. The technique of programming applicable to these data can in itself be flexible, not being limited to the conventional application of the Leontiefian "input-output" analysis; the data used for the so-called "commodity-balance analysis" for principal industrial commodities, "physical input-output analysis" for a particular group of industries etc. are all, in this context, considered as an integral part of interindustry information.

In order to deal with the real problems relating to the dynamic aspects of interindustry relations, such as the emergence of new industries, substitution of one material for another, extension of fabrication processes through additional stages, etc., the interindustry information should be organized in a much more detailed manner than is usually the case with the published forms of input-output tables. The across-the-board adaptability of the information contained in most published tables, which is particularly important for the purpose of *ex ante* economic analysis and planning, must be considered as strictly unwarranted unless the information hidden behind those tables is carefully examined in detail.

A FORWARD STEP NEEDED FOR INTERNATIONAL COMPARISONS

A straightforward comparison of the published tables among different countries would immediately come up against difficulties arising from the diverse compilatory gaps existing among them: accounting unit in basic data, sectoring for tabulation purposes, methods of valuation of transactions, treatment of imports, treatment of dummy sectors etc. are among the most familiar factors susceptible to such variations. This highlights the significance of the work of the Conference of European Statisticians regarding the international standardization of the methods for input-output compilation.[1] The manual on a similar subject recently prepared by the United Nations Statistical Office is also an indication of the increasing need of internationally comparable data in this field.[2] The practical proposals for comparable interindustry data so far put forward are, however, consciously linked to the problem of integrating interindustry tables into the standard system of national accounts; they thus tend to concentrate, at least for the time being, on tables compiled for highly aggregative economic sectors, and hence many steps removed from the underlying details of industrial statistics.

At present very little is known about what the truly comparable data for different countries would look like; still less about the nature and range of elements susceptible to across-the-board adaptation which could be revealed by a comparative analysis of such data. The attempts at intercountry comparative analysis which have so far been undertaken seem to be mostly concerned with the over-all characteristics of input-output tables. Adjustments applied to existing tables for the purpose of comparison are somewhat patchy, with frequent recourse to aggregation techniques to avoid the difficulties arising from compilatory differences. In this way comparative evaluation tends to be limited to relatively small tables, with about twenty or even fewer intermediate sectors. Some of the studies indicate that the "fundamental" pattern of interdependence among productive sectors is somewhat similar among industrialized countries; the similarity is revealed, however, not with respect to the magnitude of individual coefficients but rather in such general terms as approximate decomposability and triangularity of the over-all matrix. For operational planning purposes the similarity in such a broad sense is superficial rather than fundamental. There are also other

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[1] The most recent report of the working group convened under this Conference is available in "Input-Output: National Tables and International Recommendations for Development and Standardization", in United Nations, Economic Commission for Europe, *Economic Bulletin for Europe*, Vol. 16, No. 2, Nov. 1964, pp. 1-31.

[2] *Problems of Input-Output Tables and Analysis: Studies in Methods, Series F, No. 14* (United Nations publication, Sales No. 66.XVII.8). See also *Input-Output Bibliography*, 1955-1960, United Nations, N.Y., 1961 (ST/STAT/7) and *Input-Output Bibliography*, 1960-1963 (United Nations publication, Sales No. 64.XVII.10).

studies at the comprehensive level which draw more attention to dissimilarities than similarities among countries; each country's pattern of industrial development reflects its peculiarities with respect to resource endowment and the extent and pattern of participation in international trade, as well as its stage of industrial development. As long as they are based upon highly aggregative data however, the revealed dissimilarities can be no more than indications of some crude topological features of different national economies which are essentially different from an appraisal of the intercountry adaptability of basic parameter-patterns.

For this latter purpose it is likely that an appropriate scheme of comparison will have to be established on the basis of data at the worksheet level available at the stage prior to the squaring of these data into the conventional form of input-output tables. It should also be borne in mind that before arriving at comparable elements of "technological" origin one must cut through difficulties such as the variation of product-mix of each industry, structure of relative prices and scale of production.

The purpose of the meeting of the expert group convened in November 1965 at the CID was thus to explore feasible approaches which would meet these requirements. While the primary sources of information considered at this particular meeting were those accumulated in various countries in connexion with the compilation of input-output relations, emphasis was laid on the aspects which would help to strengthen the link between aggregate planning and project-level programming.

CHARACTERISTICS OF THIS VOLUME

Most of the articles in this volume are selected from those originally prepared as discussion papers by the participants in advance of the above meeting. The original papers have been partly revised or amplified for the purpose of this publication. The three articles by Vera Nyitrai (Hungary), Nikola Petrović (Yugoslavia) and Hans Wittmeyer (Federal Republic of Germany) are based on their contributions made available later to the CID in order to enlarge the scope of discussion and material relevant to the theme of this publication.

The subject matter dealt with in the following twelve articles varies considerably, and so does the nature of their implications relative to the concept of industrial programming data. But they can be roughly divided into two parts.

Part I relates to the characteristics of interindustry data of individual countries reviewed with particular emphasis on the auxiliary tables and various supporting statistics concealed behind the published form of input-output tables, and also with emphasis upon factors influencing the stability or projectability of compiled technical coefficients. The selection of these articles is intended to provide planners with an opportunity to become acquainted with the data of some countries with relatively well-organized documentation in this field, but which are not usually available in languages that are widely used (Finland, Hungary, Japan, the Soviet Union and Yugoslavia). The recent accomplishment of the Statistical Office of the European Economic Community in recompiling the medium-sized tables of the five member countries into a comparable form is certainly of great significance. However, a full report on this work (a review of which might otherwise have been given a suitable place in this volume) is already readily accessible in the publications of the EEC Statistical Office. Certain technical aspects of those EEC tables relating to the chemical sector are examined in some detail in the chapter by Hans Wittmeyer appearing in Part II.

The six articles in Part II concern various analytical experiments made for intercountry comparisons of interindustry data, and suggestions regarding approaches to be followed for further, more serious comparative evaluation of existing data.

The approaches suggested in most of these articles, as well as the discussions which took place at the meeting of the expert group, generally seem to follow two different but mutually complementary directions. First, there is a common concern to examine the extent to which "basic" interindustry data, mostly existing in the form of worksheets for compilation rather than in the published tables, could possibly be reorganized for purposes of detailed intercountry comparisons. For that purpose some authors are concerned with comparative analyses of various national tables reconciled at relatively aggregative levels. It is indeed true that such comparisons will play an important role in locating, sizing-up and screening prospective fields in which detailed comparisons are to be undertaken. However, admitting that there is already sufficient evidence regarding the approximative decomposability of the comprehensive matrices, some authors are even more concerned to establish concrete schemes according to which detailed partial input-output relationships can be compiled for blocs or complexes of specific industries.

The formal recommendations made by the expert group are reproduced below. In relation to these recommendations it should be remembered that the articles collected in this volume are all meant for background material for the preparatory work needed to implement them.

Research conceived in line with the recommendations is now under way at the CID with the help of a special working party organized by experts from several countries. Its immediate purpose is to pin-point strategically important segments of the interindustry balance to be investigated selectively in greater detail and to distinguish areas that are typically more comparable from those that tend to be less so as among different countries. In pursuit of this objective an effort will be made to develop a technique for handling the problems of relative prices, industry-mix, product-mix, degree of integration etc. in the context of intercountry comparisons. It is hoped that a substantial part of the collection of information and its analysis and interpretation will be completed in 1967 and published in a later issue of the Industrial Planning and Programming Series.

REPORT AND RECOMMENDATIONS FOR THE INDUSTRIAL PROGRAMMING DATA PROJECT OF THE UNITED NATIONS CENTRE FOR INDUSTRIAL DEVELOPMENT BY THE FIRST *AD HOC* GROUP OF EXPERTS WHICH MET IN NEW YORK FROM 9 TO 12 NOVEMBER 1965

Letter of transmittal to the Commissioner for Industrial Development

We have the honour to submit herewith the report of the First *Ad Hoc* Working Group on Industrial Programming Data. It is the outcome of our meeting held at New York during the four days commencing 9 November 1965. At the request of the Group, Dr. Anne P. Carter acted as Chairman of the whole Group. Professor Wassily Leontief and Mr. Morris Goldman acted as Chairman of Sub-committees I and II respectively, which were formed within the Group during the above meeting period.

The terms of reference given to this Group by the Commissioner for Industrial Development were:

> "To examine the adaptability of existing industrial programming data of various countries to the needs of developing economies, with special reference to existing interindustry tables and related basic data from which they are compiled, and to formulate feasible lines of research to be undertaken by the Centre for this purpose."

The following report was written by the Group at the meeting and represents the consensus of all fifteen members of the Group as to the nature and scope of the research study recommended for the United Nations Centre for Industrial Development as part of its Industrial Programming Data Project.

We wish to acknowledge our gratitude to the staff members of the Policies and Programming Division of the Centre who acted as technical secretaries for the Group.

Signed by (in alphabetical order):
Aujac, Henri; Cao-Pinna, Vera; Carter, Anne P.; Denisenko, Ivan M.; Eleish, Gamal E.; Forssell, Osmo; Goldman, Morris; Helmstaedter, Ernst; Hoffenberg, Marvin; Leontief, Wassily; Matuszewski, T. I.; Sevaldson, Per; Thore, Sten; Treml, Vladimir G.; Watanabe, Tsunehiko.

New York, N.Y., 12 November 1965

I. INTRODUCTION

Most developing countries engage in some form of programming of industrial investment and industrial projects. It is obviously important that they should do so on the basis of the best possible available information and using the available data to the greatest possible extent. The Group feel that the Industrial Programming Data Project may fill a gap now existing in this field, and may thus be a positive step in aiding the developing countries in the formulation of their industrial plans and policies.

The need for such a project arises from the present state of data availability in the developing countries when considered against the demanding nature of industrial programming. It is a well-known fact that many of these countries lack the basic data necessary for industrial programming and, with only a few exceptions, there is an almost complete lack of data describing the structural characteristics of the economy. At the same time the economists are pressed to produce industrial development programmes, advise on choices of investments and technology as well as a host of other difficult economic matters. Even when consulting firms are asked to appraise industrial projects there remains the problem of evaluating the total impact of such projects, for which purpose the available data in these countries are generally inadequate.

The Group were informed of and kept in view the Centre's Studies of Manufacturing Establishments, which is a part of the Industrial Programming Data Project already under way in the Centre. This study is designed with particular emphasis on the plant-level data and consists of compiling and analysing the experiences of individual establishments in various countries relating to certain techno-economic relations which are considered as being of crucial importance for industrial programming.

The attention of the Group was drawn to the fact that the developed, as well as some developing, countries have already collected a wealth of interindustry data which, with some adaptation, could be extremely valuable in guiding the developing countries in choosing their industrial strategies and in formulating consistent industrial programmes. Because of the complexity of interindustry data which in many respects differ from a mechanical aggregation of establishment data, and also because industrial programming spans various phases ranging from the formulation and evaluation of individual industrial projects to the assessment of the consistency of general resource allocations, the Group are agreed that the proposed research project concentrating on the data compiled for interindustry analysis should be considered as an additional branch of the Industrial Programming Data Project to be carried out in conjunction with the Studies of Manufacturing Establishments mentioned above.

The effort of the Group was thus concentrated on examining the feasibility of reorganizing and analysing various forms of interindustry data as they exist in various countries, with a view to making them operational for programming purposes in developing countries. After general debates on various problems and issues involved in such a task, the Group formed two sub-committees: Sub-committee I was concerned with the reconciliation and analysis of interindustry information, particularly aiming at the derivation of some reference data which might be operationally useful for the purpose of assessing alternative nationally or regionally balanced patterns of industrial development; and Sub-committee II worked with stronger emphasis on aspects of detailed interindustry information that might be linked with the programming data required for formulation and evaluation of specific industrial projects.

The reports of the two sub-committees were prepared separately, but were discussed later by the entire Group. It was noted that the two reports involved common elements in many respects, this being indicative of the complexity of the data needed for research which makes the two approaches mutually interdependent. Differences between them are, however, suggestive as to the phasing of work, which should be carefully planned in carrying out the proposed project. For this reason the Group are agreed in presenting these two reports as they are, without attempting to merge them into a single one.

II. REPORT OF SUB-COMMITTEE I

This report summarizes the deliberations of Sub-committee I, formed by five members of the *Ad Hoc* Group of Experts during its meeting period: Gamal E. Eleish, Senior Lecturer, African Institute for Economic Development and Planning, Economic Commission for Africa, Senegal; Ernst Helmstaedter, Professor, Institute for Social and Economic Sciences, University of Bonn, Federal Republic of Germany; Marvin Hoffenberg, Professor, Institute of Government and Public Affairs, University of California at Los Angeles, United States; Wassily Leontief, Professor, Harvard University, United States, and Tsunehiko Watanabe, Professor, Gakushuin University, Japan. This report is intended to formulate a feasible work plan for the treatment of existing data from various countries in the form of reference programming relations particularly suitable for the purpose of assessing comprehensive resource balances in alternative development plans.

The suggested work plan is set out in four stages: (I) reorganization of existing interindustry information, (II) operation necessary to secure intercountry comparability of coefficients, (III) construction of comparable or partially comparable tables and (IV) preparation of reference information for industrial planning and programming purposes.

Stage I: Reorganization of existing interindustry information

Before starting the collection of relevant interindustry information from various countries it is recommended to engage in preparatory work to establish a basic framework in which information from individual countries will be recollated on an analytically reconcilable basis. This preparatory work may have recourse to the interindustry data available in a few countries possessing sufficiently detailed and well-organized documents in this field.

The industry classification suitable for this framework may be of an order of two hundred or more, implying the possibility of different countries laying greater emphasis on different industries in contributing information sufficiently detailed for comparison purposes. Many countries, especially small ones, do not seem to have enough interindustry data to complete the framework. It is worth noting however that there will be many cases in which information compiled in a small table for a small economy can attain the same degree of specificity as that compiled in a larger table for a larger economy.

Interindustry information to be collected in accordance with the framework should include, wherever possible—

(i) flow (and flow-coefficient) tables, completed with rows and columns describing value added and final demand,[1]

(ii) import tables,

(iii) quantity tables,

---

[1] Flow coefficients should be those compiled on the total supply basis (i.e. including imported inputs) if a complete import table is not available. Efforts should be made to comply with the recommendations of the Conference of European Statisticians concerning the standardization of input-output tables, especially as to the definition of final demand sectors and value-added categories, and the distinction between material goods and services and non-material services.

(iv) commodity prices and price deflators (with distinction between domestic use and exports), and

(v) capital coefficients tables as fully detailed as possible, and labour coefficients (with skill specification, if feasible).

As soon as the above preparation is under way the Centre will contact experts in various countries to organize special study groups in order to collect and collate the available interindustry information, both published and unpublished, into the framework mentioned above.

Stage II: Operation necessary to secure intercountry comparability of coefficients

This operation is not intended to secure the same degree of comparability for all coefficients but is aimed at reducing the discrepancies due to differences in the definition and statistical procedures involved in the original data. Major tasks to be envisaged in this operation are—

(i) realignment of sectoral and commodity classification, and

(ii) compilation of relative-price deflators appropriate for intercountry comparisons.

The first task will be guided by both the International Standard Industry Classification and the basic framework of sectoring used in the few selected most detailed national tables. Compilation of price deflators is the most important task of all and consists of the following steps:

(i) to establish, for each country considered, average prices applicable to the product-mix of each producing industry;

(ii) to obtain intertemporal price deflators applicable to each country's tables; and

(iii) to estimate relative-price deflators for intercountry comparison (adjustment for any special price regulations, tariffs and indirect taxes, as well as relative (market) price indexes relating to the commodities appearing in quantity tables or similar).

In the accomplishment of the above tasks it will be helpful to analyze the product-mix of comparable sectors in different countries. A number of techniques developed for intertemporal comparisons within a country will prove to be applicable to such analysis.

Stage III: Construction of comparable or partially comparable tables

The results of the work performed at the previous stages will make it possible to reconstruct tables of various national economies which are partially, if not entirely, comparable. The size of such tables can be varied according to the type of needs.

Stage IV: Preparation of reference information for industrial planning and programming purposes

Among the various conceivable aspects of this task, the following have been noted in particular:

A. Description of structural characteristics of economies at various levels of development:

(i) patterns of interindustrial relations in a highly-developed economy (this may be called "reference table");

(ii) variations of the reference table reflecting:

(*a*) differences in size of economy and role of foreign trade,

(*b*) absence or presence of specific industries, and

(*c*) various stages of technological progress, etc.

B. Analysis of input requirements of specific industries:

(i) indication of "strategic" coefficients by means of sensitivity tests;

(ii) comparison of labour and capital requirements and import contents of inputs;

(iii) comparison of output distribution; and

(iv) indication of specific areas which require detailed technological studies.

C. Preparation of "examples" for the use of the reference table and its variations for assessment of alternative balanced patterns of industrial development.

The work at this stage, as well as at some phases of the preceding stages, requires extensive use of electronic computation facilities. It is recommended that the Centre establish a means of access to such facilities.

III. REPORT OF SUB-COMMITTEE II

Sub-committee II was formed by the remaining ten members of the First *Ad Hoc* Group of Experts on Industrial Programming Data during its meeting period. They were: Henri Aujac, Director, Bureau d'informations et de prévisions économiques, France; Vera Cao-Pinna, Director, Centro di Studi e Piani Economici, Italy; Anne P. Carter, Senior Research Associate, Harvard University, United States; Ivan M. Denisenko, Chief of Section, Economic Institute of the USSR, Planning Commission; Osmo Forssell, Research Fellow, Central Statistical Office of Finland; Morris Goldman, Associate Director, Office of Business Economics, Department of Commerce, United States; T. I. Matuszewski, Professeur agrégé, Université de Montréal, Canada; Per Sevaldson, Senior Statistician, Central Statistical Bureau of Norway; Sten Thore, Professor, School of Economics and Business Administration, Norway; and Vladimir G. Treml, Associate Professor, Franklin and Marshall College, Lancaster, Pa., United States.

This report is concerned with substantive aspects of the compendium of detailed interindustry information which the Centre is recommended to establish with a view to facilitating efficient and consistent linkage between the aggregative and the project-level planning and programming.

Stage I: Assembling a compendium of detailed information on industrial input patterns

Detailed input-output information covering 75 per cent or more of material inputs will be gathered for selected industries of major interest to developing countries. This material will not be limited to published input-output information, and should draw heavily on worksheets and special studies used in preparing and analysing published tables. *Ex ante* or "planning" input-output structures should also be considered as an additional source of information. The survey may be limited to the collection of already existing information, published or unpublished, and should be pursued in close co-operation with other United Nations agencies. Fullest use should be made of information contained in the discussion papers prepared for the present meeting of the First *Ad Hoc* Working Group and also of the data being gathered in the Studies of Manufacturing Establishments which are already under way in the Centre for Industrial Development.

Materials in the compendium will not necessarily be directly comparable among countries or among different industries in the same country but will include descriptive information required for interpretation. The extent of detail to be aimed at for this stage will be less than that of the establishment-level statistics but will correspond to the worksheet-level data available for interindustry compilation before the squaring of these data has been attempted. In particular, the desire to give uniformly classified inputs and outputs for different industries ought not lead to the withholding or aggregation of whatever fragmentary information may be usable for compilation purposes. While the collection of materials recommended in Stage I will be of great value in itself its value will be much enhanced by reconciliation and analysis as recommended in the Centre's proposals addressed to the members of this Working Group. Such reconciliation and analysis is envisaged as Stage II.

For any given industry, the compendium should include the following information, to be divided roughly into the following six categories:

(i) *Detailed definition and description of the industry.* This should include such items as year of reference, definition of processes, number and size distribution of plants, proportion of public ownership, installed prime movers, and other characteristics of equipment.

(ii) *Characteristics of output-mix.* Commodity and process mix should be specified insofar as possible in terms of quantity (in specified units), price and total value. Primary, secondary and joint products should be distinguished.

(iii) *Input requirements.* These should include capital-input requirements wherever possible, as well as current inputs of basic and auxiliary materials and services and primary factors. Where possible, materials should be subdivided into domestic and imported items, and labour requirements subdivided by types and skills. Depreciation, taxes and other value-added elements should also be collected. Wherever possible, quantity, price and value of inputs should be specified.

(iv) *Input coefficients.* The basis of the coefficients should be specified; i.e. total supply base or domestic output base, gross or net of intra-industry transactions. Any provision made for non-proportionalities, especially of auxiliary inputs, should be noted. The stock of capital should be related to capacity output as well as actual output, and wherever possible the information useful for an indication of its age structure should be collected.

(v) *Major consuming industries.* These should include deliveries to final demand and be subdivided, if possible, into private consumption, current government demands, gross capital formation, exports and inventory changes. The level of aggregation specified for consuming industries may be less detailed than that specified for inputs, and it is not likely that both quantity and value information will be available in all cases. However, for intra-industry transactions every possible specification of detail should be made.

(vi) *General appendix.* This should cover matters such as sources of basic information, compiling agency, valuation basis and conventions for handling taxes, secondary products, transportation, trade margins and dummy industries.

In some countries, information can be collected for more than one year and in more than one region. Not all countries should be asked to contribute equally detailed information on all industries. Particular efforts should be made to include developing countries for which reliable data exist for certain sectors—particularly for newly introduced industries.

It is recommended that a task force be set up for gathering information from the statistical agencies of the various countries, or alternatively that correspondents be appointed in different areas to transmit the information to the Centre. It is also recommended that the Centre select a small study group to supervise the collection of information and to organize research activities to be conducted in Stage II.

Stage II: Analysis of intercountry differences in input patterns

This will consist of analysis and interpretation of the information compiled in Stage I and an attempt to explain intercountry variation in selected important technical coefficients. Such analysis is, of course, vital for successful application of these programming materials. It is recommended that the Centre take full advantage of various comparative studies mentioned in the papers submitted to this meeting and that it have the advice of technical consultants for particular industries being surveyed. Intercountry differences in such factors as prices, product and process-mix, degree of integration, utilization of capacity, and various characteristics of the capital stock should be considered. It should also be noted that differences among coefficients for the developing and the more developed countries often reflect special technical and organizational problems associated with the introduction of new industries in developing economies.

It would be too ambitious to attempt reconciliation of differences among all coefficients for all countries at this stage. It is recommended that Stage II begin experimentally with intercountry comparisons of principal coefficients for a few industries.

Part One

CHARACTERISTICS OF NATIONAL INTERINDUSTRY DATA

INPUT-OUTPUT TABLES OF JAPAN: BASIC FRAMEWORK, PRIMARY DATA AND INTERTEMPORAL COMPARISONS

Shuntaro Shishido, Economic Planning Agency, Government of Japan

I. A BRIEF SURVEY OF THE JAPANESE INPUT-OUTPUT TABLES

Since about 1953 three bench-mark input-output tables have been prepared in Japan for 1951, 1955 and 1960. Although many other preliminary tables have been compiled by various organizations, our major emphasis in this article will be placed on these bench-mark tables, since they form the statistical basis for those preliminary tables.

1. *The 1951 table*

The 1951 table[1] was prepared by the Ministry of International Trade and Industry (MITI) for the purpose of analysing the structural changes of industries in connexion with the balance-of-payment, employment and investment problems.

Although the published table is available on a 182-sector basis,[2] the basic table was compiled in a rectangular matrix of 527 × 182. One of its distinctive features is the use of activity basis for its sectoral classification, a practice followed by the subsequent bench-mark tables. This is due mainly to its analytical advantage and also to the survey method of the Monthly Survey of Industrial Production by the MITI, in which the basic information on output and input is collected on an activity, not an establishment basis.

The original industrial classification for the table is designed for the MITI's administrative use, and is now being adjusted to the ISIC[3] by the Council for Industrial Planning on a 153-sector basis of the 1960 table.

By-products and scrap are treated as part of the output of the sector in which they originate and are transferred to the using sectors. This procedure is the same as in the United States table for 1947 compiled by the Bureau of Labor Statistics. All transactions are valued at producers' market prices, that is inclusive of indirect taxes less price subsidies.

Imports are divided into competitive and non-competitive areas, and the former are treated as a negative column in final demand. However, in the 36-sector table, which was designed specifically for analytical use, all non-competitive imports were eliminated by regarding them as competitive to domestic products.

The 1951 table for Japan proves to be largely consistent with the data in the national income accounts of the Economic Planning Agency (EPA). The aggregates of value added and final demand (net of imports) are conceptually equal to the Gross Domestic Product (GDP) at market price (inclusive of indirect taxes less price subsidies).

Besides the input-output table with 182 sectors, a "quantity table" of 345 × 182 was also compiled, in which demand and supply balances for 530 selected commodity groups are indicated in both value and quantity terms. This table was of great use for the study on the physical aspect of interindustry relations.

As noted above, in the aggregative table prepared with 36 sectors all imports are treated as competitive, and by-products and scrap are separated from the output of original industries and are grouped into dummy sectors. A similar 36-sector table, though of a very preliminary nature, was prepared for the year 1954 by the MITI, principally for the purpose of comparative analysis of production structure between 1951 and 1954.[4]

The EPA also compiled a small input-table for 1951 independent of the MITI work. This table has nine sectors and is designed for the integration of the input-output scheme with the existing national income statistics.

2. *The 1955 table*

In view of the extensive use of various types of data, the compilation of the new bench-mark table for 1955 was made through collaboration among various government agencies, such as MITI, EPA, the Ministry of Agriculture, the Ministry of Construction, the Statistics Bureau etc., for which the Statistical Standards Bureau of the Administrative Management Agency played the role of co-ordinator. This is the first official table worked out by the Government and it contains 122 sectors. The underlying research was undertaken, however, for about 300 sectors.

Again the statistical unit is on an activity basis, and emphasis is laid on suitability for analytical use and comparability with the 1951 table. All transactions are valued at producers' market prices (as in the case of the 1951 table) but average, instead of actual, prices are

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[1] See H. B. Chenery and P. G. Clark, *Interindustry Economics* (Wiley, New York, 1959), Chap. 7, and S. Shishido, *Recent Input-Output Studies in Japan*, Memorandum C-6 of the Stanford Project for Quantitative Research in Economic Development, 1957 (mimeographed).

[2] The number of sectors mentioned in this paper to indicate the size of an input-output table refers to producing sectors alone and does not include final demand columns and primary input rows.

[3] United Nations, *International Standard Industrial Classification of All Economic Activities*, Statistical Papers Series M, No. 4, Rev. 1 (New York, 1958).

[4] Ministry of International Trade and Industry, Japan, *Interindustry Analysis of the Japanese Economy*, 1957 (in Japanese).

adopted in order to overcome the difficulty arising from price differentials occurring within an export column.

As to the sector classification, the second (1955) table employs a more standardized system than the 1951 table. This system is largely based on the Japanese Industrial Classification (JIC), slightly modified for interindustry analysis.

The treatment of by-products and scrap is almost the same as in the 1951 table: they are regarded as a part of the output of the sectors in which they originate and are transferred to the using sectors.

Imports are treated in a different way, so as to provide a more comprehensive relationship between domestic and imported products. Since each transaction cell is divided into imports and domestic products, there are $2n \times n$ transactions in the 1955 table. Thus one can avoid the arbitrary distinction between competitive and non-competitive imports.[5] This method of presentation seems to have the demerit, discussed later, of requiring too large a space for practical use.

As for linkage to the national income accounts, the table is mainly in accordance with the national income concept, except for education and health services, which are charged to the household sector whether they are produced by private or by government organizations.

As with the 1951 table, a "quantity table" is attached. It contains 178 commodity groups and 122 using sectors.

A preliminary table with 35 sectors was prepared by the MITI for 1959 and used for the analysis of industrial structure, employment and investment pattern etc.[6]

3. *The 1960 table*[7]

The third bench-mark table was compiled for 1960 during 1962–63 through co-operation among various government agencies and under the co-ordination of the Statistical Standards Bureau.[8] This official input-output table marked a turning-point in the post-war history of input-output research at government level, as regards (*a*) comprehensiveness of the accounting system employed, (*b*) international comparability, (*c*) statistical reliability as a basis for revising the existing national income statistics, and (*d*) utilization for the Medium-Term Economic Plan. These four points are discussed below.

(a) *The accounting system.* The 1960 table is available with two types of valuation (producers' prices and purchasers' prices), together with three converting matrices (i.e. for freight charges, for trade margins, and for by-products and scrap) and three supporting tables (i.e. quantity table, import matrix, and employment matrix). All these official tables are available on a 153-sector basis, while the original data are also available on IBM punch-cards in the form of a 450×350 transaction matrix. As in the previous tables, each sector is defined on an activity basis.

The dual presentation of the input-output table at both producers' and purchasers' prices was motivated by the usefulness of the latter, especially for final demand analysis and comparison with the national income accounts.[9] It should also be noted that such dual presentation is not unduly expensive, since the converting matrices for freight charges, trade margins etc. can be estimated from relevant statistical sources in parallel with the ordinary input-output estimation at producers' prices.[10]

The use of "negative input method" for by-products and scrap that was employed in the 1960 table is believed to be more advantageous for computing technological inter-relationships than the conventional "transfer method" employed in the 1951 and the 1955 tables. Thus the amount of output in each sector is smaller than that for the previous tables by the amount of by-products and scrap originating in it.

All imports are treated as competitive, but a special square matrix for imports on a 153-sector basis was also estimated, so that the whole table at producers' prices is now easily convertible into an input-output table on a non-competitive or semi-competitive import basis.

Unlike the 1955 table that for 1960 adopts actual prices instead of average prices, even if price differentials seem to be significant in certain sectors. This treatment is due to the need to maintain consistency with the national income accounts. However, conversion into an average-price table can easily be made by using the allocation pattern in physical terms derived from our quantity table on a 151 × 153 basis. This type of flexibility in treating imports and in the valuation of transactions can be considered as an important feature of the 1960 tables.

Consistency with the standardized national accounts, especially with the System of National Accounts and Supporting Tables (SNA),[11] was also taken into account more rigorously. This is especially the case with the imputation of interests and rent. Since the imputed interest charges are distributed among the related sectors on the basis of sectoral bank deposits etc., the values of operating surplus in those sectors are reduced by these amounts. On the other hand, the rental income of the real estate sector is distributed to the original producing sectors so that the amounts of value added in those sectors are increased.

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[5] For the theoretical criteria for this distinction see section II below.

[6] Ministry of International Trade and Industry, Japan, *Interindustry Analysis of the Japanese Economy by the 1955 Interindustry Table,* 1962 (in Japanese).

[7] See annex for further technical details.

[8] Statistical Standards Bureau, Administrative Management Agency, Japan, *A Report on the Interindustry Table for 1960* (Tokyo, 1963) (in Japanese).

[9] See S. Shishido, "Problems in the International Standardization of Interindustry Tables", in *Journal of the American Statistical Association,* March 1964.

[10] In cases where there are no cost data for "cost approach", so that one must rely simply on "market approach" at producers' prices, the preparation of these converting matrices would be difficult.

[11] United Nations, *A System of National Accounts and Supporting Tables,* Department of Economic and Social Affairs, Series F, No. 2 Rev. 2 (New York, 1964).

(b) *International comparability*. In the 1960 table particular stress is laid on international comparability in order to facilitate analytical use of the table, in particular for comparisons of technology, import dependency, final demand, patterns etc. The International Standard Industrial Classification (ISIC) of All Economic Activities was adopted as a basis for sectoral classification, although slight adjustments were needed to modify it from an establishment to an activity basis. For instance, electricity for its own use and own-account construction are separated from their original sectors and integrated respectively into the commercial electricity and the construction sectors.

Coke produced by steel industries is however included in the output of the specialized coke-producing sector.

As for consistency with the standardized concepts of national accounts, rows for primary inputs and columns for final demand are defined in accordance with SNA. For practical use, the fourth quadrant of the table (i.e. intersections of final demand columns and value-added row) are left completely blank.

(c) *A basis for revising national income series*. Even after conceptual adjustments there were in fact certain statistical discrepancies observed between the national income and the input-output estimates for 1951 and 1955. However, most of such gaps will be eliminated in the 1960 table, since the national income series since 1951 are themselves to be revised substantially on the basis of the 1960 table. The new series are to be published by the end of this year, so that an integrated use of national income and input-output models will be greatly accelerated.

(d) *Utilization for the Medium-Term Economic Plan*. The 1960 table is the first to be officially applied for the preparation of government economic plans. The official table with 153 sectors was aggregated into 60 sectors for planning purposes, and a test was made on the stability of input-output coefficients between 1955 and 1960. For this purpose, the 1955 table with 122 sectors was adjusted for 1960 prices by the Council for Industrial Planning, as described below. The results of the test indicate that there have been significant technological changes affecting the use of certain inputs, such as changes in energy consumption and substitution from primary products to manufactured products, but that there is little change in the value-added output ratio or the degree of fabrication. The chemical and the construction industries are the only exceptions: there are indications of an increase in the value-added output ratio in the former sector and a decline in the latter. These trends in input-output coefficients were extrapolated up to 1968, the target year of the present plan, by means of Stone's RAS formula.[12] This preliminary projection was further revised to some extent by the help of experts specialized in individual industries.

Aggregative estimates of final demand are given in the Macroscopic Medium-Term Model.[13] The breakdown of these into 60 rows was made with the use of various econometric sub-models. Details may be referred to in the report of the Committee on Econometric Models.[14]

4. *Preliminary table for* 1963

On the basis of the 1960 bench-mark table, and in co-operation with various government agencies, a preliminary table was compiled in 1963 at 1960 prices. This official table has 56 sectors, but the original data are available at the 153 sector level of classification.

II. BASIC STATISTICS FOR MANUFACTURING INPUTS

In this section, problems related to the basic statistics in manufacturing sectors are discussed, with special reference to input-output coefficient or technical coefficient matrix for international comparison. There are about four major sources of such information in Japan: the Monthly Survey of Industrial Production, the Annual Census of Manufacturers and the Annual and Quarterly Surveys of Corporate Enterprises.

1. *The Monthly Survey of Industrial Production*

This survey, initiated just after the Second World War, covers most of the mining and manufacturing establishments and collects monthly data on output and input in physical terms on an activity basis (see table 1). Thus, many multi-product establishments are requested to fill more than one questionnaire. The extent of coverage of this survey is high, about 80 per cent in value terms, although the cut-off points vary from industry to industry.

The results of this survey are used in physical terms in the input-output table for most of the important manufacturing activities. The data in the quantity tables are also primarily based on this survey.

The monthly data for various indices, such as those for industrial production, industrial shipment, raw material consumption etc. by industry, are also derived from this survey. This facilitates following the current movement of the selected material consumption per unit of output for important industrial sectors; and a follow-up of this nature is of essential importance for the year-to-year compilation of input-output tables on a continual basis.

2. *The Annual Census of Manufacturers*

This census of the MITI has a history of about 50 years. It is a complete census of private manufacturers on an establishment basis, but different questionnaires are used

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[12] See University of Cambridge, Department of Applied Economics, *Input-Output Relationships*, 1954–1966: *A Programme for Growth*, 3 (1963).

[13] T. Tatemoto, T. Uchida and T. Watanabe, "A Stabilization Model for the Post-war Japanese Economy, 1953–1962", Part I, 1964 (to be published in the *International Economic Review*).

[14] Economic Planning Agency, Japan, *Econometric Models for Medium-Term Economic Plan* 1964–1968, Reports by the Committee on Econometric Methods, 1965.

TABLE 1: THE MONTHLY SURVEY OF INDUSTRIAL PRODUCTION

Statistical sector	*I. Coverage*
Mining	All establishments manufacturing designated products.
Coal	All establishments manufacturing coal, coke and lignite.
Textiles	All establishments manufacturing the following designated products: Chemical fibres, flax fibres, cotton spinning ("Wa-bo" or Japanese spinning excluded), cotton and rayon staple fabrics (together with spinning), hemp fabrics, dyeing and finishing, full-fashion stockings, laces, paper and pulp, and cellophane. For "Wa-bo", cotton manufacturing, cotton and rayon staple fabrics (special), silk rayon fabrics, woollen fabrics, and knitted goods, a sample of one-twentieth for establishments under a certain size, with cut-off of secondary products. Enterprises with two or more establishments of chemical fibres, spinning ("Wa-bo" excluded), and dyeing and finishing. Enterprises with two or more establishments manufacturing raw yarn together with fabrics (excluding paper and pulp).
Chemicals	All establishments manufacturing designated products. Enterprises (chemical fertilizers). Lime manufacturing (establishments employing 15 or more persons). Manufacturing of vinyl chloride stabilizers.
Iron and steel	All establishments manufacturing designated products.
Machinery	Establishments employing 20 or more persons, manufacturing designated products. (Some establishments employing five or more persons are included.)
Light industries	Manufacturers of designated products, mostly employing 20 or more persons, but some employing as few as 4 persons, as in production of pottery or lacquered ware.

Statistical sector	*II. Principal data collected*	
	A. Production	*B. Shipment*
Mining	Quantity.	Quantity; partly value. By sector of demand as for non-ferrous metals, etc.
Coal	Quantity. The survey is made on coal, coke, lignite and mine districts, and on receipt and payment, value of shipments by industry, items of consumption and items of production for establishments of mining gas.	Quantity. For coal: by destination and means of transportation; for lignite: also by sector of demand; for coke: by consumers, sellers and others.
Textiles	Quantity; partly value.	Quantity and value. Divided into self-consumed fabrics for piece-work, and those for markets and others (with the exception of secondary fabrics). For part of products, the value is investigated.[a]
Chemicals	Quantity.	Quantity and value. Shipments to a distribution point and exports as for chemical fertilizers. Breakdown by domestic use and export for chemical fertilizers and by sector of demand for calcium carbide, sulphuric acid, soda manufacturing products, synthetic anhydride and oxygen (co-ordinated statistics[a]).
Iron and steel	Quantity. Products produced from self-owned raw materials and from raw materials supplied; includes products consumed within the factory.	Quantity. Deliveries outside the establishment are divided into sales and others.
Machinery	Quantity. Products produced from self-owned raw materials and from raw materials supplied; includes self-consumption in the factory.	Quantity, weight and value. Limited to shipments out of enterprise. Products of commission work done by others are included. Covers only those designated machine tools used for speculative production. Machine tools for metals.
Light industries	Quantity and value.	Quantity and value. Sales are subdivided into domestic use and export. Carbon products, optical lenses, furbishing stones and whetstones are shown by sector of demand. Pottery for domestic use: its use for electrical products is investigated. Leather: sales by sector of demand are investigated by the survey on demand and supply of leather products.
	C. Stock	*D. Raw material*
Mining	Quantity.	Quantity of stocks, consumption and shipments, purchases, electricity consumed, by type of industry.

Statistical sector	*II. Principal data collected*	
	C. Stock	*D. Raw material*
Coal	Quantity.	Quantity. Coal: stocks, purchases, consumption, delivery of materials and electricity consumed, by purpose. Lignite: consumption of materials. Coke: domestic and export, by kind of coke and by coke material.
Textiles	Quantity.	Quantity. Stocks, purchases, consumption of all kinds of inputs.
Chemicals	Quantity. Chemical fertilizers and caustic soda: stockpiled in the head-office.[a]	Quantity. Stocks, purchases, production, consumption and shipments for some parts of principal raw materials, fuels and motive power. Consumption: separate entries for consumption by the enterprise and by others, and for some kinds of products items of consumption are investigated.
Iron and steel	Quantity.	Quantity. Amount of purchases, production, consumption (by section) and delivery for materials consumed for primary products and all products.
Machinery	Quantity. Only machine tools used for speculative production included.	Raw materials actually consumed, by kind of business and by material (some exceptions). Stocks in the establishment at the end of a month.
Light industries	Quantity.	Quantity. Stocks, purchases, production, and consumption of principal materials as for principal products. Asbestos: items of consumption also are investigated.

E. Labour

Mining	Number of persons registered at end of month and their working conditions: in some cases detailed surveys are made of wages and salaries paid to employees.
Coal	Coal: number of persons, their movements, conditions of employment, and wages in detail. In addition, detailed surveys are made of the number of work hours etc. Coke: number of persons registered at end of month and total wages and salaries paid to employees. Lignite: number of persons at end of month, total number of persons engaged, total hours worked, and wages.
Textiles	Number of persons in the establishment at end of month (by direct and indirect production, separately).
Chemicals	Number of persons registered at end of month and monthly total number of work hours per establishment and total wages and salaries paid by kind of industry and by certain products.
Iron and steel	Number of persons in factory (by section of manufacturing) and total number of persons in the company as a whole at end of month.
Machinery	Total number of persons in the establishment at end of month.
Light industries	Number of persons in the establishment at end of month, by kind of industry and monthly total number of persons and total wages and salaries paid by industries.

F. Equipment

Mining	Operation of furnace for aluminium. Based on *Mining Trends in Japan*; detailed surveys are made on mines (including crude petroleum and natural gas wells) and on refining equipment every year. Yearly surveys are made of petroleum equipment.[a]
Coal	Monthly working capacity of coke. (Yearly surveys are made of equipment for mines, coal mining, digging and coal face, equipment for lignite and production equipment for coke.[a])
Textiles	Equipment capacity, movable capacity, working capacity or number of movable spindles, total running hours (number of working spindles), as per establishment except those for hemp, fibres, dyeing and settling and cellophane. (Detailed surveys are made of paper and pulp every four years, and surveys of working equipment for fabrics, dyeing, woollen fabric dyeing and settling are made every year by the Bureau of Textiles.[a])
Chemicals	Production capacity of principal products. (A detailed survey was made in 1957[a] and surveys of equipment were conducted in 1961.)
Iron and steel	None. (Detailed equipment surveys are made of primary iron and steel products every four years.[a])
Machinery	None. (Detailed surveys were made of machine tools for metals in 1952 and in 1958.[a])
Light industries	Surveys of equipment were made for metallic table-ware, fountain-pens, fibreboard, fire-bricks and centrifugal concrete. None for rubber, leather, polyvinyl chloride products, corrugated board and ceramic furnaces.

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[a] Statistics in conformity with the Statistical Reports Co-ordination Law.

for small and for large establishments (see table 2). For the former group, namely establishments employing from one to nine persons, a very simplified questionnaire is used, asking for data on total value of shipment, number of persons engaged etc. From larger establishments, however, the collected data cover value of shipments and its components by type of product groups, value of inventories and its components, value of total raw materials and fuel consumption, gross value added, gross fixed investment, depreciation etc.

In the preparation of the input-output table for manufacturing sectors the results of this census are used as supplementary sources for estimating the value of output of minor sectors which are not covered by the Monthly Survey. The basic data for gross value added, however, are all taken from this census, as they are not available from the Monthly Survey. Since the industrial classification of the census is based on the Japanese Industrial Classification, it was necessary to make adjustments to the I.S.I.C. basis in preparing the input-output table for 1960.

Although normally the annual census provides only information on the total value of inputs, that for 1963 also collected data on the components of raw materials and fuels in both value and in physical terms, in accordance with the World Programme for an Industrial Census proposed by the United Nations in 1963.[15] The results of the tabulation of these items will be utilized for the compilation of input-output tables, especially for such industries as miscellaneous foods, sundry goods etc., where the Monthly Survey provides no data on input components, the main source of information being the trade organizations.

The 1963 annual census has another merit: it enables systematic conversion of raw material inputs from an establishment to an activity basis by the use of the product-mix matrix and input-output matrix prepared on an establishment basis. This procedure involves the following formula:

$$\bar{X}_{ij}=X_{ij}P_{jk} \tag{1}$$

$$X_{ij}=\bar{X}_{ij}[P_{jk}]^{-1} \tag{2}$$

where $\bar{X}_{ij}$ = intermediate transactions on an establishment basis, X_{ij} = similar transactions on an activity basis and P_{jk} = a square matrix of product-mix coefficients.[16] The product-mix coefficients are defined here as sectoral proportions of the product-mix within each establishment group. This implies that the input-output coefficients on an activity basis can be easily derived even if available input data are on an establishment basis. Application of this formula to the 1963 census data will be made in the near future.

3. *Surveys of corporate enterprises*

Among many surveys on corporate enterprises in Japan those undertaken by the Ministry of Finance are most useful for cost analysis. They consist of two sample surveys on an annual basis and a quarterly basis. Both sets of data, although on an enterprise basis, serve admirably for splitting value-added, indirect costs and other miscellaneous direct costs. Obviously value-added output ratios derived from these sources are different from those derived on an activity basis, yet they have helped in estimating the components of non-material cost items by industry. Use of the data from these surveys is not limited to manufacturing sectors, but is also extended to other sectors.

The above discussion has dealt with the basic data for the inputs used by manufacturing industries. In the light of international comparison of such data the following two points need to be emphasized:

(*a*) Industrial classification must be specified separately for output and input items. Only the significant output and input items need be selected for cost analysis in the first stage.

(*b*) Presentation in physical terms would be preferable to value terms if selected commodity groups are clearly specified. The unit of measurement for the presentation in physical terms must be standardized.

III. COMPARISON OF INTERINDUSTRY TABLES FOR 1955 AND 1960

Because of the increasing importance of long-term and medium-term projections of the Japanese industrial structure, it was imperative for the bench-mark interindustry tables for 1955 and 1960 to be completely comparable in terms of concepts and sectoral classification.

The analytical value of these tables would be greatly increased if they were based on internationally accepted statistical standards such as those provided by the SNA and the ISIC. Since the 1960 table was already based on these, adjustments for the 1955 table on a 150-sector basis were made under the sponsorship of the Council for Industrial Planning in 1961 and 1963.[17] The major aspects of these adjustments of the 1955 table are outlined below.

1. *Adjustment of sector classification to the ISIC*

The 1955 table is based in principle on the Japanese Industrial Classification which differs from the ISIC in (*a*) type of statistical unit, (*b*) sequential order of industries, and (*c*) concepts of specific industries etc.

(*a*) The ISIC is closer to the concept of technical unit, although both of these two classification systems are

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[15] *International Recommendations of the 1963 World Programme of Basic Industrial Statistics* (ST./STAT/SER.M./17/Rev.1/Add.I).

[16] S. Shishido, *Recent Input-Output Studies in Japan*, Memorandum C-6 of the Stanford Project for Quantitative Research in Economic Development 1957 (mimeographed).

[17] Since a similar attempt is also being made by the Council for the 1951 table, a full comparison of the three bench-mark tables will become possible in the near future.

TABLE 2. THE ANNUAL CENSUS OF MANUFACTURERS

I. Coverage

Schedule A: 147,000 establishments employing ten persons or more, covered by the Standard Industrial Classification for Japan: F—Manufacturing (excluding head offices where no manufacturing processes are operated).

Schedule B: 421,000 establishments with nine or fewer employees, covered by the Standard Industrial Classification for Japan: F—Manufacturing and automobile repairing service (excluding head offices engaging in no manufacturing and processing).

Schedule C: Head offices with two or more establishments.

II. Principal data collected

(Schedules A and B)

Production	No data collected.
Shipment	Value (quantity) of shipments by product (final products, excluding products of contract works for others for which materials are supplied by other establishments, and including products of contract works done by others for which materials are supplied to the establishment). Shipments by kind of product are covered only by schedule A. Transfer of products within the same enterprise is included.
Receipts for repairing and processing services, value of shipments of waste materials.	Receipts for processing and repairing services rendered to others during year (by kind of processing as to receipts from processing) and yearly value of waste materials produced in the course of production. In schedule B, shipments of waste materials are included in the shipments of products.
Value of raw materials, fuels and electricity consumed.	Value of raw materials, fuels and electricity consumed during year. Raw materials and fuels are those purchased from others and those supplied by other establishments of the same enterprise; excluding raw materials supplied by others for contract works, including materials and fuels acquired by themselves through primary manufacturing activities. Value of electricity is divided into "purchased" and "generated for own use": only the former is surveyed. Schedule A only. Schedule B: surveys are made of the total value of raw materials, fuels and electricity and of products of contract work. In 1963 only a survey was made of the amount of yearly consumption by principal raw materials.
Expenditures for contract and commission works.	The sum expended or to be expended for contract and commission work done by others for which materials (or products of the establishment) are supplied to others (schedule A only). As to schedule B, this is included in the value of raw materials, fuels and electricity consumed.
Excise duties	Value of excise taxes is included in that of shipment of products (schedule A only).
Stocks	Value of stocks of raw materials and fuels, and value of semi-manufactured products and work-in-process at end of year. As to products: quantity and value by kind of commodity (schedule A only).
Labour	Number of regular, self-employed, and family workers by sex at end of year (schedules A and B). Regular workers by month, yearly total cash wages and salaries paid on a contract basis and (specially) for regular workers (by salaried employee and wage-workers separately), and other payments (schedule A only).
Equipment investment, etc.	Value of tangible fixed assets at beginning of year, value of tangible fixed assets acquired, value liquidated, and value of depreciation, annually (buildings, structures, machinery and equipment, vessels, vehicles and carts and tools, implements and fixtures durable for a year or more). Increase and decrease in estimated value of provisional construction accounts (schedule A).
Other	Value of capital or value of contributions (company only) and kind of business organization, management system, land and building area, and water consumption for industrial use (for enterprises with 30 or more employees).

(Schedule C)

Principal business	Value of sales by product, receipts for processing services rendered to others, and other receipts.
Stocks	Stocks of products, raw materials and fuels at beginning and end of year excluded from schedule A.
Labour	Number of regular workers by sex, by salaried employee and worker and total cash wages and salaries paid for a year excluded from schedule A.
Equipment investment	As in schedule A but including only those excluded from it.
Other	Value of capital or value of investment, and kind of business organization.

TABLE 2. THE ANNUAL CENSUS OF MANUFACTURERS *(continued)*

III. Census organization

1. Respondent (interviewer)—City, town and village—Prefectoral government—Ministry.

2. Refining establishments only: Respondent—Local bureau—Ministry.

IV. Date of inquiry

31 December every year.

V. Date of return made to the office

31 March of the following year.

VI. Tabulation

Mechanical.

VII. Date of publication

Preliminary report: September of the following year. Report by industries and report by commodities: Two years later.

Source: Research and Statistics Division, Minister's Secretariat, Ministry of International Trade and Industry, Japan, 31 December 1964.

based on establishment unit. For example, some simple processing activities by farmers are included in agriculture by the JIC and in manufacturing industries by the ISIC; and "manufacturing retailers", who are engaged in manufacturing activity but also retail their own products, are classified in retail trade by the former but in their respective manufacturing industries by the latter. In the 1955 table however, both these activities were defined as manufacturing—different from that of the JIC. Thus, adjustment relating to the statistical unit was necessary only for the processing activities by farmers.

(*b*) An adjustment of sequential order was easily made by rearranging the original IBM punchcards of individual transactions in accordance with the order used by ISIC.

(*c*) The two systems show conceptual differences of certain industries. For example, the JIC includes repairs among the service industries, while the ISIC considers them to be a subsidiary activity of the relevant industries. This led to the repair activities in the 1955 table being broken down into several groups and reclassified under the relevant manufacturing industries. A similar adjustment was needed for the munition industries, which were split into several components on the ISIC basis. Conceptual adjustments were also made for some industries, among them crude salt, oils and fats, and machinery, as they had not been fully in accordance with the ISIC.

Commercial transport was broken down into five subsectors, railway, road, ocean, inland and coastal, and air and other, because of the analytical importance of these sectors and for comparability with the 1960 table. While the input data were already available, a new estimation was necessary for dividing the output row into these transport activities.

2. *Adjustment to SNA concepts*

In order to maintain strict comparability with the 1960 table, the concepts in the 1955 table relating to final demand and value-added had to be adjusted to the international statistical standards of the SNA.

The most important revision in this respect concerned educational and medical activities by the Government. Such activities had been treated as a part of private consumption in the original 1955 table; they now had to be transferred to the heading of government consumption.

In addition, private consumption expenditure in eating and drinking places was broken down into two parts—foods and service charges—so that in the adjusted table foods are held to go directly from producers to household, without passing through eating and drinking places, whose output is reduced accordingly.

Another adjustment to SNA standards was necessary for the value-added row of the 1955 table. First, imputed interest charges were estimated for each sector on the basis of financial statistics; this slightly reduced all the value-added in the original table. A similar adjustment, but in reverse, was also needed for rental services for business use, which were allocated to each related sector in terms of its contribution. This implies that the value-added in the related sectors was increased and that in the rental sector was reduced by the amount of this adjustment.

3. *Scrap and by-product matrix*

As in the case of the 1960 table, a matrix relating to the industrial origin and use of scrap and by-products was newly prepared in order to make the 1955 table fully comparable. In the original table for 1955, these scrap and by-products had been "transferred" from the originating sector to the using sectors, thus making their value of output higher. To bring this into accord with the principles of the 1960 table, the values of scrap and by-products were first separated from the original values of output in each sector, and then further broken down into sectoral components corresponding to their competitive industries. The matrix thus obtained was deducted from the original transaction matrix so as to derive net inputs as in the case of the 1960 table.

4. *Customs duties*

In the original 1955 table, customs duties had been included in the concept of the value-added row and the unallocated column. It was thus necessary to divide the total amount of customs duties into the relevant commodity groups and to add them to the related imports. This adjustment was based primarily on the customs duty statistics of the Ministry of Finance.

5. *Valuation*

Although both bench-mark tables are valued at producer's market prices, there are significant differences in the treatment of price differentials among certain using sectors. Because of the lack of basic data however, the average-price basis adopted in the 1955 table could not be adjusted to the actual price basis. This is the only difficulty which prevents strict comparison between the two bench-mark tables but, except for exports, this inconsistency is on the whole negligible in value terms.

6. *Deflation of the* 1955 *table in* 1960 *Prices*

After the 1955 table with 150 sectors had been made completely comparable in current prices, price deflators were estimated in order to compare these two tables at constant prices.

Various price data on goods and services were utilized for this purpose, and research was made on a more detailed basis than at the 150-sector level. The price deflators for commodities are generally of high quality, but those for services are less reliable because of the lower representativeness of the basic data.

In deriving the 1955 table in 1960 prices, the following formulae were used:

$$p_iX_i = \Sigma_j p_iX_{ij} + p_iY_i - p_iM_i \quad (1)$$

$$p_jX_j = \Sigma_j p_iX_{ij} + \pi_jV_j \quad (2)$$

$$(i, j = 1, \ldots, 150)$$

where X_i = output; X_{ij} = intermediate transaction; Y_i = final demand; M_i = imports; V_j = value-added; p_i or p_j = deflator for output, and π_j = deflator for value added.

π_j, deflator for primary factors (labour, capital etc.), is obtained indirectly from equation (2) above. The validity of such estimates, however, was checked, though at a more aggregated level, by using the information on wage rate and labour productivity. The results proved to be fairly satisfactory.

The input coefficients matrices resulting from the transaction tables recompiled as above are presented in tables 3A, 3B and 3C. The underlying transaction tables are all of the type in which all imports are treated as though they were competitive (as illustrated in the annex, table 9). Table 3A is derived from the 1955 table in 1955 prices, table 3B from the 1955 table in 1960 prices, and table 3C from the 1960 table in 1960 prices. The final demand quadrants corresponding to these three tables, together with total intermediate delivery and gross production, all in value terms, are presented in tables 4A, 4B and 4C.

7. *Measurement of changes in technical coefficients*

After all the adjustments so far described had been made, a test was undertaken to check the consistency of the technical coefficient matrix between 1955 and 1960 at the 60-sector level, using the following formula:

$$\lambda_i = \Sigma_j a^{60}_{ij} X^{60}_j / \Sigma_j a^{55}_{ij} X^{60}_j$$

where a^{55}_{ij} = technical coefficient for 1955, a^{60}_{ij} = technical coefficient for 1960, X^{60}_j = output for 1960, and λ_i = rate of change in the technical coefficient relating to use of the *i*-th input.

As indicated in table 5, fairly high rates of technical changes can be observed for certain primary and manufacturing products during this period, even after allowance has been made for statistical errors. Generally these technical changes can be classified into three groups: (*a*) substitution between energy inputs; (*b*) substitution of fabricated products for primary products; and (*c*) general increase in intermediate demand for manufacturing and service inputs.

(*a*) Substitution of petroleum and electricity for coal is the most notable phenomenon, which was also observed in the previous test of the coefficients for 1951 and 1955.[18] The magnitude of changes arising from this factor is also very similar to what was found in our previous studies.

(*b*) The second type of technical change is represented by the substitution of chemicals for natural raw materials such as cotton and other natural fibres and natural rubber etc. A similar tendency is also observed as to use of manufactured wooden products in place of material wood, cement products in place of cement and so on, but the degree of substitution in this area is more limited and is often cancelled out by other factors. Changes in

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[18] Ministry of International Trade and Industry, Japan, *Inter-industry Analysis of the Japanese Economy by the* 1955 *Interindustry Table*, 1957 (in Japanese).

TABLE 3A: 1955 INPUT

		Food crops 1	*Industrial crops* 2	*Livestock for textiles* 3	*Other livestock* 4	*Forestry and logging* 5	*Fisheries* 6	*Coal-mining* 7	*Iron-mining* 8	*Other metal-mining* 9
	01	25,133	6,584	273,758	261,251	219	111			
	02		103			48				
	03	1,137			189					
	04	92,035	56,021	6,975	9,672	217				
	05	4,849	1,196	1,308	3,946	249,010	4,795	54,685	6,953	21,407
	06	4				42	5,736			
	07				192	23	412	34,192	14,141	4,188
	08									
	09									
	10									
	11	4,317	1,902	2,616	1,992	6	559			
	12				35	84	1,265			
	13	549	649	141,892	124,021	6	1,667			
	14					158	13,328			
	15	4		27,245	32,923	828	11,047			
	16				283	716	79			
	17						83			
	18					21	4,484			
	19									
	20	7,941	4,317	2,616	2,637	4,395	51,248	1,370	528	1,352
	21				46	15	789	35	91	83
	22	1,575	11	8,283	5,446	20,075	13,887	7,813	9,782	13,769
	23				54	43	76	98	253	230
	24	3,088	2,517		1,844	169	858	385	998	906
	25			1	882	607	8,665	2,977	8,867	5,166
	26					2				
	27	41	34		29	280	767	4,855	2,637	2,212
	28	61,306	88,166		8,641	530	1,876	15,617	19,415	45,318
	29	11,816	23,739	19,834	31,428	1,009	1,517	31	22	20
	30	1,684	467		71	7,216	64,104	4,929	11,989	4,045
	31				451		914	96	479	708
	32	1,815	740		276	176	626	1,739	1,924	1,893
	33							3,995		
	34			218	227	1,471	272	10,940	23,964	24,529
	35				21	4	771			
	36	1,334	1,880	6,321	4,314	10,076	11,976	5,088	8,481	6,836
	37	4,247	6,926		21	2,669	347	12,874	23,487	7,255
	38	442			167	240	826	8,790	9,961	12,211
	39	287			118	3,063	1	1,586	725	683
	40	33	570				37,459		479	295
	41	187	68		181	442	325	1,020	7,211	1,848
	42	1,224			583	162	2,315	197	510	464
	43									
	44									
	45									
	46	4,234	866	77	246	4,290	368	6,446	20,214	10,794
	47	1,879		654	1,745	904	2,574	60,484	28,761	42,488
	48				38		1		2	2
	49				15	356	84	85	2	2
	50	23,117	30,744	26,591	28,069	3,725	29,704	7,957	15,951	16,419
	51									
	52	1,838	3,422	1,095	1,601	955	4,095	10,426	4,341	4,647
	53	2,218	3,037	3,193	3,281	585	2,501	7,207	1,486	2,921
	54	671	1,606	71	155	1,086	6,193	1,630	2,642	1,881
	55				147	2,315	615	1,512	6,473	7,284
	56	13,301	9,614	14,182	12,605	7,008	15,968	12,468	8,922	19,504
	57									
	58									
	59			5,231	2,661	6,630	17,902	602	1,203	3,276
	60	1,220	6,219	40,977	11,197	67,462	81,070	93,820	62,870	83,522
Subtotal	*61*	273,529	251,193	583,130	553,700	399,342	404,369	375,950	305,775	348,162
Value added	*62*	726,471	748,807	416,870	446,300	600,658	595,631	624,050	694,225	651,838
TOTAL	*63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*Unit:* 10^{-6})

Oil and gas extraction 10	*Other minerals extraction 11*	*Meat and dairy products 12*	*Grain-milling 13*	*Seafoods processing 14*	*Other foods 15*	*Beverages 16*	*Tobacco 17*	*Natural-fibre spinning 18*	*Man-made fibre spinning 19*	*Fabrics 20*
	235		936,857	107	111,495	37,930		4		8,320
		△231		△2,354	68,846	1,361	144,185	299,453	△1,336	13,877
		2,090						145,422		
		602,355		4,208	7,701			101,715	25,580	1,630
1,245	9,406	1,276	1	839	4,479	226		382	1	271
				503,105	853					80
625	12,400	2,921	298	5,949	3,830	4,030	379	3,772	514	5,608
3,913										
	5,977	86		6,169	3,142			31		81
		41,389		41	7,185	1,344				338
				8	139,142	4,863	10			
				50,333	209					
		20,502		53,967	146,034	19,085	1,214			4,937
				2,477	51	823				
					51			3,597		457,289
										10,353
238	5,635	245	550	2,946	1,397	1,279	429	261	234	122,102
76	29	60	6	37	37	22	2	10	9	36
6,961	6,856	853	994	16,133	3,650	1,424	2,103	889	944	1,029
209	80	118	16	102	47	61	6	28	25	99
824	1,107	16,521	2,612	13,256	3,242	2,217	14,335	698	715	6,640
11,471	4,248	2,574	925	7,120	4,292	6,956	10,941	3,997	7,146	4,691
			57		14		97	1,146	616	573
2,885	3,911	497	220	312	295	131	97	319	103	1,466
1,034	11,361	5,389		3,037	11,509	76,238	2,307	104,723	722,930	83,431
18	168	1,012	1	17,465	22,491	5,058	268	3,366	2	5,048
8,465	8,788	2,673	39	1,646	3,314	1,299	855	1,726	310	3,903
	235	103		16	1,295		5	38		86
4,742	1,141	8,045	142	1,028	19,002	70,668	20	77	103	67
							53			
72,488	5,655	206	31	386	44	13	189	25		36
		240			1,330		2,137	98	103	130
8,315	5,487	9,918	360	46,918	90,120	5,577	668	93	112	183
37,075	4,245	3,948	39	527	1,056	2,190	1,029	7,543	3,596	3,725
13,294	5,983	602	192	531	437	672	149	2,710	1,452	1,326
3,725	2,514	1,928	208	1,809	3,644	803	714	458	310	522
618	74									
11,138	811	1,654	38	320	423	871	476	1,625	208	1,020
422	174	468	43	1,690	343	706	12	65	50	933
10,067	1,802	2,696	125	1,690	1,006	1,571	656	3,792	1,342	2,814
51,703	20,543	4,026	2,787	4,154	69	2,974	588	11,669	6,063	5,547
7	1	129	32	1,626	2,156	954	15	49	1	526
7	149	994		453	1,470	134	97	36	1	352
9,168	24,906	38,195	30,137	58,416	71,309	31,501	4,395	16,040	13,314	22,232
7,333	4,818	25,763	1,663	6,363	6,545	4,405	1,420	4,850	3,240	4,236
2,534	2,725	16,421	4,358	1,764	8,156	3,246	1,184	1,661	1,249	2,358
937	20,908	16,811	216	7,349	1,645	547	1,486	1,806	14,116	1,381
5,568	2,425	1,876	248	986	1,048	1,449		2,158	2,055	3,655
13,024	7,827	9,196	2,938	10,016	21,029	11,851	2,671	13,705	9,635	14,276
1,249	905	35,575	774	8,280	7,745	11,326	388	6,955	16,541	1,931
62,701	101,672	33,013	12,678	20,242	24,667	17,299	14,483	27,392	22,020	27,345
354,077	285,198	912,132	999,587	861,466	735,539	333,107	210,062	763,757	847,631	826,484
645,923	714,802	87,868	413	138,534	264,461	666,893	789,938	236,243	152,369	173,516
1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 3A: 1955 INPUT

	Apparel 21	*Wood products* 22	*Furniture* 23	*Pulp and paper* 24	*Printing and publishing* 25	*Leather products* 26	*Rubber products* 27	*Basic and intermediate chemicals* 28	*Oils, fats and final chemicals* 29
01	4	33		1,613				12,141	75,306
02	81,523	266		9,493			277,089	2,928	116,877
03									
04	101	14				1,271			332
05	30	617,588	153	99,418			596	4,895	10,458
06	616	60				4,075		5,733	19,826
07	1,076	329	1,400	20,503	520	3,000	8,259	26,302	4,778
08								△5,269	
09								1,789	
10				575				349	36
11		68		6,927			30	61,602	1,075
12		65				350,036		7,128	21,728
13		90						804	3,123
14		68							
15		973		2,444	13		10	4,295	8,428
16		845						43	
17		65							20
18	30,789	266		6	607	5,412	2,655	11	
19									
20	410,913	837	8, 886	8, 697	7,552	27,162	149,524	9,739	2,21
21	7,951	18	28	16	41	12	37	22	49
22	11,097	41,241	300,986	7,730	419	775	745	6,051	25,919
23	35	51	1,504	44	112	33	102	61	135
24	5,036	2,792	3,936	333,359	313,201	978	1,027	54,837	18,733
25	5,330	2,581	6,666	105,506	1,164	4,355	5,216	2,109	2,075
26	56,171	11	1,859	79		90,174		9	
27	21,014	1,098	356	2,610	3,479	65	434	2,504	866
28	13,439	5,546	3,401	19,358	1,407	81,633	50,293	278,067	123,474
29	117	3,737	30,878	3,250	22,305	3	140	10,818	78,542
30	756	642	878	6,414	1,993	8,053	13,671	7,070	5,450
31	59	27	433	122	207	33	20	21,324	160
32	1	404	5,527	1,040	523	1	6,172	2,758	13,196
33								215	
34	1,557	1,655	19,643	260	168	228	30	2,669	860
35	1,026	24	3,832	128	3,182	4,890		9,759	544
36	5,529	2,543	24,141	2,463	403	21,887	48	633	8,322
37	1,971	791	1,731	2,812	9,502	2,250	1,212	6,158	1,819
38	246	489	156	3,156	1,911	605	226	4,338	1,111
39	440	810	1,375	543	33,926	653	283	660	2,613
40								72	20
41	395	154	121	672	5,873	3	39	1,700	770
42	9,979	1,175	14,161	176	226	35,667	7,454	184	617
43									
44									
45									
46	803	2,533	89	1,760	1,182	934	692	4,420	1,516
47	2,427	10,116	7,944	32,948	7,873	7,271	13,318	43,007	6,296
48	17		51	163	3,428			3,912	20
49	13	204	216	2,540	2,530	228	142	3,462	3,137
50	48,746	7,105	24,630	17,444	27,718	36,137	24,073	27,832	49,188
51									
52	3,087	3,481	12,634	6,049	5,270	4,954	5,689	15,209	8,950
53	2,660	2,459	15,001	7,274	5,950	2,059	2,044	8,023	6,517
54	560	414	1,195	1,550	367	1,408	2,009	4,431	3,008
55	3,339	2,158		1,578	31,784	1,989	5,079	1,634	3,563
56	9,529	12,386	25,194	10,156	12,516	12,163	11,813	13,859	12,103
57									
58									
59	21,090	1,693	1,668	1,648	22,573	6,782	12,722	5,109	48,645
60	27,751	47,612	35,104	27,274	69,565	68,309	70,559	56,708	95,391
Subtotal *61*	787,225	778,516	555,779	749,796	599,501	785,489	673,452	732,217	787,906
Value added *62*	212,775	221,484	444,221	250,204	400,499	214,511	326,548	267,783	212,094
TOTAL *63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE *(continued)* *(Unit: 10^{-6})*

Petroleum products 30	*Coal products* 31	*Non-metal mineral products* 32	*Iron and steel (primary)* 33	*Steel rolling, casting and forging* 34	*Non-ferrous primary metals* 35	*Fabricated metal products* 36	*General machinery* 37	*Electrical machinery* 38	*Automobiles* 39	*Other transport equipment* 40
		26				5	2	46		
		99								
								73		
2	25,277	17,574	955	239	767	1,183	72	2,863		
24	677,884	69,525	2,191	3,275	7,336	1,548	1,864	2,039	928	2,220
			93,084							
		1,603	12,401		375,291		635	25,927		
426,736		159		59	61		11	113		
1,622		79,478	3,211	725	1,278					
		80		33						
	14									
		73								
	55									
		107				5	159	4,916		67
							2			
108	226	1,469	16	18	195	1,590	2,429	1,763	2,066	6,580
34	15	22	3	5	15	77	20	22	58	24
248	5,159	12,677	158	1,212	2,059	3,338	7,631	9,715	1,886	43,535
95	42	60	10	14	42	215	7,408	4,635	465	667
494	8,583	29,237	147	96	221	1,571	1,588	8,675	844	367
5,179	6,991	4,224	111	390	2,468	5,392	6,006	833	1,716	775
						72	1,369	24	1,017	3,423
425	987	537	741	721	199	2,841	6,424	4,462	77,281	29,132
8,695	△6,414	17,617	1,788	2,085	5,051	4,042	2,647	7,676	14,258	10,247
76	17	585	3	56	△2,689	2,787	4,812	7,051	11,872	27,732
34,102	9,623	23,273	11,769	8,430	6,492	3,702	3,455	5,109	2,848	4,779
8	4,976	2,871	90,801	3,525	11,724	3,620	3,070	2,133	351	448
973	3,031	52,296	14,438	844	7,363	2,073	3,777	16,999	12,990	5,491
		1,367	533,016	454,707		62	5	186		
	123	2,256	2	233,741	1,100	361,214	274,445	102,663	94,452	225,126
	82	3,640	3,762	16,845	186,312	101,303	57,400	166,345	10,002	16,692
3,741	824	87	6	801	1,034	16,096	14,867	4,981	17,467	12,561
320	466	709	15,179	12,625	4,368	10,705	145,302	16,220	95,684	91,389
127	201	518	2,572	1,775	1,382	5,186	28,957	160,036	22,879	29,921
4,059	850	2,859	367	1,298	1,482	1,221	652	629	93,917	882
			63	65	36		1,068	3	28,741	65,460
23	58	263	253	1,342	284	1,504	6,347	1,989	1,939	4,635
191	85	168	22	37	95	1,423	1,386	15,585	1,095	719
1,259	860	1,323	2,352	2,593	1,460	1,333	1,571	3,600	3,428	2,030
4,316	5,387	31,516	25,469	7,346	32,221	7,860	5,966	7,324	5,565	13,785
2	52,432	168	△6,154	2,786	36	928	509	2,017	2,135	576
214	192	198	192	544	565	197	807	40	367	30
8,530	15,276	47,355	7,555	9,491	12,417	24,680	31,152	42,363	47,946	46,254
2,230	52,491	20,541	12,393	5,460	7,635	7,397	6,436	7,950	5,879	6,785
1,253	20,663	15,953	6,579	3,119	5,655	4,083	4,102	5,385	3,435	4,803
1,607	33,845	9,719	2,375	1,667	2,347	1,986	2,132	1,892	1,602	2,148
2,238	1,151	3,615	488	2,354	2,312	24	646	678	1,531	800
8,953	4,375	13,515	4,035	5,571	11,840	9,678	11,323	8,441	9,219	9,364
4,308	3,180	3,073	253	1,172	881	524	7,002	4,413	1,395	1,764
23,992	56,788	113,466	32,175	38,812	67,376	22,042	33,701	19,288	1,649	5,375
546,180	880,934	585,913	874,781	825,879	758,712	613,506	689,311	677,104	578,906	676,589
453,820	119,066	414,087	125,219	174,121	241,288	386,494	310,689	322,896	421,094	323,411
1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

Table 3A: 1955 Input

		Precision instruments 41	*Miscellaneous manufacturing* 42	*Residential construction* 43	*Non-residential construction* 44	*Public works* 45	*Other construction* 46	*Electricity* 47	*Municipal gas* 48	*Water services* 49
	01	59	28	190	67	73				
	02	41,447	4,832	55	182	514	206			
	03									
	04	49								
	05	59	7,417	9,668	9,374	15,963	2,593	2		
	06		9,327	1,011	507		109			
	07	1,993	2,388		8	2,086	435	114,562	501,998	943
	08									
	09									
	10								8,932	
	11		1,695	13,617	18,220	101,707	14,253			2,419
	12									
	13									
	14									
	15		4,008							
	16									
	17									
	18	6,068	3,202							
	19									
	20	13,642	10,148	14,968	4,106	2,011	13,764	136	372	
	21	3,370	23	64	109	1,591	477	2,350	118	5,042
	22	16,131	43,320	283,618	173,600	27,552	68,479	793	251	
	23	481	64	56,306	27,576	233	2,571	120	327	
	24	27,183	31,236	3,336	939	917	1,355	472	1,289	
	25	7,788	36,918	1,555	1,660	2,415	2,691	3,839	11,303	1
	26	12,448	17,117							
	27	2,834	1,751	241	368	2,419	1,586	3,408	1,985	
	28	35,172	159,451	450	660	4,080	2,182	154	△37,278	△186,767
	29	6,398	10,465	9,265	7,439	440	5,510	10	28	328
	30	2,561	14,122	786	1,767	17,728	3,214	14,334	31,544	1,353
	31	1,260	272	2,140	2,273	1,203	10,362		△362,732	
	32	19,632	6,969	84,909	104,195	125,126	111,946	1,151	8,271	6,559
	33						118		805	
	34	53,377	33,111	41,458	68,989	24,114	70,049		40,128	12,298
	35	50,905	18,831	2,462	1,461	1,229	4,874		3,567	
	36	5,006	3,441	27,936	95,134	31,128	111,838	103	121	9,879
	37	21,906	2,060	4,509	30,283	5,871	15,322	57,367	37,097	69,280
	38	4,802	596	7,508	21,169	4,937	72,181	69,340	174	984
	39	460	1,049	619	1,062	12,924	2,940	3,905	8,583	4,756
	40	10				26	7			123
	41	97,088	249	669	715	885	1,459	170	28	41
	42	1,085	31,516	3,128	3,700	949	1,735	241	659	
	43									
	44									
	45									
	46	2,430	1,129	432	581	1,116	2,331	17,959		17,449
	47	3,069	9,233	795	2,080	4,060	855	9,338	27,333	115,521
	48			45	64	189	48	10,332	4,640	
	49	59	468	300	840	617	172	558	215	
	50	43,589	45,700	45,652	44,192	34,266	29,075	7,666	21,493	21,358
	51									
	52	6,057	6,503	15,497	16,752	21,032	13,859	19,988	76,683	2,324
	53	4,738	7,050	18,400	17,024	24,173	12,505	7,271	29,784	1,328
	54	1,195	1,345	2,834	3,657	8,001	3,474	10,708	47,159	1,269
	55	1,114	4,130	969	1,291	6,483	3,245	1,363		2,665
	56	12,835	14,185	8,395	9,043	12,246	9,919	10,902	15,933	9,204
	57									
	58									
	59	11,149	14,215	62	234	2,390	812	3,461	9,388	4,920
	60	42,473	95,676	42,952	45,453	37,286	20,727	1,697	107,048	56,859
Subtotal	*61*	561,920	655,241	706,801	716,778	539,982	619,277	373,697	597,248	160,134
Value added	*62*	438,080	344,759	293,199	283,222	460,018	380,723	626,303	402,752	839,866
TOTAL	*63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*continued*) (*Unit: 10⁻⁶*)

Trade 50	*Real estate* 51	*Railroads* 52	*Road transport* 53	*Other transport* 54	*Com-munications* 55	*Finance and insurance* 56	*Public administration and defence* 57	*Community services* 58	*Other services* 59	*Unallocated* 60
55		14	71	25					1	4,217
340		93								874
										535
449	18	4	11	2	2	1,568		2,417	6,434	1,608
										1,832
252	64	52,098	539	17,645	1,138	1,687		2,615	3,773	902
										2
△7		△14								1
			1,298							9
		2,438	296						36	3,317
								30		820
										2,792
										884
								274	1	108,388
										2,980
										224
									1,058	14,924
										1,315
2,605		1,627	648	728	864	113		757	3,846	17,220
548		4,851	1,436	1,193	4,055	419		1,859	1,580	152
10,516		12,981	14,012	5,914	199	78		1,177	1,422	32,709
2,308		173	141	290	201	99		667	2,424	782
13,156		2,665	9,292	5,987	1,434	391		2,625	4,083	6,128
22,570	69	5,214	8,307	3,718	9,735	17,642		24,075	41,211	14,135
		281	34							1,397
402			16,052	2,762	303	718		262	667	11,672
28		458	56	5	4	2		12	308	28,153
132		293	46	1,134	48	9		47,800	17,012	10,004
577		9,027	113,889	132,082	1,882	1,144		1,826	1,466	8,161
38		31,908	4,190	55	1,679			67	1,296	128
43		1,675	206	8	240	3		1,251	3,131	12,009
△53		△2,215								
342		11,622	1,836	192	605				791	13,271
								2,794	234	8,799
1,217		290	257	667	365	37		435	5,343	6,256
2,148		11,376	1,272	3,469	903	102		92	220	1,989
2,256		11,312	2,093	4,489	12,974	939		1,432	835	2,871
1,501		134	74,006	3,819	2,819	5,871		8,775	2,889	12,765
		21,932	2,687	64,380	735					4,577
494		484	207	1,154	128	9		10,638	8,618	2,050
3,979		380	415	645	553	200		5,900	5,053	3,212
9,723	121,733	87,230	11,145	2,592	1,912	13,236		21,257	7,796	2,493
3,850	27	21,791	7,669	140	5,887	4,231		7,551	17,863	8
590	14	153	17	2	378	1,364		5,750	5,163	1,575
369	9	1,855	939	2,033	1,699	935		2,711	2,662	4
7,036	27	7,838	18,944	17,055	2,808	3,488		15,516	19,700	50,533
13,732		10,952	3,342	9,075	9,347	8,379		11,592	7,940	23,936
4,472		6,312	4,373	4,055	6,543	2,475		6,270	3,425	656
13,507		5,008	1,438	7,731	6,076	899		2,214	1,104	3,140
34,848		987	7,706	5,702	8,830	62,531		4,384	15,552	4
16,260	39,750	8,348	13,929	41,268	11,539	1,013		14,347	15,889	12,211
								11,531	1,536	
52,573	55	3,258	16,988	36,807	20,253	21,436		33,889	52,814	27,837
35,912		31,568	67,239	155,690	26,445	17,152		64,209	29,608	3,473
258,086	161,767	366,380	407,027	532,514	141,684	168,169		318,998	294,884	470,547
741,914	838,233	633,620	592,973	467,486	858,316	831,831		681,002	705,116	529,453
1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

Source: Transactions table compiled at 1955 producers' prices.

TABLE 3B: 1955 INPUT

		Food crops 1	*Industrial crops* 2	*Livestock for textiles* 3	*Other livestock* 4	*Forestry and logging* 5	*Fisheries* 6	*Coal-mining* 7	*Iron-mining* 8	*Other metal-mining* 9
	01	24,864	7,888	358,175	270,954	178	104			
	02		58			27				
	03	862			151					
	04	86,257	63,288	9,362	10,241	163				
	05	6,064	1,782	2,020	4,850	253,446	5,178	70,244	8,259	30,721
	06	5				37	5,755			
	07				201	19	376	34,364	13,515	4,767
	08									
	09									
	10									
	11	3,751	1,953	2,226	1,403	4	331			
	12				41	75	1,282			
	13	557	778	190,004	132,784	5	1,556			
	14					141	13,593			
	15	4		31,848	30,813	595	8,992			
	16				272	527	66			
	17						72			
	18					14	3,670			
	19									
	20	7,610	4,877	3,366	2,694	3,386	46,031	1,358	503	1,516
	21				45	11	768	33	80	86
	22	1,535	13	11,239	5,976	18,301	12,612	8,986	10,633	17,841
	23				54	33	66	94	231	249
	24	2,683	2,579		1,733	119	687	342	838	906
	25			1	1,036	544	8,869	3,368	9,496	6,588
	26					2				
	27	36	36		28	201	627	4,389	2,256	2,254
	28	52,408	88,863		7,783	372	1,624	15,891	18,568	50,744
	29	10,780	23,808	22,047	27,735	766	1,308	30	20	22
	30	1,728	565		77	5,962	60,470	5,140	11,833	4,754
	31				478		845	98	463	815
	32	2,046	985		327	147	544	1,428	1,504	1,692
	33							3,802		
	34			312	260	1,285	272	12,093	25,116	31,542
	35				19	3	664			
	36	1,365	2,268	8,528	4,653	8,298	11,260	5,288	8,343	8,008
	37	4,764	9,163		24	2,410	358	14,669	25,330	9,317
	38	428			171	187	735	8,648	9,276	13,540
	39	260			113	2,232	1	1,458	631	708
	40	31	693				31,837		470	345
	41	168	70		151	309	275	955	6,392	1,949
	42	1,150			577	123	1,999	188	461	499
	43									
	44									
	45									
	46									
	47	1,809		830	1,771	700	2,277	59,142	26,619	46,823
	48				42		1		2	2
	49				24	443	119	133	3	4
	50	25,771	38,153	36,054	30,528	2,994	26,918	7,942	15,070	18,471
	51									
	52	2,050	4,501	1,610	1,882	857	4,196	11,810	4,654	5,932
	53	2,198	3,550	4,173	3,428	467	2,278	7,254	1,416	3,314
	54	649	1,829	91	159	885	6,261	1,616	2,450	2,086
	55				147	1,765	535	1,455	5,894	7,899
	56	12,991	11,074	18,264	12,979	5,509	14,329	12,368	8,377	21,806
	57									
	58									
	59			7,683	3,121	5,454	16,759	623	1,178	3,821
	60	1,191	7,164	52,770	11,528	53,027	72,753	93,067	59,030	93,379
Subtotal	*61*	256,015	275,938	760,603	571,253	372,023	369,253	388,276	278,911	392,400
Value added	*62*	743,985	724,062	239,397	428,747	627,977	630,747	611,724	721,089	607,600
TOTAL	*63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*Unit: 10^{-6}*)

r l- g	*Oil and gas extraction 10*	*Other minerals extraction 11*	*Meat and dairy products 12*	*Grain-milling 13*	*Seafoods processing 14*	*Other foods 15*	*Beverages 16*	*Tobacco 17*	*Natural-fibre spinning 18*	*Man-made fibre spinning 19*	*Fabrics 20*
		282		940,698	98	112,583	42,114		7		9,354
			△142		△1,473	64,044	1,282	131,676	319,876	10,911	10,677
			1,397						170,322		
			496,643		3,545	7,785			158,709	11,315	1,794
,721	1,705	13,737	1,312	1	893	5,634	288		687	1	349
					494,330	1,005					96
,767	673	14,475	2,558	292	5,326	4,107	4,380	399	5,429	1,953	6,142
	4,544										
		6,009	49		3,586	2,232			41		76
			48,556		41	9,357	1,556				496
					8	152,448	5,400	10			
					50,333	250					
			17,352		44,695	146,289	18,878	1,242			4,821
					2,038	50	822				
						45			4,910	1,241	325,694
											66,653
,516	251	6,348	210	533	2,539	1,455	1,341	436	340	287	120,778
86	74	31	49	5	30	36	22	2	13	9	36
,841	8,523	9,059	733	1,043	14,224	3,866	1,566	2,179	1,268	1,162	1,200
249	215	89	98	15	87	48	63	6	36	26	104
906	780	1,131	12,659	2,236	10,417	3,046	2,107	13,370	818	731	6,376
,588	13,842	5,556	2,528	1,014	7,145	5,157	8,471	12,917	6,098	5,413	5,760
				50		13		92	1,252	1,823	566
,254	2,782	4,087	390	193	250	283	128	92	392	254	1,439
,744	1,103	13,281	3,959		2,389	10,899	68,649	2,023	16,698	658,267	69,832
22	19	190	828	1	13,061	20,194	5,335	274	5,014	2	5,356
,754	9,414	10,594	2,419	39	1,522	3,670	1,458	930	2,560	974	4,417
815		278	91		15	1,406		5	56	18	96
,692	4,029	1,194	6,706	158	872	19,441	73,407	23	118	102	83
								53			
,542	85,257	7,306	197	34	377	51	16	218	37	19	43
			198			134		2,122	123	117	134
,008	9,219	6,593	8,949	362	43,254	9,949	6,240	724	124	138	207
,317	45,058	5,592	3,906	43	533	1,278	2,687	1,224	11,446	9,111	4,606
,540	13,951	6.805	514	183	463	456	711	153	3,238	4,475	1,416
708	3,653	2,673	1,539	185	1,476	3,560	795	685	584	341	521
345	683	89									
,949	11,127	876	1,323	30	249	416	875	450	2,065	1,319	1,026
499	429	192	388	40	1,431	348	726	12	83	69	967
,823	53,924	23,223	3,417	2,642	3,603	10,458	3,131	600	13,916	18,817	5,887
2	7	1	118	33	1,525	2,422	1,086	16	76	19	603
4	12	271	1,355		631	2,452	227	159	54	167	601
,471	9,761	28,765	33,190	29,164	52,048	76,222	33,895	4,579	21,664	16,248	24,229
,932	8,860	6,309	25,334	1,827	6,393	7,874	5,371	1,678	7,546	4,815	5,207
,314	2,720	3,171	14,350	4,253	1,575	8,720	3,517	1,244	2,270	1,625	2,576
,086	991	28,744	14,602	224	7,511	1,844	586	1,854	2,799	3,704	1,478
,899	5,714	2,699	1,567	232	842	1,071	1,501		2,772	2,334	3,816
,806	13,780	8,976	7,920	2,825	8,813	22,158	12,655	2,765	18,393	13,442	15,369
,821	1,379	1,082	31,962	777	7,601	8,516	12,617	420	9,179	12,076	2,169
,379	66,342	116,601	28,431	12,193	17,811	25,991	18,473	14,993	36,525	28,574	29,439
,400	380,819	336,309	777,655	1,001,325	812,107	759,263	342,376	199,625	827,538	811,899	742,489
,600	619,181	663,691	222,345	△1,325	187,893	240,737	657,624	800,375	172,462	188,101	257,511
,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 3B: 1955 INPUT

	Apparel 21	*Wood products* 22	*Furniture* 23	*Pulp and paper* 24	*Printing and publishing* 25	*Leather products* 26	*Rubber products* 27	*Basic and intermediate chemicals* 28	*Oils, fats and final chemicals* 29
01	4	28		1,822				13,091	77,442
02	55,654	167		7,455			268,232	2,376	111,938
03									
04	101	11				1,272			345
05	35	703,237	189	139,128			780	6,651	14,226
06	660	59				4,763		6,458	23,903
07	1,049	295	1,471	22,576	464	3,192	9,224	30,459	5,280
08								△6,387	
09								1,821	
10				682				436	43
11		52		7,004			30	60,622	964
12		68				498,514		11,051	32,140
13		82						952	3,526
14		68							
15		807		2,398	11		10	4,434	8,482
16		695						46	
17		55							20
18	23,857	195		5	443	4,708	2,424	11	
19									
20	341,106	723	8,793	6,739	5,681	27,902	159,848	10,946	2,375
21	7,349	15	27	16	33	12	37	23	49
22	12,139	42,104	360,600	9,161	396	881	882	7,502	30,752
23	32	43	1,504	46	95	34	108	68	142
24	4,291	2,228	3,663	341,895	253,351	910	1,005	59,839	18,112
25	5,822	2,590	7,847	130,181	1,164	5,191	6,528	2,737	2,569
26	49,344	9	1,760	78		86,470		9	
27	18,338	880	335	2,574	2,780	62	434	2,597	857
28	10,360	3,521	2,539	20,340	1,148	79,866	51,365	296,959	118,037
29	111	3,222	30,976	3,472	19,317	3	152	11,076	76,531
30	761	594	953	7,294	1,837	8,848	15,767	8,459	6,219
31	59	25	461	139	187	36	23	24,998	182
32	1	356	6,422	1,299	444	1	7,825	3,627	14,100
33								245	
34	1,658	1,618	22,553	312	164	265	37	3,632	1,038
35	942	21	3,794	133	2,677	4,903		10,255	560
36	5,547	2,344	26,104	2,792	371	23,970	55	755	9,466
37	2,168	797	2,053	3,494	9,569	2,701	1,527	8,051	2,393
38	234	427	160	3,386	1,662	627	246	4,897	1,196
39	390	1,476	1,316	544	27,577	633	288	696	2,630
40								85	22
41	350	125	113	625	4,487	3	38	1,819	758
42	9,194	995	14,062	183	191	35,871	7,870	202	645
43									
44									
45									
46									
47	2,291	8,773	8,082	35,136	6,805	7,491	1,440	48,250	6,738
48	17		56	189	3,205			4,747	23
49	20	284	354	4,352	3,512	378	246	6,241	5,393
50	46,978	6,377	25,580	18,990	24,455	38,009	26,580	32,021	53,750
51									
52	3,376	3,497	14,889	7,472	5,276	5,913	7,128	19,766	11,095
53	2,585	2,195	15,711	7,985	5,294	2,184	2,275	9,266	7,180
54	536	382	1,238	1,664	333	1,461	2,190	5,185	3,515
55	3,101	1,841		1,656	27,029	2,016	5,405	1,804	3,752
56	9,125	10,898	26,002	10,988	10,974	2,714	12,963	15,774	13,139
57									
58									
59	21,068	1,608	1,796	1,860	22,454	7,395	14,563	6,066	55,092
60	26,574	41,890	36,231	29,507	60,995	71,402	77,425	64,543	103,561
Subtotal *61*	667,227	847,679	627,634	835,572	504,381	940,601	697,917	805,161	830,180
Value added *62*	332,773	152,321	372,366	164,428	495,619	59,399	302,083	194,839	169,820
TOTAL *63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*continued*) (*Unit: 10⁻⁶*)

Petroleum products 30	*Coal products* 31	*Non-metal mineral products* 32	*Iron and steel (primary)* 33	*Steel rolling, casting and forging* 34	*Non-ferrous primary metals* 35	*Fabricated metal products* 36	*General machinery* 37	*Electrical machinery* 38	*Automobiles* 39	*Other transport equipment* 40
		27				5	2	48		
		70								
								71		
3	31,628	20,958	1,147	252	980	1,348	72	3,450		
24	644,001	70,541	2,242	2,941	7,959	1,504	1,650	2,091	1,043	2,243
			99,778							
		1,432	11,163		358,282		495	23,382		
355,883		174		57	72		11	125		
1,375		70,024	2,849	566	1,207					
		94		30						
	15									
		67								
	50									
		89				4	113	4,223		59
							3			
102	217	1,433	16	16	210	1,516	2,082	1,749	2,158	6,032
30	14	20	3	4	15	69	16	21	60	22
251	5,791	14,387	173	1,072	2,336	3,284	7,473	10,557	2,322	50,066
87	40	58	9	12	43	199	6,249	4,528	498	643
420	7,668	26,026	132	75	211	1,338	1,233	7,846	833	326
5,620	7,727	4,813	127	393	3,005	5,869	5,963	958	2,162	877
						63	1,093	23	1,031	3,122
368	872	489	679	579	193	2,471	5,097	4,100	77,799	26,396
7,750	△5,161	16,583	1,755	1,746	5,456	3,608	2,168	6,535	14,896	9,761
72	15	558	3	48	△2,836	2,579	4,045	6,879	12,732	26,682
34,102	9,803	24,440	12,451	7,817	7,284	3,714	3,162	5,415	3,307	4,995
8	4,966	2,956	94,115	3,202	12,888	3,559	2,753	2,219	400	460
1,069	3,362	49,522	16,706	860	8,979	2,044	3,694	17,990	14,495	6,043
		1,396	535,062	391,491		67	4	192		
	133	2,506	3	229,221	1,311	383,803	282,858	119,918	118,098	254,437
	76	3,324	3,460	13,581	181,753	92,470	47,593	156,547	10,564	15,857
3,729	837	91	6	740	1,156	16,096	13,561	5,262	20,216	13,085
350	519	814	17,547	12,793	5,356	11,736	145,302	18,785	121,410	104,371
120	193	513	2,568	1,553	1,463	4,909	25,002	160,036	25,066	29,506
3,580	764	2,648	342	1,062	1,467	1,080	526	588	91,925	813
			66	60	40		972	3	33,519	68,465
21	53	210	241	1,118	286	1,354	5,216	1,882	2,061	4,352
174	80	162	21	31	97	1,306	1,161	15,120	1,164	688
4,047	5,146	31,036	25,267	6,388	33,900	7,394	5,120	7,279	6,059	13,510
2	△54,179	179	△6,604	2,620	41	944	472	2,169	2,514	610
322	295	313	306	761	956	298	1,113	64	642	47
8,165	14,903	47,605	7,651	8,425	13,336	23,703	27,290	42,981	53,295	46,277
2,423	58,087	23,432	14,243	5,500	9,305	8,061	6,398	9,152	7,416	7,703
1,209	20,320	16,172	6,719	2,792	6,125	3,954	3,624	5,509	3,851	4,845
1,734	32,428	9,613	2,370	1,461	2,483	1,885	1,842	1,898	1,759	2,118
2,065	1,082	3,502	477	2,014	2,393	22	545	663	1,641	771
8,518	4,240	13,502	4,061	4,915	12,637	9,238	9,857	8,511	10,183	9,310
4,275	3,218	3,203	265	1,078	981	522	6,359	4,642	1,608	1,829
22,825	55,035	113,357	32,382	34,240	71,913	21,038	29,340	19,448	1,822	5,345
470,723	849,238	578,339	889,801	741,514	753,283	623,054	661,529	682,859	648,549	721,668
529,277	150,762	421,661	110,199	258,436	246,717	376,946	338,471	317,141	351,451	278,332
1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 3B: 1955 INPUT

		Precision instruments 41	*Miscellaneous manufacturing* 42	*Residential construction* 43	*Non-residential construction* 44	*Public works* 45	*Other construction* 46	*Electricity* 47	*Municipal gas* 48	*Water services* 49
	01	71	30	169	62	66				
	02	34,204	4,430	33	114	316	125			
	03									
	04	59								
	05	80	9,202	10,281	10,487	17,813	2,797	3		
	06		10,838	961	496		104			
	07	2,349	2,526		7	1,831	377	118,289	458,163	606
	08									
	09									
	10								9,196	
	11		1,547	10,157	13,988	76,880	10,635			1,339
	12									
	13									
	14									
	15		3,778							
	16									
	17									
	18	5,041	2,813							
	19	48								
	20	15,573	10,046	12,425	3,490	1,719	11,491	138	348	
	21	3,950	22	52	96	1,483	429	2,589	103	3,468
	22	20,544	50,570	279,190	176,452	27,530	67,584	803	235	
	23	539	64	46,423	23,399	195	2,120	118	297	
	24	28,619	29,365	2,605	743	707	1,030	428	1,081	
	25	10,282	43,761	1,509	1,658	2,375	2,612	4,442	12,091	1
	26	13,219	16,321							
	27	2,989	1,659	187	294	1,901	1,230	3,150	1,697	
	28	36,316	128,745	360	545	3,527	1,866	132	△28,367	△102,276
	29	7,228	10,597	7,633	6,308	367	4,488	10	26	205
	30	3,116	15,428	703	1,627	16,069	2,876	15,285	31,098	898
	31	1,512	295	1,907	2,085	1,086	9,250		△350,357	
	32	23,884	7,263	73,964	86,869	92,579	94,860	1,349	8,185	3,261
	33						103		724	
	34	71,450	38,255	39,288	67,307	23,165	67,360		41,836	8,633
	35	56,318	18,774	2,010	1,228	1,017	3,980		3,104	
	36	6,071	3,747	24,906	87,292	28,123	99,742	109	119	6,536
	37	29,127	2,460	4,407	30,463	5,815	14,981	66,849	39,964	50,250
	38	5,514	614	6,336	18,387	4,222	60,938	69,767	162	616
	39	494	1,011	488	862	10,332	2,320	3,673	7,463	2,784
	40	12				23	6			81
	41	98,877	216	537	592	720	1,171	162	24	24
	42	1,208	31,516	2,561	3,118	787	1,421	235	595	
	43									
	44									
	45									
	46									
	47	3,501	9,460	667	1,795	3,451	717	9,338	25,269	71,906
	48			41	59	174	43	11,176	4,640	
	49	108	771	404	1,165	843	232	896	319	
	50	50,773	47,794	39,089	38,944	29,733	24,904	7,825	20,284	13,571
	51									
	52	8,007	7,718	15,058	16,752	20,709	13,470	23,154	82,121	1,675
	53	5,566	7,435	15,887	15,129	21,152	10,801	7,485	28,345	851
	54	1,424	1,392	2,398	3,181	6,848	2,969	10,753	43,737	815
	55	1,251	4,163	800	1,097	5,422	2,679	1,341		1,632
	56	14,858	14,743	7,144	7,919	10,560	8,443	11,060	14,943	5,812
	57									
	58									
	59	13,463	15,412	55	214	2,195	737	3,703	9,185	3,241
	60	49,166	99,440	36,549	39,807	32,152	17,643	1,722	100,399	35,905
Subtotal	*61*	626,811	654,221	647,184	664,031	453,887	548,534	375,984	567,029	111,834
Value added	*62*	373,189	345,779	352,816	335,969	546,113	451,466	424,016	432,971	888,166
TOTAL	*63*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

INPUT COEFFICIENTS TABLE (*continued*) (*Unit: 10⁻⁶*)

ater ices 9	*Trade* 50	*Real estate* 51	*Railroads* 52	*Road transport* 53	*Other transport* 54	*Com-munications* 55	*Finance and insurance* 56	*Public administration and defence* 57	*Community services* 58	*Other services* 59	*Unallocated* 60
	53		13	73	28					1	4,046
	△224		46								688
											512
	495	13	5	13	3	3	1,872		2,181	6,924	1,919
											1,936
606	237	40	46,431	539	19,308	1,194	1,717		2,012	3,431	917
											3
	△6		△11								1
				1,404							9
1,339			1,871							21	2,789
									25		995
				256							2,903
											1,005
									188	1	105,579
											2,797
											216
										835	8,917
											2,434
	2,372		1,466	644	787	852	113		571	3,338	15,944
3,468	471		4,618	1,534	1,382	4,541	451		1,431	1,357	150
	10,566		13,006	15,131	6,924	205	78		888	1,292	37,939
	2,067		147	135	303	201	96		488	2,099	758
	10,851		2,080	8,156	5,747	1,319	350		1,774	3,272	5,499
1	23,796	48	5,208	9,337	4,568	11,447	20,120		20,756	41,991	16,121
			226	30							1,282
	339			14,417	2,712	285	654		181	543	10,637
2,276	24		393	54	5	4	2		9	263	24,661
205	121		253	45	1,206	49	8		32,103	14,984	9,188
898	561		8,310	117,979	149,582	2,040	1,203		1,451	1,377	9,209
	36		28,822	4,264	63	1,816			52	1,192	132
3,261	43		1,352	187	10	301	3		917	3,187	13,583
	△47		△1,861								
8,633	351		11,315	2,012	229	699				867	14,752
									1,930	200	8,323
6,536	1,178		266	266	753	394	38		344	5,001	6,555
0,250	2,281		11,444	1,440	4,293	1,070	117		80	226	2,285
616	2,069		9,825	2,046	4,797	13,267	931		1,073	739	2,848
2,784	1,286		109	67,614	3,815	2,695	5,443		6,149	2,392	11,834
81			20,009	2,759	65,691	800					4,590
24	415		397	179	1,120	123	8		6,983	6,003	1,636
	3,539		320	393	669	549	193		4,291	4,343	3,091
1,906	3,508	16	18,811	7,450	148	5,983	4,171		5,626	15,818	8
	581	9	143	18	2	416	1,454		4,634	4,918	1,680
	540	9	2,573	1,465	3,468	2,775	1,481		3,245	3,766	6
3,571	6,548	17	6,907	18,787	18,489	2,913	3,510		11,805	18,098	55,492
1,675	14,495		10,952	3,760	11,164	11,005	9,567		10,006	8,100	27,331
851	4,194		5,609	4,373	4,434	5,904	2,511		4,809	3,104	666
815	15,154		4,354	1,454	8,503	6,313	921		1,696	1,001	3,457
1,632	31,244		838	7,365	5,958	8,830	60,648		3,214	13,475	4
5,812	15,031	24,183	7,311	13,727	44,462	11,898	1,013		10,845	14,195	12,211
									12,474	1,963	
3,241	50,699	35	2,997	17,468	41,369	21,929	22,362		28,462	50,952	30,360
5,905	33,198		27,647	66,265	167,739	27,266	17,152		48,536	26,451	3,473
1,834	238,066	24,370	254,202	393,039	579,731	149,085	158,187		231,229	267,720	473,371
8,166	761,934	975,630	745,798	606,961	420,269	850,915	841,813	1,000,000	768,771	732,280	526,629
0,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000.000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

Source: Transactions table compiled at 1960 producers' prices.

TABLE 3C: 1960 INPUT

	Food crops 1	*Industrial crops* 2	*Livestock for textiles* 3	*Other livestock* 4	*Forestry and logging* 5	*Fisheries* 6	*Coal-mining* 7	*Iron-mining* 8	*Other metal-mining* 9
01	43,079	31,325	275,685	161,139	△2,113	79			
02		1,479			△557				
03	302		4,364						
04	31,879	23,188	16,679	18,436	137				
05	3,160	2,209	1,745	4,294	388,594	3,931	47,618	5,625	22,494
06						22,389			
07				340	17	223	15,010	1,763	2,630
08									
09									
10							80		107
11	154	124	2,182	1,189	2	296			
12				371					
13	7,218	7,136	112,242	64,513	2	139			
14						78			
15	1,899	1,771	43,394	191,396		11,402			
16	55	46		551					
17									
18						1,346			
19									
20	9,795	6,379	727	2,079	2,035	45,103	5,201	2,793	1,174
21				113	85	77	3,358	1,815	764
22	212	175	2,570	2,426	483	12,518	3,577	77	32
23				375	213	84	3,616	1,944	820
24	1,444	22		1,013	125	3,032	4,918	2,639	1,111
25				793	171	84	10,075	2,999	9,269
26					12				
27	848	517	6,206	706	102				
28	64,568	89,244		8,992	935	1,662	18,564	19,565	34,375
29	16,869	28,105	12,267	9,659	1,429	2,227	191	13	6,673
30	4,355	6,401	727	1,990	8,679	73,894	5,002	8,212	6,141
31				667	2	3	11	26	1,011
32	1,681	2,763	485	968	129	1,029	1,046	64	24
33									
34			145	204	202		19,352	1,776	30,378
35				27					
36	1,151	960	776	2,493	2,347	7,837	5,138	4,068	4,471
37	4,012	2,021		534	2,216	15,570	16,904	29,116	11,108
38	2,683	513		888	2,119	1,371	4,672	4,776	6,695
39				44	3,896		663	759	735
40				36	889	29,140	4,367	6,204	
41				272	154	32	1,382	747	310
42	2,399	585	485	281	306	8,713	1,901	1,622	1,021
43									
44	5,114	5,127	3,345	14,655	795	1,559	7,792	65,351	35,660
45									
46									
47	1,852	1,340	630	6,308	187	627	72,623	45,258	58,310
48				165	72		358	77	83
49				327	8		561	219	2,198
50	11,319	14,293	20,752	20,132	3,312	12,241	19,788	12,499	16,436
51						10	197	1,738	437
52	2,826	3,607	1,552	3,435	2,010	4,891	10,866	18,703	13,667
53	3,219	5,116	5,770	6,914	437	3,139	1,767	669	1,196
54	1,897	2,693	1,842	1,847	328	4,958	2,749	1,892	2,371
55				771	433	513	7,690	19,269	8,007
56	9,045	9,168	776	2,404	5,219	8,663	12,336	7,067	16,013
57									
58							2,080		1,343
59				3,168	1,455	7,820	13,288	8,328	13.525
60	1,673	9,370	136,145	13,352	4,407	23,124	24,731	59,340	70,809
Subtotal *61*	234,709	255,678	651,491	550,262	431,276	309,804	349,473	337,015	381,399
Business consumption .. *62*				2,199	3,674	9,842	29,612	68,350	55,279
Wages and salaries *63*	23,254	33,761	1,115	14,994	119,106	263,115	478,666	223,664	314,230
Business surplus *64*	649,640	633,097	287,806	362,882	405,442	284,087	35,520	276,104	138,898
Depreciation *65*	73,340	51,114	39,127	52,232	33,063	127,206	80,966	88,688	86,026
Indirect Tax *66*	19,704	26,883	22,691	17,774	7,480	6,119	25,763	7,221	26,090
(△) *Subsidies* *67*	△646	△533	△2,230	△342	△42	△173		△1,043	△1,924
Total value added *68*	765,291	744,322	348,509	449,738	568,724	690,196	650,527	662,985	618,601
TOTAL *69*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*Unit: 10⁻⁶*)

	Oil and gas extraction 10	*Other minerals extraction* 11	*Meat and dairy products* 12	*Grain-milling* 13	*Seafoods processing* 14	*Other foods* 15	*Beverages* 16	*Tobacco* 17	*Natural-fibre spinning* 18	*Man-made fibre spinning* 19	*Fabrics* 20
		11	122	926,155	748	134,074	50,725	2	5	16	5,512
			132		154	21,765	1,716	127,978	289,738	26,156	27,186
			1,772						183,366	14,147	
			508,374		716	7,636			99,192		1,904
,494	660	5,519	15		1,188	3,556	478	108	1	2	233
			2,879		516,811	4,418					
,630	172	14,278	922	111	696	1,867	2.936	399	3,176	471	3,048
107	10,186	16									23
		9,896	390		6,704	5,440					
			131,927		3,170	8,560					
					7	115,327	1,545				
					10,063	214					
			34,685		61,071	211,703	37,765	1,098			4,591
					1,201	2(436	47,178	364			
								16,942			
				4	157				3,928	337	322,030
										△1,850	97,946
,174	479	1,020	104	42	2,967	584	529	194	1,919	919	113,622
764	325	786	77	512	317	△212	70	340	816	752	1,298
32	9	1,979	1,503	1	12,442	4,158	9,664	2,760	762	2,466	1,032
820	343	660	73	26	483	196	75	11	809	577	515
,111	470	4,066	13,963	3,705	17,468	7,319	5,899	15,151	2,288	4,745	3,227
,269	2,413	2,738	324	70	458	1,454	1,000	4,605	3,725	3,431	3,257
				432				171			
		34			867	21	3	125	13	43	969
,375	4,908	11,764	2,086		7,745	13,655	2,919	2,193	20,225	649,763	97,329
,673		1,080	19,420		3	45,716	4,012	990	7,610	5	7,710
,141	11,361	18,572	5,172	183	5,005	10,695	5,065	203	3,664	862	5,899
,011		440				469		3	14	47	28
24	9	63	10,595	99	626	5,337	52,528	26	26	19	17
,378		1,171	41		148	188		550	47	158	65
						78	633	4,531			
,471	5,504	3,097	7,612	48	33,235	8,497	5,835	475	141	448	190
,108	23,247	9,472	89	176	1,308	522	11	1,275	2,926	15,126	4,455
,695	48,888	8,626		309	640	446		509	1,232	3,673	1,223
735		656		179		746	100	276	12	10	24
310	127	396	27	10	131	76	29	4	309	220	197
,021	145	555	1,821	11	12,589	3,394	32	3,323	355	279	755
,660	51,292	25,644	299	255	12,963	4,563	3,944	2,346	2,701	3,361	1,715
,310	51,591	26,848	3,967	1,605	2,766	7,370	2,596	883	20,358	14,787	7,584
83	63	1,325	292	13	132	2,542	4	117	306	71	484
,198	425	372	2,818	22	1,173	1,383	625	29	497	584	197
,436	5,911	20,474	77,478	37,579	61,635	37,592	42,051	2,889	37,539	19,833	29,957
437	389	394		9	74	136	99	46	433	564	289
,667	3,624	9,622	6,509	4,224	3,998	7,066	5,512	2,054	4,424	4,747	5,006
,196	515	1,350	4,215	3,794	2,393	5,661	2,755	902	1,299	4,717	3,364
,371	416	5,412	3,137	11,647	2,835	7,420	3,181	409	3,378	2,315	2,654
,007	3,426	14,986	2,201	238	2,088	2,256	1,345	907	2,920	2,081	2,746
,013	6,336	10,188	4,598	636	2,252	8,232	5,299	4,166	8,305	6,026	7,480
,343	54		74	73	75	75	74	75	404	288	490
.525	11,361	5,889	13,002	153	5,350	8,902	21,132	1,939	4,907	5,013	5,353
809	66,676	77,297	45,432	8,011	23,227	43,797	56,660	14,346	33,450	1,259	17,866
,399	311,325	296,695	908,147	1,000,330	820,080	757,333	376,057	215,713	746,495	788,469	789,470
,279	11,578	23,648	4,424	3,650	5,131	16,146	12,367	1,440	10,181	7,381	8,931
,230	219,405	363,262	48,438	5,653	68,406	81,731	57,285	57,779	111,545	79,146	101,240
,898	186,524	212,064	14,135	14,079	92,923	88,702	49,297	6,846	94,792	88,141	76,326
026	263,512	77,424	20,393	1,253	11,456	20,937	18,932	7,512	31,467	31,458	18,502
090	10,277	27,016	4,463	727	2,005	36,069	486,427	710,710	5,521	5,404	5,531
924	△2,611	△108		△25,692		△918	△365				
601	688,675	703,305	91,853	△330	179,920	242,667	623,943	784,287	253,505	211,531	210,539
000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 3C: 1960 INPUT

	Apparel 21	*Wood products* 22	*Furniture* 23	*Pulp and paper* 24	*Printing and publishing* 25	*Leather products* 26	*Rubber products* 27	*Basic and intermediate chemicals* 28	*Oils, fats and final chemicals* 29
01	5	3		2,470	6			31	12,195
02	7,435	174		8,847			204,946	1,041	81,697
03	4,930								
04						631			538
05	6,629	548,569	338	57,477	2	16,216		1,735	4,906
06								1,960	7,258
07	1,166	603	2,105	16,512		4,179	5,999	17,358	3,116
08								△4,066	
09								1,279	
10		67		562				5,072	
11				4,454			567	34,582	1,267
12						320,410			2,407
13									8,242
14									4,016
15		5		1,014				2,366	13,897
16					15			1,067	4,309
17									13
18	20,965	377			138	1,430	450	95	
19	2,963						86		
20	472,117	1,238	23,764	5,188	3,184	76,300	154,375	2,817	2,122
21	15,525	267	686	746	765	757	2,011	1,074	3,053
22	5,003	101,341	175,030	24,031	1,700	1,633	13	5,363	29,008
23	553	216	5,020	486	723	50	350	645	514
24	5,238	3,857	5,128	419,868	307,741	3,721	1,306	43,992	49,493
25	2,240	898	351	30,466	16,301	329	1,396	4,447	1,321
26	49,675	41	142	13	408	146,390			416
27	16,790	30	4,522	59	123	4,654	19,770	475	921
28	4,099	5,620	42,064	27,287	8,181	33,394	105,247	323,210	151,906
29	752	8,806	32,362	1,627	31,205	4,050	923	11,898	94,133
30	1,763	4,552	1,531	10,280	14	6,422	19,161	26,652	12,211
31	116	61	986	64	20			20,152	561
32	18	614	6,484	938	41	1,445	8,795	1,691	12,344
33								29	
34	8,553	2,472	85,029	214	445		2,593	345	1,874
35	1,668	120	10,187		4,360			10,114	1,065
36	18,236	10,951	55,183	2,316	269	36,708	875	1,758	15,131
37	2,050	1,720	706	4,130	7,800	181	6,676	6,098	1,484
38	256	1,976	1,204		2,842	1,047	1,443	6,059	331
39		1,920							
40		379						20	
41	211	84	282	186	1,900	18	133	247	196
42	8,673	124	20,955	250	2,656	36,448	12,868	344	590
43									
44	1,205	1,769	10,591	2,034	2,421	8,122	2,114	6,228	3,042
45									
46									
47	3,689	6,793	7,899	48,698	4,624	4,949	12,469	46,223	7,899
48	313	82	605	177	936	775	762	1,123	905
49	313	135	378	405	396	57	109	3,610	2,945
50	76,563	37,077	47,532	30,358	27,578	50,941	46,840	33,965	44,855
51	124	22	1,969	275	374	243	261	311	198
52	4,708	11,759	10,611	11,034	13,317	4,035	7,305	13,366	8,271
53	4,271	4,780	10,392	10,054	11,364	3,980	3,336	6,180	7,168
54	2,909	6,792	5,259	7,747	2,850	3,392	4,915	10,625	5,667
55	2,521	1,284	1,434	2,292	22,560	457	1,431	4,111	3,247
56	8,816	8,562	14,337	9,327	17,888	8,058	10,632	9,505	8,487
57									
58	269	44	132	359	1,380	9	192	624	206
59	3,930	2,995	7,663	3,950	10,227	732	2,664	5,009	53,337
60	1,136	12,599	18,019	14,944	47,946	9,052	25,190	29,966	46,838
Subtotal 61	768,398	792,778	614,049	761,138	554,700	791,215	668,199	700,800	715,601
Business consumption .. 62	6,321	12,679	32,205	7,697	39,518	1,507	11,718	14,083	15,554
Wages and salaries 63	144,810	111,375	204,842	99,861	226,229	111,239	144,700	99,190	93,585
Business surplus 64	68,595	60,799	122,381	89,163	152,819	78,489	148,189	98,233	135,223
Depreciation 65	7,609	14,142	17,425	36,522	20,560	13,535	21,519	78,482	20,088
Indirect tax 66	4,268	9,227	9,097	5,619	6,173	4,016	5,674	9,213	20,137
(△) *Subsidies* 67									△190
Total value added 68	231,602	208,222	385,951	238,862	445,300	208,785	331,801	299,200	284,399
TOTAL 69	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*continued*) (*Unit: 10⁻⁶*)

fats inal icals 9	*Petroleum products 30*	*Coal products 31*	*Non-metal mineral products 32*	*Iron and steel (primary) 33*	*Steel rolling, casting and forging 34*	*Non-ferrous primary metals 35*	*Fabricated metal products 36*	*General machinery 37*	*Electrical machinery 38*	*Automobiles 39*	*Other transport equipment 40*
2,195			15	1	3	6	3		2		
1,697			340						687	△1,049	
538											
4,906		30,055	2,943		218	855	1,274				
7,258											
3,116		530,009	41,135	1,165	815	2,686	1,120	175	295	126	833
				75,781							
			2,754	11,263	385	182,941					
	361,102		83	178	54	80		26	148		
1,267	165		85,217	573	277	965					
2,407											
8,242			77								
4,016											
3,897			395								
4,309											
13											
			19				1	212	1,881	217	46
								98			
2,122	406	2,408	2,988	253	444	378	2,394	2,298	3,155	1,604	3,339
3,053	262	660	878	169	318	761	824	930	1,744	822	2,034
9,008	10	10,489	2,591	102	754	1,489	3,998	2,654	712	1,101	17,011
514	282	713	706	173	296	928	836	4,146	7,424	1,291	2,320
9,493	384	2,226	31,042	391	1,186	3,059	2,009	1,597	6,734	2,332	1,786
1,321	1,827	2,031	3,752	1,952	2,774	2,999	3,383	5,987	2,409	1,008	1,081
416							68	1,189	297	45	815
921			70	416	625	339	3,322	6,985	10,277	107,274	33,301
1,906	5,509	△1,525	18,225	3,461	7,009	11,198	5,850	2,596	11,522	374	2,816
4,133	9,518	5	2,326	1	188	771	3,542	3,646	6,173	8,464	11,735
2,211	21,579	7,425	40,172	7,568	8,364	8,248	3,699	3,568	6,104	2,241	4,082
561		49,913	6,426	73,893	5,020	8,562	3,317	2,167	1,563	321	944
2,344	9	1,868	84,667	12,932	4,401	7,481	3,780	4,504	15,301	9,907	4,370
		15,241	△90	488,317	464,910	△622	2,037	△3,944	△3,139	△3,597	△7,227
1,874			20,827	6	249,209	345	276,752	214,315	77,306	53,018	146,980
1,065		555	7,465	4,202	7,442	403,901	117,517	26,823	103,440	5,793	21,719
5,131	3,123	3,815	1,157	19	2,319	1,324	33,780	16,486	7,637	15,022	13,334
1,484	1,903	2,862	2,636	4,724	7,263	6,431	6,064	229,802	21,234	157,399	135,681
331	3,195	1,631	3,781	4,309	4,542	2,687	4,572	24,442	259,563	40,737	42,208
		55	2,069		834	2,097	110	4,225	3,465	186,727	1,434
					45			9	16	9,593	102,181
196	108	272	270	66	113	354	319	6,402	8,875	1,838	3,331
590	2,579	304	567	75	143	466	364	5,804	20,327	5,454	6,340
3,042	4,615	1,250	8,697	1,530	1,809	2,841	6,053	2,459	2,749	2,799	3,939
7,899	1,632	5,819	39,640	29,275	9,027	31,088	6,217	6,478	7,148	5,298	9,490
905	11	408	3,733	184	205	69	992	571	2,068	2,197	1,824
2,945	138	152	889	373	345	633	187	347	407	305	850
4,855	3,430	39,292	50,945	20,459	11,332	34,955	24,788	17,903	26,822	31,958	20,844
198	288	48	541	61	76	280	68	390	326	157	195
8,271	2,395	29,650	21,418	5,066	3,316	10,001	7,763	9,649	8,763	6,004	6,526
7,168	523	5,560	13,189	5,750	3,509	6,924	4,702	3,861	4,404	5,362	5,485
5,667	798	41,178	24,657	8,551	4,062	5,475	3,911	2,709	2,330	2,056	3,095
3,247	1,569	3,304	4,875	1,173	1,895	3,285	3,511	6,383	4,731	3,591	3,447
8,487	2,417	3,220	11,061	2,117	3,588	6,704	7,326	6,697	9,296	10,019	10,864
206	578	1,533	797	110	269	470	37	653	738	407	472
3,337	4,383	6,911	10,057	3,558	3,972	4,601	913	10,385	10,193	7,279	7,362
6,838	58,776	34,626	25,568	41,330	7,165	14,100	43,857	36,050	41,399	25,586	43,466
5,601	496,515	843,963	581,567	811,528	820,520	773,359	591,259	671,678	696,527	711,082	670,353
5,554	8,332	14,046	13,091	3,776	5,280	11,154	20,008	20,167	13,528	11,869	10,428
3,585	21,284	36,980	174,480	41,336	72,142	81,735	199,525	137,806	120,868	130,643	172,392
5,223	183,079	76,189	174,511	115,950	70,012	105,438	160,019	136,395	124,351	87,297	96,550
0,088	38,755	14,324	42,174	26,069	30,710	25,312	15,265	24,853	20,091	21,934	39,647
0,137	252,036	14,499	14,176	1,341	1,337	3,001	13,923	9,100	24,635	37,174	10,629
△190											
4,399	503,485	156,037	418,433	188,472	179,480	226,641	408,741	328,322	303,473	288,918	329,647
0,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 3C: 1960 INPUT

		Precision instruments *41*	*Miscellaneous manufacturing* *42*	*Residential construction* *43*	*Non-residential construction* *44*	*Public works* *45*	*Other construction* *46*	*Electricity* *47*	*Municipal gas* *48*	*Water services* *49*
	01	10	30	231	133	204			1	10
	02	23,858	860							
	03									
	04									
	05	2	9,203	8,401	4,718	15,335	5,939			392
	06		25,673	1,400	565					
	07	615	51	8	28	39	64	113,319	342,791	646
	08									
	09									
	10						9	31	25,013	
	11		4,525	13,193	12,634	38,442	10,083	△190		
	12		3,438							
	13									
	14									
	15		762							
	16	40								
	17									
	18	3,379	254							
	19	62								
	20	15,381	5,637	13,987	18,041	1,163	732	605	1,569	210
	21	4,233	1,835	296	352	883	529	1,252	1,020	3,197
	22	4,839	42,888	259,611	106,590	23,618	32,837	15	151	1,664
	23	1,182	850	35,873	10,246	776	472	942	1,088	333
	24	19,716	43,014	4,944	7,057	1,056	642	572	1,663	3,564
	25	2,006	2,870	1,170	2,028	2,438	1,858	1,761	4,392	2,203
	26	15,927	7,672	1	1		10			
	27	2,778	89	485	1,131	1,749	1,205		2	29
	28	17,132	249,373	1,179	1,937	5,141	4,104	74	1,283	13,730
	29	3,481	13,815	7,987	8,558	646	420	3	8	3,131
	30	6,332	12,172	5,655	6,326	35,006	13,302	76,243	30,292	31,083
	31	672	97	988	783	1,100	12,839		△336,983	9,531
	32	10,671	1,821	82,251	116,517	96,143	67,095	2,002	1,696	3
	33	△5,185						1,626	4,717	
	34	66,145	38,017	42,088	105,442	48,134	92,270		7	108
	35	41,791	14,858	3,793	2,413	228	2,251			
	36	3,045	4,701	56,603	106,213	54,759	91,738	612	2,625	12,222
	37	36,458	2,472	7,901	48,456	6,864	16,151	5,401	3,090	3,681
	38	2,675	670	19,508	38,021	8,411	121,957	56,150	5,206	4,655
	39			6,222	7,709	29,063	20,311		677	283
	40							5		
	41	149,546	324	198	2,201	296	5,928	161	12,710	3,613
	42	7,197	15,027	18,538	11,107	3,109	2,998	180	467	63
	43									
	44	3,564	2,650	781	1,074	1,067	1,022	40,514	47,408	15,558
	45									
	46									
	47	5,623	9,069	806	1,281	2,056	2,048		27,634	66,969
	48	287	7	140	346	252	256	1,366	26,894	1,184
	49	450	294	579	719	427	311	35	2,203	2,878
	50	28,477	44,533	55,338	57,668	39,149	37,180	10,502	39,856	13,238
	51	513	765	151	294	468	307	647	437	43
	52	11,511	10,168	12,131	13,607	14,614	12,793	14,157	23,384	4,466
	53	3,619	5,920	14,879	15,749	20,810	12,075	3,222	3,556	2,599
	54	2,693	3,177	6,067	6,946	9,624	6,263	14,588	32,036	1,005
	55	6,066	3,529	3,020	7,478	6,314	6,253	3,412	2,635	3,140
	56	12,691	11,061	8,069	9,681	8,355	7,729	1,048	13,637	4,888
	57									
	58	277	155	447	504	445	410	101	305	122
	59	27,163	23,957	3,190	7,621	5,113	5,579	2,586	11,901	9,244
	60	45,262	42,274	22,286	29,814	47,418	30,789	20,772	12,561	47,982
Subtotal	*61*	582,183	660,557	720,397	771,991	530,717	628,761	377,015	347,936	267,667
Business consumption ..	*62*	22,237	18,079	8,284	11,942	15,299	14,816	20,452	18,001	7,539
Wages and salaries	*63*	185,565	123,413	124,250	104,229	223,625	162,786	147,850	197,759	346,075
Business surplus	*64*	136,614	158,854	139,499	97,327	194,989	166,000	99,250	143,466	222,715
Depreciation	*65*	22,507	14,068	5,910	12,373	32,927	24,874	219,425	163,749	152,300
Indirect tax	*66*	50,895	25,029	1,660	2,139	2,443	2,764	136,008	129,089	3,704
(△) *Subsidies*	*67*									
Total value added	*68*	417,817	339,443	279,603	228,009	469,283	371,239	622,985	652,064	732,333
TOTAL	*69*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

COEFFICIENTS TABLE (*continued*) (*Unit: 10⁻⁶*)

Trade 50	*Real estate* 51	*Railroads* 52	*Road transport* 53	*Other transport* 54	*Com-munications* 55	*Finance and insurance* 56	*Public ad-ministration and defence* 57	*Community services* 58	*Other services* 59	*Unallocated* 60	*Total intermediate* 61
△472									433	2,404	36,494
										1,295	9,531
										7,246	2,734
										2,860	7,176
12	27	3	3			8		1,501	3,295		19,501
										11,516	4,162
		18,778	80	949	304	391		3,105	2,112	1,750	7,206
											2,170
											2,503
										411	4,928
										3,331	4,076
										4,189	1,962
										3,602	5,066
										10,496	389
837								171		5,941	11,115
										1,096	891
											133
										2,929	11,976
										2,037	3,579
4,751	4	923	2,126	7,789	1,573	3,449		786	2,437	77,794	15,171
3,765	10	3,153	3,106	4,226	3,696	2,227		1,869	3,524	24,164	1,979
5,387		20	210	468	7	88		20	5,439	1,845	15,064
3,232	51	797	1,569	825	310	2,399		2,731	3,408	1,339	2,357
12,283	98	743	1,411	982	3,997	3,267		5,442	3,532	18,813	17,554
12,553	28	3,321	4,185	6,145	15,695	16,806		19,160	64,767	427	6,880
									103	1,299	1,006
91		704	1,075	808	543			3,502	1,140	11,438	4,394
366		71		102				434	881	33,063	27,976
28		1,098	509	670	1,943	21		54,315	19,412	10,382	9,650
19,954	182	52,180	96,320	93,507	4,932	1,476		4,153	6,525	27,789	13,325
101	3	12,459			161	1		327	1,775	142	3,646
△490		239	34	89	6	78		1,441	2,418	11,821	12,880
				△2,031						573	35,430
328										38,558	41,372
								903		4,109	13,845
4,719		1,239	1,123	2,878	145	26		382	4,337	17,316	12,352
545		1,063	1,056	736	1,955	554		628	2,098	15,479	21,346
		51	54	428	16,810			2,619	3,361	33,271	20,256
13,238		39,482	106,965	635	1,766			1,650	152	26,468	8,470
	32	50,920		46,783				224	417	211	4,094
1,153	1	208	396	277	179	916		15,194	11,456	3,676	3,057
1,072	1	233	443	309	675	1,025		6,859	7,892	26,845	4,450
12,238	127,036	13,843	2,908	2,436	12,760	10,850		20,601	15,095	394	7,901
9,115	1,525	24,401	921	3,667	3,495	4,090		8,771	16,405	6,006	10,339
48	95	807	1,615	587	3,032	1,574		6,978	4,330	515	1,059
158	87	1,209	868	343	2,105	1,352		2,961	4,424	8,828	1,017
15,780	93	20,563	25,707	7,855	6,988	9,966		16,967	34,922	24,530	26,202
2,712	168	1,234	1,234	1,236	788	2,595		641	3,378		615
24,840	344	8,281	16,358	6,970	7,557	10,461		17,626	9,082	9,766	9,367
966	7	2,083	2,207	2,817	508	272		937	2,000	39,651	5,562
2,169	17	1,459	2,917	78,238	15,898	849		2,946	1,477	17,120	5,978
13,643	240	8,701	8,703	8,699	1,619	23,967		17,382	13,189	18,409	6,355
43,095	10,297	1,810	4,307	14,884	6,685	121,154		12,810	10,315	104,682	15,112
569		495	495	495		3,746			2,475		499
22,963	2,025	7,848	12,152	13,470	6,143	13,585		3,614	78,572	201	10,547
	8,016	23,562	67,519	97,983	59,960	38,363		15,204	19,440	2	24,783
231,751	150,388	303,989	368,577	406,253	182,236	275,558		254,851	366,019	698,031	557,482
80,195	1,862	31,048	25,522	20,672	12,897	35,001	52,243	68,543	25,377	154,347	23,890
276,614	5,065	368,739	338,936	282,540	406,101	329,488	642,295	500,704	236,756		162,222
318,558	474,170	100,021	113,929	147,314	228,774	273,981	193,051	136,012	272,910	58,697	173,861
59,916	259,402	179,377	142,898	127,798	158,349	34,539	112,411	36,648	72,104		48,401
32,965	109,113	16,827	10,137	15,488	11,643	51,432		3,241	26,835	92,163	35,059
				△65						△3,238	△915
768,249	849,612	696,011	631,423	593,747	817,764	724,442	1,000,000	745,149	633,981	301,969	442,518
1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000.000	1,000,000	1,000,000	1,000,000	1,000,000	1000,000	1,000,000

Source: Transactions table compiled at 1960 producers' prices.

TABLE 4A: 1955 TOTAL INTERMEDIATE USE, FINAL USE, IMPORTS AND GROSS VALUE OF PRODUCTION—VALUES IN 1955 PRODUCERS' PRICES

(*Thousand million yen*)

Industry	*Total intermediate use*	*Consumption*	*Gross fixed investment*	*Net increase in stock*	*Exports*	*(Minus) Imports*	*Gross production*
01 Food crops	1,192·2	209·1		108·5	3·1	−134·9	1,378·0
02 Industrial crops	323·7	− 9·6	− 2·2	9·0	1·8	−234·9	87·8
03 Livestock for textiles	67·1	− 4·7		0·5	0·0	− 58·3	4·6
04 Other livestock	260·0	70·6		10·9	1·3	− 3·5	339·3
05 Forestry and logging	439·8	59·0	− 0·6	1·3	1·7	− 26·5	474·7
06 Fisheries	75·9	125·1			15·8	− 0·3	216·5
07 Coal-mining	192·2	8·9		−5·4	2·4	− 20·1	178·0
08 Iron-mining	35·4			−1·9	0·0	− 29·4	4·2
09 Other metal-mining	89·0	− 6·6	− 39·0	−0·7	0·3	− 9·0	33·9
10 Oil and gas extraction	57·6	0·2		0·6		− 53·5	4·9
11 Other minerals extraction	111·3	4·0	− 1·4	−1·3	0·5	− 32·3	80·8
12 Meat and dairy products	33·7	100·2		0·7	2·9	− 20·8	116·8
13 Grain milling	161·1	879·1		14·8	3·3	− 71·2	987·0
14 Seafoods processing	10·0	92·0		3·9	16·2	− 0·2	121·9
15 Other foods	245·6	536·5		8·2	21·3	− 7·1	804·5
16 Beverages	3·8	283·9		12·1	5·5	− 0·3	305·0
17 Tobacco manufacturing	0·2	204·9		0·2	0·6	− 0·0	205·9
18 Natural-fibre textiles	398·3	19·3		−5·1	37·3	− 1·1	448·6
19 Man-made-fibre textiles	9·5			0·2	0·0		9·7
20 Other textiles	296·4	277·6	5·5	37·0	199·2	− 2·9	813·0
21 Wearing apparel	10·7	158·4	0·3	20·3	48·2	− 0·9	236·9
22 Sawmills and wood products	337·1	8·8		0·0	23·7	− 1·5	368·1
23 Furniture	38·9	27·8	10·0	0·1	1·9	− 0·1	78·6
24 Pulp and paper	331·6	9·5		0·5	7·7	− 6·4	342·9
25 Printing and publishing	194·9	115·0			1·2	− 1·7	309·5
26 Leather products	23·4	6·0		0·1	2·2	− 1·0	30·7
27 Rubber products	60·6	31·0		0·8	6·8	− 0·2	99·0
28 Basic and intermediate chemicals	528·4	0·3		1·9	44·4	− 16·5	558·3
29 Oils, fats and final chemicals	179·1	118·4		9·3	7·9	− 7·7	307·1
30 Petroleum products	154·7	13·7		4·1	7·5	− 48·0	132·0
31 Coal products	64·6	8·4		−0·5	0·4	− 0·0	73·0
32 Non-metal mineral products	230·0	−23·6		0·6	27·1	− 1·4	232·7
33 Iron and steel (primary)	511·6	−11·7	−68·8	−2·6	7·1	− 23·9	411·8
34 Steel rolling, casting and forging	561·2	2·5		−3·4	86·0	− 5·0	641·2
35 Non-ferrous primary metals	185·3	1·1		−3·0	21·2	− 8·1	196·4
36 Fabricated metal products	160·7	19·2	5·3	0·6	24·2	− 1·9	208·9
37 General machinery	205·7	19·6	191·7	19·0	37·3	− 34·2	439·1
38 Electrical machinery	166·8	30·0	114·1	5·9	17·2	− 6·3	327·7
39 Automobiles	94·4	12·0	81·9	2·0	7·3	− 7·0	190·7
40 Other transport equipment	55·6	29·9	142·5	0·1	42·0	− 2·4	267·6
41 Precision instruments	42·9	30·9	21·8	0·5	10·0	− 3·7	102·4
42 Miscellaneous manufactures	41·7	36·6		0·3	28·6	− 0·5	106·8
43 Residential construction			310·7				310·7
44 Non-residential construction			247·1		5·4		252·5
45 Public works			233·6				233·6
46 Other construction	135·1	23·7	268·1		14·8	− 0·4	441·3
47 Electricity	178·1	75·3			3·7		257·1
48 Municipal gas	17·7	19·6			0·0		37·3
49 Water services	15·3	9.0			0·1		24·4
50 Trade	489·0	1,019·8	45·7	5·7	95·6	− 6·4	1,649·3
51 Real estate		218·7					218·7
52 Railroad	170·2	85·9	4·4	0·6	26·9	− 0·0	288·0
53 Road transport	101·7	176·9		0·7	18·2	− 0·0	297·4
54 Other transport	69·0	42·6	0·0	0·2	11·5	75·2	198·4
55 Communications	135·6	21·9			8·2	− 3·8	162·0
56 Finance and insurance	239·3	134·8			5·3	− 4·0	375·4
57 Public administration and defence		487·3					487·3
58 Community services	8·9	633·0					641·8
59 Other services	282·0	682·7			30·9	− 10·9	984·7
60 Unallocated	672·3	101·5	− 1·0	− 1·5	70·4	− 28·5	813·1
61 TOTAL	10,696·5	7,225·7	1,569·4	256·1	1,063·7	−863·2	19,948·2

TABLE 4B: 1955 TOTAL INTERMEDIATE USE, FINAL USE, IMPORTS AND GROSS VALUE OF PRODUCTION—VALUES IN 1960 PRODUCERS' PRICES

(*Thousand million yen*)

Industry	*Total intermediate use*	*Consumption*	*Gross fixed investment*	*Net increase in stock*	*Exports*	*(Minus) Imports*	*Gross production*
01 Food crops	1,272·6	207·6		117·2	3·0	−140·2	1,460·5
02 Industrial crops	265·2	− 6·9	− 2·0	9·6	1·3	−188·4	78·8
03 Livestock for textiles	53·9	− 3·7		0·4		− 46·8	3·6
04 Other livestock	262·5	69·9		10·8	1·2	− 3·5	341·1
05 Forestry and logging	586·0	70·6	− 0·7	1·8	2·0	− 34·8	625·1
06 Fisheries	87·2	145·1			17·7	− 0·3	249·7
07 Coal-mining	199·6	9·3		− 5·4	2·4	− 20·3	185·7
08 Iron-mining	39·0			− 2·0		− 32·3	4·6
09 Other metal-mining	82·3	− 6·1	−36·1	− 0·6	0·2	− 8·2	31·4
10 Oil and gas extraction	52·5	0·2		0·5		− 48·5	4·7
11 Other minerals extraction	99·9	2·6	− 1·2	− 0·9	0·3	− 27·9	72·9
12 Meat and dairy products	46·5	118·2			3·7	− 28·3	140·3
13 Grain milling	173·3	946·1		15·8	3·4	− 76·6	1,062·4
14 Seafoods processing	11·7	108·1		4·6	18·9	− 0·2	143·4
15 Other foods	242·6	526·1		7·9	20·5	− 7·0	790·3
16 Beverages	3·6	275·1		11·7	5·2	− 0·2	295·6
17 Tobacco manufacturing	0·2	204·8		0·2	0·6		205·9
18 Natural-fibre textiles	274·6	11·1		− 4·1	27·0	− 0·7	307·9
19 Man-made fibre textiles	54·1				5·3	− 0·1	59·3
20 Other textiles	281·2	264·0	5·8	34·2	198·6	− 2·3	781·7
21 Wearing apparel	11·2	170·3	0·2	22·0	52·9	− 0·9	256·1
22 Sawmills and wood products	398·0	8·9			27·6	− 1·8	433·0
23 Furniture	39·0	27·7	10·0		1·8		78·7
24 Pulp and paper	318·2	8·3		0·4	7·2	− 6·3	328·0
25 Printing and publishing	230·1	135·7			1·4	− 1·9	365·4
26 Leather products	22·2	6·5			2·3	− 0·9	30·3
27 Rubber products	57·1	29·1		0·7	6·3	− 0·2	93·4
28 Basic and intermediate chemicals	478·2	0·2		1·6	42·1	− 14·6	507·8
29 Oils, fats and final chemicals	170·4	113·3		8·6	7·3	− 7·2	292·7
30 Petroleum products	168·3	14·8		4·5	8·0	− 52·2	143·5
31 Coal products	68·9	8·9		− 0·5	0·4		77·9
32 Non-metal mineral products	235·7	−22·3		0·6	28·6	− 1·6	241·1
33 Iron and steel (primary)	521·7	−11·6	−68·3	− 2·6	8·0	− 23·7	423·5
34 Steel rolling, casting and forging	659·6	3·1		− 3·9	99·2	− 5·7	752·4
35 Non-ferrous primary metals	179·5	0·9		− 2·8	20·4	− 7·7	190·5
36 Fabricated metal products	174·3	20·8	5·7	0·6	26·1	− 2·0	225·6
37 General machinery	244·5	23·2	227·9	22·6	44·4	− 40·6	522·1
38 Electrical machinery	171·2	30·7	117·1	6·0	17·5	− 6·5	336·4
39 Automobiles	89·8	11·4	75·1	1·8	6·7	− 6·3	178·6
40 Other transport equipment	57·9	31·3	149·1		42·3	− 2·3	278·6
41 Precision instruments	38·7	27·5	19·9	0·4	8·3	− 3·5	91·5
42 Miscellaneous manufacturing	41·5	36·3		0·2	28·5	− 0·4	106·3
43 Residential construction			378·0				378·0
44 Non-residential construction			292·0		6·3		298·4
45 Public works			280·3				280·3
46 Other construction	162·6	28·5	328·1		17·8	− 0·4	536·7
47 Electricity	181·7	76·7			3·7		262·3
48 Municipal gas	19·5	21·4					41·1
49 Water services	25·0	14·7			0·1		39·9
50 Trade	519·6	1,180·4	47·6	5·9	99·8	− 6·6	1,846·8
51 Real estate		372·2					372·2
52 Railroad	201·1	101·4	5·1	0·7	31·6		340·4
53 Road transport	106·7	185·7		0·7	19·0		312·3
54 Other transport	77·7	38·3		0·2	11·3	62·8	190·6
55 Communications	136·1	21·9			8·2	− 3·7	162·6
56 Finance and insurance	247·6	139·5			5·4	− 4·1	388·5
57 Public administration and defence		525·6					525·6
58 Community services	13·2	865·7					878·9
59 Other services	310·0	807·3			35·7	− 12·3	1,140·9
60 Unallocated	695·9	104·9	− 1·0	− 1·5	72·7	− 29·4	841·7
TOTAL	11,161·2	8,101·3	1,832·6	267·9	1,110·2	−846·6	21,635·5

TABLE 4C: 1960 TOTAL INTERMEDIATE USE, FINAL USE, IMPORTS AND GROSS VALUE OF PRODUCTION—VALUES IN 1960 PRODUCERS' PRICES

(*Thousand million yen*)

	Industry	*Total intermediate use*	*Consumption*	*Gross fixed investment*	*Net increase in stock*	*Exports*	*(Minus) Imports*	*Gross production*
01	Food crops	1,352·1	283·5	11·5	64·2	6·1	−145·9	1,571·4
02	Industrial crops	353·1	−17·1		−1·6	2·7	−252·4	84·7
03	Livestock for textiles	101·3	0·1	−0·3	0·2	3·5	−102·7	2·1
04	Other livestock	265·9	102·3	6·6	33·4	2·6	−1·6	409·1
05	Forestry and logging	722·5	61·4	−4·1	−2·2	3·2	−64·9	715·8
06	Fisheries	154·2	156·1		6·3	42·8	−4·3	355·2
07	Coal-mining	267·0	10·8		−8·2	0·2	−50·9	218·8
08	Iron-mining	80·4			4·3		−76·9	7·8
09	Other metal-mining	92·7			1·5	0·1	−53·4	41·0
10	Oil and gas extraction	182·6	0·3		2·4		−174·3	11·1
11	Other minerals extraction	151·0	3·0		−1·1	0·6	−39·0	114·4
12	Meat and dairy products	72·7	230·6		4·2	4·0	−31·0	280·5
13	Grain milling	187·7	919·1		0·6	1·8	−19·9	1,089·3
14	Seafoods processing	14·4	166·8		10·2	28·9	−1·7	218·6
15	Other foods	411·8	862·9		32·3	22·3	−109·4	1,219·9
16	Beverages	33·0	472·1		26·6	1·6	−2·6	530·7
17	Tobacco manufacturing	4·9	276·8		12·1	2·4	−6·4	289·8
18	Natural-fibre textiles	443·7	10·0		−6·5	42·9	−0·8	489·2
19	Man-made-fibre textiles	132·6	0·4		5·3	5·7	−0·9	143·2
20	Other textiles	562·1	461·8	2·6	50·9	253·7	−6·8	1,324·2
21	Wearing apparel	73·3	203·9		17·0	61·7	−2·3	353·6
22	Sawmills and wood products	558·1	14·4	−1·1	3·6	33·4	−3·4	605·0
23	Furniture	87·3	43·4	21·2	4·3	3·2	−0·2	159·4
24	Pulp and paper	650·4	−3·4		14·2	17·4	−12·6	666·0
25	Printing and publishing	254·9	130·1		5·4	2·8	−4·4	388·7
26	Leather products	37·3	14·9		1·5	4·3	−1·6	56·2
27	Rubber products	162·8	36·2		12·6	31·4	−1·2	241·8
28	Basic and intermediate chemicals	1,036·5	2·5		22·9	46·3	−78·0	1,030·2
29	Oils, fats and final chemicals	357·5	167·5		14·2	15·1	−53·9	500·4
30	Petroleum products	493·7	36·5		17·8	12·3	−79·4	480·8
31	Coal products	135·1	14·1		3·7	0·2	−0·4	152·7
32	Non-metal mineral products	477·2	−8·4		14·4	45·8	−5·7	523·3
33	Iron and steel (primary)	1,312·6	−4·1	−68·6	−16·0	5·2	−112·7	1,116·4
34	Steel rolling, casting and forging	1,532·8		−0·8	34·4	124·6	−11·3	1,679·7
35	Non-ferrous primary metals	512·9	−0·9	−42·6	12·7	11·0	−73·7	419·5
36	Fabricated metal products	457·6	25·3	34·5	20·3	48·3	−3·4	582·6
37	General machinery	790·8	55·3	763·2	70·2	61·7	−101·1	1,640·1
38	Electrical machinery	750·5	143·3	379·4	78·6	92·8	−17·4	1,427·1
39	Automobiles	313·8	20·2	276·6	18·6	44·6	−6·2	667·6
40	Other transport equipment	151·7	93·6	320·5	17·2	133·2	−21·6	694·5
41	Precision instruments	113·3	48·1	28·4	11·8	30·8	−15·9	216·5
42	Miscellaneous manufacturing	164·9	91·0	4·6	11·7	80·5	−3·9	348·8
43	Residential construction			707·8				707·8
44	Non-residential construction	292·7	6·4	813·1		0·1		1,112·4
45	Public works			489·1				489·1
46	Other construction			866·6		5·8	−0·2	872·2
47	Electricity	383·0	120·4			3·2	−0·4	506·3
48	Municipal gas	39·2	44·1			0·9	−0·3	83·9
49	Water services	37·7	24·6			0·8	−0·1	63·0
50	Trade	970·7	1,214·7	158·3	22·9	136·1	−13·5	2,489·2
51	Real estate	22·8	596·3					619·1
52	Railroads	347·0	406·9	3·8	1·7	12·6	−0·4	771·6
53	Road transport	206·1	48·9	8·2	3·6	23·1		289·9
54	Other transport	221·5	48·4	1·3	1·7	104·8	84·2	461·8
55	Communications	235·5	42·8			5·0	−2·9	280·4
56	Finance and insurance	559·9	344·2			0·9	1·4	906·3
57	Public administration and defence		825·3					825·3
58	Community services	18·5	1,154·2			0·7	−0·9	1,172·5
59	Other services	390·8	998·5			3·0	−5·7	1,386·6
60	Unallocated	918·2	−9·7		21·9	37·2	−23·7	943·9
	TOTAL	20,654·0	10,990·1	4,779·9	677·7	1,665·7	−1,718·7	37,048·8

product-mix are also important factors in the explanation of changes in technical coefficients; they have, too, a similar trend in favour of a higher degree of fabrication in raw material consumption.

(*c*) The general increase in the use of manufactured and service inputs seems to be related to the above two factors; but it is not essentially connected with substitution itself. This type of technical change is represented by such things as the increased use of tires due to the progress of motorization, the increase in repair expenses for machinery due to higher mechanization and so on. As for service inputs, such as trade, banking and communication, a tendency for these items to increase is also noteworthy, although it is cancelled out to some extent by the decrease in "Other services", for which the data for the corresponding price deflators are not altogether reliable.

Even though many other types of technical changes are implied in the table, the relatively small values of intermediate demand (for tobacco for instance) are subject to relatively high observation errors and their changes are not considered as significant, except for transport sectors, where shift from railway to other types of transport is significant.

To sum up: the total trend of the various types of technical changes noted above, though likely to cancel each other, appears to indicate a slightly increasing demand for total intermediate input, as shown at the bottom of table 5 (see also the right-hand columns in table 6). A similar trend was also indicated in our study on the 1951 input-output data[19] and on the pre-war data.[20] This may imply, however, that value-added ratios have had a tendency to decline slightly on the average.

The first two columns in table 6 summarize on a [illegible]5-sector basis the results obtained from the original [illegible]-sector tables. As can easily be seen this table implies that the value-added ratio in manufacturing as a whole tends to increase, largely because of higher efficiency in raw material consumption, whereas in other sectors (such as construction and services) there are opposite tendencies which substantially contribute to the slight tendency to decline in the value-added ratio described above. It should also be noted that value-added (or total input) ratios are generally quite stable, in spite of substitutions between various specific inputs, except for a few sectors.

The method of *ex post* projection, used as a test of the stability of input coefficients as in tables 5 and 6, involves the idea that changes in an input coefficient matrix can be looked upon as a combination of "substitution" and "fabrication" effects. The former refer to the trend of substitution between input materials such as fuels and electricity, natural and chemical fibres, wooden and

TABLE 5: WEIGHTED ROW-SUMS OF INPUT COEFFICIENTS, 1955 AND 1960

Sector	$\sum_j a_{ij}^{60} X_j^{60}$	$\sum_j a_{ij}^{55} X_j^{60}$	(1)/(2)
	(1)	(2)	(3)
1. Food crops	1,352·1	1,406·1	0·962
2. Industrial crops	353·1	446·4	0·791
3. Livestock for textiles	101·3	85·1	1·190
4. Other livestock	265·9	377·3	0·705
5. Forestry and logging	722·5	827·3	0·873
6. Fisheries	154·2	137·6	1·121
7. Coal-mining	267·0	394·4	0·677
8. Iron-mining	80·4	173·7	0·463
9. Other metal-mining	92·7	104·8	0·885
10. Oil and gas extraction	182·6	199·5	0·915
11. Other minerals extraction	151·0	195·1	0·774
12. Meat and dairy products	72·7	83·6	0·870
13. Grain-milling	187·7	250·9	0·749
14. Seafoods processing	14·4	17·2	0·836
15. Other foods	411·8	338·3	1·217
16. Beverages	33·0	4·6	7·220
17. Tobacco manufacturing	4·9	0·3	17·978
18. Natural-fibre spinning	443·7	462·8	0·959
19. Man-made fibre spinning	132·6	90·6	1·464
20. Fabrics	562·1	451·3	1·245
21. Apparel	73·3	18·2	4·032
22. Wood products	5,581·1	804·6	0·694
23. Furniture	87·3	89·5	0·976
24. Pulp and paper	650·4	529·2	1·229
25. Printing and publishing	254·9	372·7	0·684
26. Leather products	37·3	39·1	0·954
27. Rubber products	162·8	129·7	1·255
28. Basic and intermediate chemicals	1,036·5	872·0	1·189
29. Oils, fats and final chemicals	357·5	272·2	1·313
30. Petroleum products	493·7	303·5	1·627
31. Coal products	135·1	166·3	0·812
32. Non-metal mineral products	477·2	487·9	0·978
33. Iron and steel, primary	1,312·6	1,255·6	1·045
34. Steel rolling, casting and forging	1,532·8	1,749·1	0·876
35. Non-ferrous primary metals	512·9	528·8	0·970
36. Fabricated metal products	457·6	362·6	1·262
37. General machinery	790·9	640·5	1·235
38. Electrical machinery	750·5	476·9	1·574
39. Automobiles	313·8	157·9	1·987
40. Other transport equipment	151·7	134·4	1·128
41. Precision instruments	113·3	72·9	1·554
42. Miscellaneous manufacturing	164·9	84·2	1·959
43. Residential construction	0	0	—
44. Non-residential construction	0	0	—
45. Public works	0	0	—
46. Other construction	0	0	—
47. Electricity	383·0	337·8	1·134
48. Municipal gas	39·2	29·6	1·326
49. Water services	37·7	43·1	0·874
50. Trade	970·7	918·2	1·057
51. Real estate	0	0	—
52. Railroads	347·0	361·0	0·961
53. Road transport	206·1	200·3	1·029
54. Other transport	221·5	132·6	1·670
55. Communications	235·5	215·1	1·095
56. Finance and insurance	559·9	415·0	1·349
57. Public administration and defence	0	0	—
58. Community services	18·5	17·3	1·065
59. Other services	390·8	457·1	0·855
60. Unallocated	918·2	1,240·1	0·740
TOTAL	20,338·9	19,961·7	1·181

Note: For reasons of comparability, intermediate demand for construction (43, 44, 45, 46) and real estate (51) is excluded from column (1).

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[19] Ministry of International Trade and Industry, Japan, *op. cit.*

[20] H. B. Chenery, S. Shishido and T. Watanabe, "The pattern of Japanese growth, 1914-1954", in *Econometrica*, Vol. 30, No. 1, Jan. 1962.

TABLE 6 : WEIGHTED ROW-SUMS AND COLUMN-SUMS OF INPUT COEFFICIENTS, BASED ON THE 60-SECTOR INPUT-OUTPUT DATA

Sector	$\sum_j a^{60}_{j} X^{60}_j$ (1)	$\sum_j a^{55} X^{60}_j$ (2)	$\sum_i a^{60}_{ij} X^{60}_j$ (3)	$\sum_i a^{55}_{ij} X^{60}_j$ (4)
1. Agriculture, forestry and fisheries	2,949·1	3,279·8	1,035·6	1,036·2
2. Coal and crude petroleum	449·6	593·9	79·9	85·9
3. Other mineral extraction	324·1	473·6	52·1	54·0
4. Foods, processed	724·5	694·7	2,709·6	2,590·0
5. Textiles and apparel	1,211·7	1,022·9	1,795·2	1,845·0
6. Wood products and furniture	645·4	894·1	576·9	542·0
7. Pulp and paper products	650·4	529·2	506·9	573·2
8. Printing and publishing	254·9	372·7	215·6	231·2
9. Leather products	37·3	39·1	44·5	52·2
10. Rubber products	162·8	129·7	161·6	167·2
11. Chemicals	1,394·0	1,144·2	1,080·0	1,300·6
12. Petroleum and coal products	628·8	469·8	367·6	243·4
13. Non-metallic mineral products	477·2	487·9	304·3	285·5
14. Metals	3,815·9	3,896·1	2,953·0	2,872·2
15. Machinery	1,541·4	1,117·4	2,095·6	2,231·6
16. Transport equipment	465·5	292·3	940·2	1,071·7
17. Instruments	113·3	72·9	126·0	150·3
18. Miscellaneous products	164·9	84·2	230·4	237·1
19. Construction	292·7	376·6	2,176·6	1,853·9
20. Electricity and gas	459·9	410·5	237·0	267·9
21. Trade	970·7	918·2	576·9	602·2
22. Real estate	22·8		93·1	20·3
23. Transport and communication	1,010·1	909·0	580·1	704·4
24. Services	969·2	889·4	1,056·0	808·8
25. Unallocated	918·2	1,240·1	658·9	511·7
TOTAL	20,654·3	20,338·3	20,653·6	20,338·3
(4–18) Manufacturing total	12,288·0	11,247·2	14,107·4	14,393·2

Note: Totals of columns (1) and (3) are higher than the total of column (1) of table 5 because of the inclusion of the intermediate demand for construction and real estate. For the same reason, totals of columns (2) and (4) are also higher than that of columns (2) of table 3.

metal products, ferrous and non-ferrous metals etc. which can be observed in the rows. "Fabrication" relates to changes in the rate of value-added which reflect changes in capital intensity, productivity, product-mix, by-products etc. An input coefficient at time-point 1 ($a^1{}_{ij}$) may thus be approximated as:

$$\hat{a}^1{}_{ij} = r_i a^0{}_{ij} s_j,$$

where $a^0{}_{ij}$ is the corresponding actual coefficient at time point O; r_i is the substitution multiplier regarding the use of i-th input material; and s_j is the fabrication multiplier regarding j-th industry. However, the $\hat{a}_{\ ij}$ thus obtained would not be identical with the actual coefficient $a^1{}_{ij}$, but should be such that the column sum and the row sum of such coefficients, weighted by the outputs at time-point 1, equal the column sum and the row sum of the underlying actual transactions matrix for time-point 1. This means that r_i and s_j ought to be obtained by solving the following simultaneous equations:

$$\begin{cases} \sum_i r_i a^0{}_{ij} s_j X^1_j = \sum_i a^1_{ij} X^1_j \\ \sum_j r_i a^0_{ij} s_j X^1_j = \sum a^1{}_{ij} X^1_j \end{cases}$$

The substitution and fabrication multipliers calculated from the 1955 and 1960 tables (both in 1960 prices) were used as a basis for the projection of input coefficients to the year 1968 in the Economic Planning Agency's *Econometric Models for Medium-Term Economic Plan, 1964–1968.*[21] In this projection expert opinions for specific industries were also taken into account. The resulting set of multipliers, applied as such to the 1960 coefficients in order to obtain the 1968 projected coefficients, are presented in table 7.

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[21] Economic Planning Agency, Japan (1965).

TABLE 7: SUBSTITUTION (*r*) AND FABRICATION (*s*) MULTIPLIERS APPLIED TO THE 1960 COEFFICIENTS FOR THEIR PROJECTIONS TO 1968

(1960 = 1)

Sector	*Substitution multipliers* (*r*)	*Fabrication multipliers* (*s*)	*Sector*	*Substitution multipliers* (*r*)	*Fabrication Multipliers* (*s*)
Food crops	0·720	1·071	31. Coal products	0·747	1·690
Industrial crops	0·654	0·931	32. Non-metal mineral products	0·800	1·113
Livestock for textiles	1·156	1·140	33. Iron and steel (primary)	0·766	1·164
Other livestock	0·910	1·172	34. Steel rolling, casting and forging	0·706	1·311
Forestry and logging	0·741	1·306	35. Non-ferrous primary metals	0·768	1·330
Fisheries	0·979	0·947	36. Fabricated metal products	1·020	1·276
Coal-mining	0·453	1·111	37. General machinery	0·866	1·223
Iron-mining	1·081	1·079	38. Electrical machinery	0·843	1·181
Other metal-mining	0·554	1·049	39. Automobiles	1·734	0·916
Oil and gas extraction	3·700	0·987	40. Other transport equipment	0·941	1·179
Other minerals extraction	0·746	1·063	41. Precision instruments	0·848	1·159
Meat and dairy products	0·930	1·098	42. Miscellaneous manufacturing	0·865	0·876
Grain milling	0·907	1·394	43. Residential construction	—	1·445
Seafoods processing	1·024	1·059	44. Non-residential construction	0·890	1·334
Other foods	0·908	1·108	45. Public works	—	1·218
Beverages	0·917	1·164	46. Other construction	—	1·276
Tobacco	0·743	1·333	47. Electricity	1·028	1·257
Natural-fibre spinning	0·807	1·140	48. Municipal gas	1·332	1·475
Man-made fibre spinning	1·808	0·700	49. Water services	0·946	0·965
Fabrics	0·942	0·960	50. Trade	0·888	1·120
Apparel	0·931	1·098	51. Real estate	0·881	1·143
Wood products	0·539	1·341	52. Railroads	0·831	0·915
Furniture	0·791	1·195	53. Road transport	0·926	0·767
Pulp and paper	1·231	0·856	54. Other transport	0·889	0·949
Printing and publishing	0·868	0·912	55. Communications	0·905	1·272
Leather products	0·920	1·069	56. Finance and insurance	0·913	1·121
Rubber products	0·971	1·065	57. Public administration and defence	—	—
Basic and intermediate chemicals	1·586	0·695	58. Community services	0·886	1·071
Oils, fats and final chemicals	1·457	0·797	59. Other services	0·878	1·351
Petroleum products	1·619	0·296	60. Unallocated	0·923	1·012

Source: S. Shishido and K. Miyamoto, "An Integrated Model for Macro-economic and Interindustry Projection". 1965 (unpublished document), appendix table 2.

TABLE 8 : TRANSACTIONS TABLE AT PURCHASERS' PRICES

Inputs / *Outputs*	*Intermediate demand*							*Final demand*								*Supply*						
	Sectors						*Subtotal*	*Non-household consumption expenditures*	*Private consumption expenditures*	*General government*	*Gross fixed capital formation*	*Changes in inventories*	*Exports of goods and services*[a]	*Subtotal*	*Total demand*	*Production*	*By-products and scrap*	*Imports of goods and services*	*Customs duties*	*Trade margins*	*Transport charges*	*Total supply*
	1	*2*	*3*	*4*	*5*	*6*																
1. Agriculture	1	20	0	0	0	—	21	1	52	—	0	2	0	55	76	18	0	25	4	22	7	76
2. Industry	5	40	7	13	4	—	69	0	28	3	25	3	77	136	205	100	8	58	6	23	10	205
3. Commercial trade	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45	—	—	—	−45	—	—
4. Transport	0	2	1	2	1	—	6	1	3	2	—	—	7	13	19	44	—	−8	—	—	−17	19
5. Services	1	8	7	5	3	—	24	1	16	6	—	—	1	24	48	45	—	3	—	—	—	48
6. Government services	—	—	—	—	—	—	—	—	—	10	—	—	—	10	10	10	—	—	—	—	—	10
Subtotal	7	70	15	20	8	—	120	3	99	21	25	5	85	238	358	262	8	78	10	0	0	358
A. Non-household consumption expenditures	0	1	1	0	1	0	3															
B. Wages and salaries	3	13	9	4	18	10	57															
C. Operating surplus	9	13	18	13	16	—	69															
D. Capital consumption allowances	2	4	2	7	2	—	17															
E. Indirect taxes	0	5	—	1	0	—	6															
F. Less : subsidies	−2	0	—	0	0	—	−2															
GDP at market prices[b]	12	36	30	25	37	10	150															
Less : Revenue from by-products and scrap	−1	−6	0	−1	0	0	−8															
Total production at producers' prices	18	100	45	44	45	10	262															

[a] Including special procurement.

[b] Gross value added.

TABLE 9 : TRANSACTIONS TABLE AT PRODUCERS' PRICES

Inputs / *Outputs*	*Intermediate demand*							*Final demand*							*Adjustments*		
	Sectors 1	2	3	4	5	6	*Subtotal*	*Non-household consumption expenditures*	*Private consumption expenditures*	*General government*	*Gross fixed capital formation*	*Change in inventories*	*Exports of goods and services*[a]	*Subtotal*	*Less : Imports of goods and services*	*Less : Customs duties (incl. tonnage dues)*	*Total production*
1. Agriculture	1	12	0	0	0	—	13	1	31	—	—	2	—	34	−25	−4	18
2. Industry	4	26	6	10	3	—	49	0	22	3	21	3	66	115	−58	−6	100
3. Commercial trade	0	9	1	1	1	—	12	—	21	0	4	—	8	33	—	—	45
4. Transport	0	4	1	3	1	—	14	1	9	2	0	—	10	22	8	—	44
5. Services	1	8	7	5	3	—	24	1	16	6	—	—	1	24	−3	—	45
6. Government services	—	—	—	—	—	—	—	—	—	10	—	—	—	10	—	—	10
Subtotal	6	64	15	19	8	—	112	3	99	21	25	5	85	238	−78	−10	262
A. Non-household consumption expenditures	0	1	1	0	1	0	3										
B. Wages and salaries	3	13	9	4	18	10	57										
C. Operating surplus	9	13	18	13	16	—	69										
D. Capital consumption allowance	2	4	2	7	2	—	17										
E. Indirect taxes	0	5	—	1	0	—	6										
F. Less : Subsidies	−2	0	—	0	0	—	−2										
GDP at market prices[b]	12	36	30	25	37	10	150										
Total production at producers' prices	18	100	45	44	45	10	262										

[a] Including special procurement.

[b] Gross value added.

TABLE 10 : TRADE MARGINS

Inputs	Intermediate demand							Final demand							
	Sectors														
Outputs	1	2	3	4	5	6	Subtotal	Non-household consumption expenditures	Private consumption expenditures	General government	Gross fixed capital formation	Change in inventories	Exports of goods and services[a]	Subtotal	Total
1. Agriculture	0	−5	0	0	0	—	−5	—	−17	0	0		0	−17	−22
2. Industry	0	−4	−1	−1	−1	—	−7	—	−4	0	−4	0	−8	−16	−23
3. Commercial trade ..	0	9	1	1	1	—	12	—	21	—	4	—	8	33	45
4. Transport	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5. Services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6. Government services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Including special procurement.

TABLE 11 : COSTS OF DOMESTIC GOODS TRANSPORT

Inputs	Intermediate demand							Final demand							
	Sectors														
Outputs	1	2	3	4	5	6	Subtotal	Non-household consumption expenditures	Private consumption expenditures	General government	Gross fixed capital formation	Change in inventories	Exports of goods and services[a]	Subtotal	Total
1. Agriculture	0	−3	0	0	0	—	−3	—	−4	0	0	0	0	−4	−7
2. Industry	0	−4	0	−1	0	—	−5	—	−2	0	0	0	−3	−5	−10
3. Commercial trade ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4. Transport	0	7	0	1	0	—	8	—	6	0	0	0	3	9	17
5. Services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6. Government services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Including special procurement.

TABLE 12 : BY-PRODUCTS AND SCRAP

Outputs \ *Inputs*	*Intermediate demand*						*Subtotal*
	Sectors						
	1	*2*	*3*	*4*	*5*	*6*	
1. Agriculture	0	0	0	0	0	—	0
2. Industry	−1	−6	0	−1	0	—	−8
3. Commercial trade	—	—	—	—	—	—	—
4. Transport	—	—	—	—	—	—	—
5. Services	—	—	—	—	—	—	—
6. Government services	—	—	—	—	—	—	—
Revenue from by-products and scrap	1	6	0	1	0	—	8
TOTAL	0	0	0	0	0	—	0

TABLE 13 : IMPORTS MATRIX AT PRODUCERS' PRICES

Outputs \ *Inputs*	*Intermediate demand*							*Final demand*							
	Sectors						*Subtotal*	*Non-household consumption expenditures*	*Private consumption expenditures*	*General government*	*Gross fixed capital formation*	*Change in inventories*	*Exports of goods and services*[a]	*Subtotal*	*Total*
	1	*2*	*3*	*4*	*5*	*6*									
1. Agriculture	0	−7	0	0	0	—	−7	—	−22	0	0	0	0	−22	−29
2. Industry	0	−15	−2	−5	−1	—	−23	—	−21	0	−20	0	0	−41	−64
3. Commercial trade	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4. Transport	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5. Services	0	0	0	0	0	—	0	—	−3	—	0	0	0	−3	−3
6. Government services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL	0	−22	−2	−5	−1	—	−30	—	−46	0	−20	0	0	−66	−96

[a] Including special procurement.

TABLE 14 : PHYSICAL BALANCE FOR IMPORTANT PRODUCTS AT PRODUCERS' PRICES

Inputs *Outputs*	*Intermediate demand*			*Final demand*									
	Unit	*1 2 3 . . .*	*Subtotal*	*Non-household consumption expenditures*	*Private consumption expenditures*	*General government*	*Gross fixed capital formation*	*Change in inventories*	*Exports of goods and services*[a]	*Subtotal*	*Less : Imports of goods and services*	*Less : Customs duties (incl. tonnage dues)*	*Total*
1. Agriculture													
(*a*) Rice	Q[b] V[b] U[b]												
(*b*) Wheat..........	Q V U												
....													
....													
....													
2. Industry													
(*a*) Coal	Q V U												
(*b*) Crude petroleum	Q V U												
....													
....													
....													

[a] Including special procurement.

[b] Q denotes physical quantity, V value and U unit value.

ANNEX

Concepts and definitions of the 1960 interindustry table

With the growing demand for interindustry or input-output analysis in recent years, numerous organizations including the central Government, local public bodies, private research organizations etc. have come to construct input-output tables for a variety of objectives. Unfortunately however, the lack of standardization in the methods of compilation of statistics has caused serious difficulties in making both time-series and international comparisons of the tables. The table constructed in 1955 by the Japanese Government as the first official attempt in interindustry analysis has not escaped such deficiencies, particularly with regard to its relationship to national income statistics, sectoral classification, and international comparability.

Because of these defects the compilation of the 1960 tables was preceded by careful studies on statistical standardization, in collaboration with academic authorities and related government agencies. As a result the framework of the table was revised in such a way as to be easily integrated with national income accounts; further, fundamental improvements were made in sectoral classifications and in various other definitions, so as to facilitate long-run time-series analysis and international comparison.[22] In principle the United Nations system of national accounts and the ISIC has been adopted as the statistical frame of reference; departure from these standards has therefore been confined to the cases where the purpose of interindustry analysis has made it unavoidable. International standardization of the tables seems highly necessary because of the amounting emphasis on international comparability of interindustry analyses and economic analyses pertaining to international geographical integration.

No effort has been spared to maintain continuity between the current and the previous (1955) tables as to sector classification and in other respects. The major characteristics of the 1960 table may be summarized as follows:

(*a*) integration with national income accounts has been attempted;

(*b*) sector classification has been made on the basis of the ISIC;

(*c*) two transaction tables, one valued at purchasers' and the other at producers' prices, plus a supporting table on transport costs, have been prepared for publication;

(*d*) in the transactions table valued at producers' prices, by-products and scrap have been treated as negative inputs;

(*e*) in the sectoral allocation of outputs, goods have been evaluated at actual, not average (or uniform), prices;

(*f*) employment coefficients have been computed for the purposes of employment analysis.

I. Format of the tables

The accounting system of interindustry tables may be viewed as a detailed version of aggregate production accounts which form part of the general national economic accounts. Consequently the total of row vectors designated as "value-added" becomes, after adjustment for customs duties (including tonnage dues), equivalent to gross domestic product (GDP) at market prices; similarly, the column total of final demand is defined as expenditures on gross domestic product (GDE) at market prices. Obviously GDP is equal to GDE. Moreover the value of outputs and the intersectoral transactions appearing in the table are strictly confined to those of goods and services; that is, transfers and monetary transactions are all excluded. Similarly neither the intersectoral flow of incomes attributable to factor services nor the external balance of payments is within the scope of the table.[23]

For convenience of use the tables have been prepared in two forms: the one valued at purchasers' prices and the other at producers' prices. The former is designed primarily for an analysis of the composition of final demand and of production cost; the latter for studying the relationship between sectors so as to show exactly the direct and the indirect effects of a change in one sector upon the others.

The structure of transactions valued at purchasers' prices is exhibited in table 8. Looking at the rows, each of which represents a production sector, we observe that the transactions total is obtained by adding trade margins and transport charges to the value (row-wise) of goods and services valued at producers' prices (which, in turn, is the sum of gross domestic production at producers' prices (gross of indirect taxes), by-products and scrap originated in sectors other than its own, and the value of imports (including customs duties)). The sum of intermediate demand plus final demand is designated total demand, which balances the total supply as explained just above. Take agriculture as an illustration. Looking along row 1 of the table from left to right, we see that the subtotal for intermediate demand (21) is added to the subtotal for final demand (55) to yield the total demand (valued at the prices actually paid): 76. The same figure, 76, can be obtained from the supply side by summing up domestic production (18), by-products and scrap (0), imports at c.i.f. (25), customs duties (4), trade margins (22) and transport charges (7). By-products and scrap in this row consist of agricultural products and/or their competitive substitutes.

Since all the transactions are valued at purchasers' prices the demand side of "commercial trade" (row 3) is left completely blank. For the same reason "transport" (row 4) contains, in principle, nothing but passenger fares (inclusive of those accruing to the steamships of foreign nationalities). Note however that the figure entered at the intersection of row 4 "transport" with the column "transport" contains freight charges for domestic exports and for the freight service proper rendered to third-party countries; this complication arises because exports are valued at f.o.b. prices. Consequently the total demand for the transport sector (row-wise) is composed of three factors: demand for passenger transport, freight charges for domestic exports, and charges for freight services proper. For example, take the figure 7, which is found at the intersection of the row "transport" with the column "exports"; this 7 is made up of the above three factors. Now, the following relationship holds between the domestic production of transport,

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[22] Work is in progress on the revision of both the 1951 and the 1955 tables by using the same method of compilation as the 1960 table. When the revision is completed the three tables will be perfectly comparable and will contain exactly the same number (150) of sectors as the 1960 table.

[23] However, row vectors showing indirect taxes and subsidies (both part of transfer incomes) are prepared in order to facilitate the conversion of data from a market-price to a factor-cost basis. Similarly row and column vectors representing non-housing consumption expenditures and a column vector of customs duties are provided in order to establish comparability with current practice in national income accounts.

44, and the total demand for transport, 19: (revenue of the domestic transport industries from passenger fares and freight charges, 44) =(expenditure on passenger fares by intermediate-demand sectors, 6)+(expenditure on passenger fares by final-demand sector, excluding exports sector, 1+3+2=6)+(revenue arising from fares of foreign tourists and from freight services rendered to foreign traders, 7) + (revenue arising from import freight services, minus passenger fares payable to foreign transport industries, 8) + (revenue arising from domestic freight services, 17).

The composition of transactions valued at producers' prices is displayed in table 9. Unlike table 8, which takes the form of a demand-and-supply balance, table 9 is appropriate for an analysis of physical inter-relationships. Valued at producers' market prices, including indirect taxes but net of transport costs, its final row "total production" balances with its final column with the same heading. The relation of the figures in this table at producers' prices with the transactions total valued at purchasers' prices, is given by the equation:

> (production valued at producers' prices) + (trade margin) + (transport costs) = (production valued at purchasers' prices).

As a result the figures in row 3 ("commercial trade") represent both original costs and wholesale and retail trade margins. With regard to row 4 ("transport"), freight charges are handled in the same way as other commercial services; it should be noted however that freight charges and passenger fares are shown together in this "transport" vector.

In addition, by-products and scrap are given special treatment in table 9, which is valued at producers' prices. That is to say, a by-product or scrap is evaluated as a negative input and entered at the intersection between the sector where the by-product (or scrap) is originated and the counterpart sector. This is tantamount to adding a negative value to the input-coefficient column, thus reducing the output total of the production sector in question. For example, the output of coke as a by-product of the manufactured-gas industry has the effect of decreasing the output of the original coke manufacturer.

There is no difference between tables 8 and 9 as regards the treatment of value-added, except for the elimination from the latter of the column "by-product and scrap" (an obvious outcome of the adoption of the method discussed in the previous paragraph). Save different methods of valuation, "final demand" is also conceptually identical in both tables. Note however that the figures for transactions of imported goods between industries contain customs duties, tonnage dues, and the like; accordingly, two columns to the right of the table are added for adjustment.

Table 8, which is valued at purchasers' prices, may be converted into table 9, which is valued at producers' prices by: (*a*) taking from the former's supply section the figures in the two columns relating to imports and customs duties and transferring them to the two columns to the right of the latter table; (*b*) taking from the former table the columns for trade margins, transport charges, and by-products and scrap and, after allocating each of the three to industrial sectors and final demand sectors, subtracting the resultant values from the corresponding transactions values of table 8.

Tables 10, 11 and 12 show respectively the column allotment of trade margins, transport costs, and by-products and scrap, as mentioned in (*b*) above. With the help of these supporting tables the interindustry table may be easily transformed from a purchasers' price to a producers' price basis, or vice versa. In table 12 (By-products and scrap) the pertinent values are entered at the intersection of the originating industry (column) with its competitive counterpart (row). To use the same illustration as above, coke as a by-product of the manufactured-gas industry is entered, as a negative value, at the intersection of the manufactured-gas industry (column) with the original coke-producing industry (row).

Table 13 presents the imports matrix referred to earlier. It is directly subordinate to the transactions table at producers' prices, and was obtained through the same procedure as the 1955 table. In other words, we have divided each row of table 9 (at producers' prices) into domestic products and imported products, and then extracted the latter portion to form table 13. This table enables us to get information on the quantity of imported products as distributed in each sector, and also to derive a matrix of domestic products by subtracting import values from the respective portions of the transactions table 9 valued at producers' prices. Imports, as has been seen, are valued at c.i.f. inclusive of customs duties; the imports matrix is expressed on the same basis.

Finally, table 14 for physical balance is again directly attached to the transactions table 9 valued at producers' prices. This table was compiled by drawing from the original input-output table (at producers' prices) the rows which are composed of two subcategories: "value unit" and "physical unit". As in the 1955 table, the coverage of this table is limited to selected important commodities; it takes the form of a demand-and-supply balance on both physical and monetary quantities. The criterion of the selection is either that the commodity is of special importance or that its unit price is greatly differentiated among different purchasers. The 1960 table has adopted—unlike that of 1955 but in common with the 1951 tables—actual-price rather than average-price valuation. Whenever a unit-price shows marked divergence from one sector to another the necessary adjustments may be made possible by referring to this supporting table. Needless to say it also provides a basis for computing average prices of the commodities of special importance.

II. INDUSTRIAL CLASSIFICATION (for 56 and 153 sectors)

	56–Sector		*153–Sector*[a]
01	Fruit and crops except for industrial use	0111	Rice, wheat and barley
		0112	Miscellaneous crops
		0113	Fruit
02	Crops for industrial use	0114	Crops for industrial use (except textile)
		0115	Textile crops for industrial use
03	Livestock and poultry for textile	0117	Livestock and poultry for textile
04	Other livestock and poultry (includes agricultural services)	0116	Livestock and poultry (except textile)
		0118	Sericulture
		0120	Agricultural services
05	Forestry and logging (includes hunting)	0211	Forestry, forest products
		0212	Firewood and charcoal
		0220	Crude wood materials
		0300	Hunting
06	Fisheries	0410	Marine fisheries
		0420	Whaling
		0430	Inland water fisheries
07	Coal and lignite	1102	Coal and lignite
08	Iron ores	1210	Iron ores
09	Non-ferrous metallic ores	1220	Non-ferrous metallic ores
10	Crude petroleum and natural gas	1301	Crude petroleum
		1302	Natural gas
11	Other mining	1400	Stone-quarrying, clay and sand-pits
		1910	Raw salt
		1990	Miscellaneous non-metallic minerals

56-Sector		153-Sector[a]	
12	Slaughtering, meat and dairy products	2011	Slaughtering
		2012	Meat products
		2020	Dairy products
13	Processed sea foods	2040	Processed sea foods
14	Grain mills	2050	Grain mills
15	Miscellaneous processed foods	2030	Processed vegetables and fruits
		2060	Bakery and confectionery
		2070	Sugar
		2091	Miscellaneous processed foods
		2092	Assorted feeds
16	Beverages	2110	Alcoholic beverages
		2140	Soft drinks
17	Tobacco, manufactured	2200	Tobacco, manufactured
18	Spinning fibres, vegetable and animal	2301	Raw silk
		2302	Cotton-spinning
		2303	Wool-spinning
		2304	Hemp-spinning
19	Spinning fibres, chemical and synthetic	2305	Staple-fibre spinning
		2306	Synthetic fibres
20	Fabrics, miscellaneous textile products	2311	Silk and rayon fabrics
		2312	Cotton and spun-rayon fabrics
		2313	Synthetic-fibre fabrics
		2314	Woollen and worsted fabrics
		2315	Hemp fabrics
		2316	Dyeing
		2320	Knitted-fabric products
		2330	Rope and fishing nets
		2390	Miscellaneous textile products
21	Wearing apparel	2410	Footwear
		2430	Wearing apparel, other than footwear
		2440	Ready-made textile products
22	Sawed products, veneer, plywood and wooden products	2510	Sawed products, veneers and plywood
		2520	Miscellaneous wooden products
23	Furniture	2600	Furniture
24	Pulp and paper	2711	Pulp
		2712	Paper
		2720	Manufactured goods of paper
25	Printing and publishing	2800	Printing and publishing
26	Leather and leather products	2910	Leather and furs
		2930	Leather products
27	Rubber products	3000	Rubber products
28	Basic chemicals	3111	Inorganic basic chemicals
		3112	Organic basic chemicals
		3113	Synthetic dyes
		3114	Explosives
		3117	Synthetic resins
		3118	Chemical fertilizers
		3119	Miscellaneous basic chemicals
29	Raw material of chemical and synthetic fibres	3115	Raw material for chemical fibres
		3116	Raw material for synthetic fibres
30	Miscellaneous chemicals	3120	Crude oil of paints and chemicals
		3130	Paints
		3191	Drugs
		3192	Miscellaneous chemicals
31	Petroleum products	3210	Petroleum products
32	Coal products	3291	Coal products
		3292	Products, asphalt- or tar-saturated
33	Non-metallic minerals, other than products of petroleum and coal	3310	Miscellaneous ceramic products for construction
		3320	Glass products
		3330	Pottery
		3340	Cements
		3390	Miscellaneous
34	Pig-iron, ferro-alloy and steel ingot	3411	Pig-iron
		3412	Scrap-iron
		3413	Ferro-alloy
		3414	Steel ingot
35	Basic iron and steel products	3415	Hot-rolled steel
		3416	Steel pipes and tubes
		3417	Cold-finished and coated steel
		3418	Steel, cast and forged
36	Basic non-ferrous metal products	3421	Non-ferrous metals
		3422	Elongated copper
		3423	Rolled aluminium
		3429	Miscellaneous primary non-ferrous metal products
37	Metal products	3501	Metal products for construction
		3502	Miscellaneous metal products
38	Machinery, except electrical machinery	3601	Prime movers, boilers
		3602	Machine tools and metal-forming machines
		3603	Industrial machinery
		3604	Machinery and equipment for general use
		3605	Office machines
		3606	Household machines
		3607	Ball and roller-bearings and other common parts
39	Electrical machinery, apparatus, appliances and supplies	3701	Heavy electric machinery and apparatus
		3702	Household electric appliances
		3703	Miscellaneous batteries and wiring devices
40	Transport equipment	3810	Shipbuilding
		3820	Railroad equipment
		3830	Motor vehicles
		3840	Repair of automobiles
		3850	Motorcycles and bicycles
		3860	Aircraft
		3890	Miscellaneous transport equipment

56–Sector		*153–Sector*[a]	
41	Precision instruments (includes optical instruments, watches and clocks)	3910	Precision machines
		3920	Optical instruments
		3930	Watches and clocks
42	Miscellaneous manufactured goods	3990	Miscellaneous manufactured goods
43	Building (includes repairing)	4001	New construction of residential buildings
		4002	New construction of non-residential buildings
44	Construction, except building	4004	Public construction
		4009	Miscellaneous construction
45	Electricity	5110	Electric power
46	City gas	5120	City gas
47	Water services (includes sewage disposal)	5220	Water services (includes sewage disposal)
48	Wholesale and retail trade	6110	Wholesale trade
		6120	Retail trade
49	Banking and insurance	6200	Banking
		6300	Insurance
50	Real estate	6401	Real estate
		6402	House rent
51	Transportation (includes storage and warehousing)	7110	National railways
		7120	Tramways (passengers)
		7140	Road freight transport
		7150	Ocean transport
		7160	Coastal transport
		7170	Aviation
		7190	Miscellaneous transport
		7200	Warehouse
52	Communication	7300	Communication
53	Public administration and defence	8100	Public administration and defence
54	Community services	8210	Educational services
		8220	Medical services
		8290	Miscellaneous public services
55	Miscellaneous services	8300	Business services
		8400	Broadcasting and recreation services
		8501	Eating and drinking services
		8509	Miscellaneous personal services
56	Unallocated	9000	Unallocated

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[a] These code numbers correspond to those of the ISIC.

STATISTICAL UNIT, CLASSIFICATION AND AGGREGATION IN FINNISH INPUT-OUTPUT STUDY

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This paper examines the suitability for an input-output study of the statistical unit, classification and aggregation used in basic statistics in Finland. Attention is first given to the homogeneity assumption in the input-output model, and to the various ways to aggregate basic units and their implications for the stability of input coefficients. Next, the statistical unit and classification used in Finnish statistics are evaluated from the viewpoint of an input-output study, and the principles followed in the classification of statistical units are indicated. Since industrial statistics constitute the principal source of information for planned research on the international comparison of input coefficients, characteristics of these statistics become the principal object of analysis.

Subsequently attention is drawn to the homogeneity of sectors: the number of commodities produced in a sector is associated with the dispersion of input coefficients among establishments and sectors; dissimilarities in commodity-mix and input prices are related to the dispersion of input coefficients for some sectors. In conclusion, the prospects for an international comparison of input coefficients are presented in the light of these observations, and the suitability of the Finnish statistical material for such a comparative study will be evaluated.

I. METHODS OF AGGREGATION

The compilation of an input-output table has to rest upon the assumptions embodied in the particular input-output model considered. An open static input-output model rests upon the following assumptions:

1. *Homogeneity assumption:* only one method of production is used to produce each particular commodity and each method of production is used to produce one type of commodity only.

2. *Proportionality assumption:* a linear, homogeneous function relates the inputs used in each method of production to the level of output produced by that particular method.

3. *Additivity assumption:* the output derived through a composite method of production is assumed to equal the sum of the outcomes of the original methods of production.

Among these assumptions the first plays a pivotal role in dealing with the problems of classification and aggregation. In what follows, particular attention will be paid to it as a guide for classification and aggregation.

Two notions may be distinguished in the homogeneity assumption:

(*a*) homogeneity of input structure or method of production, and

(*b*) homogeneity of output or commodity.

A method of production may be defined as a combination of inputs, denoted by a column vector $A_j = \{ a_{ij} \}$ $(i = 1 \ldots)$, where a_{ij} refers to the amount of commodity i used as an input in the production of one unit of commodity j. A commodity may also be defined in a similar way because the method of production and the commodity produced differ only in that the former refers to the process and the latter to the outcome of this process. Two methods of production (or two commodities), r and s, are identical if $A_r = A_s$ and dissimilar if $A_r \neq A_s$. In this particular case the two types of homogeneity assumptions become identical and the input-output compilation may then easily fulfil the homogeneity requirement in so far as the relevant statistical information can be secured and handled properly.

In estimating input coefficients, however, the possibility of substitution between inputs should be taken into account. For this reason the commodity must also be defined in terms of the use it serves. Two commodities are considered identical if they can replace one another in use, and different if they cannot do so. This alters the situation in the following way: one and the same commodity can be produced through several different methods, and the same method can be used to produce different commodities. This was, strictly speaking, not possible in the previous case.

The classification problem concerns how to aggregate commodities and methods of production. The matter is further complicated because information on individual commodities and methods of production cannot be obtained and handled when a model covering an entire economy is considered. Thus groups formed from these basic units have to be dealt with at the next stage. Such groups are formed with a view to constructing a model the results from which would deviate to the least possible extent from those obtained by an unaggregated model.

In the subsequent analysis the following symbols will be used:

$X_{\substack{i\;j\\h\;k}}$ = use of commodity h, which belongs to commodity group i, as an input in production method k which belongs to group of production methods j $(h = 1, \ldots r;\ k = 1, \ldots s)$.

X_{j_k} = amount of output produced through production method k, which belongs to group of production methods j.

$$a_{i_h j_k} = X_{i_h j_k} / X_{j_k} = \text{input coefficient}$$

When the input coefficients involved in production method k are aggregated so as to form commodity group i, the following input coefficient is obtained:

$$a_{ij_k} = \sum_{h=1}^{r} X_{i_h j_k} / X_{j_k} = \left[1/X_{j_k}\right] \cdot \left[\sum_{h=1}^{r} a_{i_h j} \cdot X_{j_k}\right] = \sum_{h=1}^{r} a_{i\, j_k} \quad (1)$$

This implies that the aggregated input coefficient equals the sum of the constituent input coefficients. The constituent input coefficients may change therefore without leading to a change in the aggregated input coefficient in so far as the sum of the changes is equal to zero. A change of this sort may occur when the commodities in group i are mutually substitutable. When a commodity group is so formed as to represent a homogeneous use category, the resulting composite input coefficient will become stable despite changes in the constituent input coefficients. However, the same product may be obtained by several different methods; if these methods are aggregated, the heterogeneity of the input structure is likely to increase.

The aggregation of production methods $k \epsilon j$ into a group of production methods j yields the following input coefficient:

$$a_{i_h j} = \sum_{k=1}^{s} X_{i_h j_k} / \sum_{k=1}^{s} X_{j_k} = \sum_{k=1}^{s} a_{i_h j_k} / \sum_{k=1}^{s} X_{j_k} \quad (2)$$

This implies that an aggregative input coefficient can remain constant only if the share of each production method $k \epsilon j$ in the output of group j remains constant and if the individual production methods to be aggregated remain unchanged. The first condition may be satisfied, for example, when the methods of production are grouped in such a way as to represent a well integrated (vertical) production line. Demand for each product will then change in the same way within the group. But if different items are produced by the same method and if those products are aggregated, the heterogeneity of output will increase.

When aggregation is performed over both commodities and production methods, the following input coefficient is obtained:[1]

$$a_{ij} = \sum_{h=1}^{r} a_{i_h j} = \left[1/ \sum_{k=1}^{r} X_{j_k}\right] \cdot \sum_{k=1}^{s} \left[\sum_{h=1}^{r} a_{i_h j_k}\right] X_{j_k} \quad (3)$$

Now this input coefficient has both of the properties mentioned above. Input coefficients relating to an establishment or a group of establishments constituting a firm may be said to represent such dual aggregation.

The two homogeneity requirements are in conflict with each other in one respect: the less aggregative is the production method the greater becomes the scope of substitution among commodities. By contrast, if substitutable commodities are grouped together, the input structure becomes increasingly heterogeneous. The purpose for which the input-output model is designed to serve lays differential emphasis upon the various types of homogeneity requirements. Consequently it is desirable to prepare as detailed an input-output table as possible. This would flexibly accommodate the estimation of input coefficients for various purposes. The detail achieved in the construction of an input-output table is generally dependent upon the availability of empirical data, which is in turn influenced by the type of statistical unit to be employed.

The classification adapted for an input-output table is the result of mutual interaction between theory and practice, and embodies elements from several different principles of aggregation. Consequently it is important to examine the statistical units and classification systems used in the collection of basic data and to evaluate their suitability for the preparation of input-output tables.

II. STATISTICAL UNIT AND CLASSIFICATION IN INDUSTRIAL STATISTICS

Industrial statistics constitute the principal source of information for the input-output table in Finland. These statistics are published annually, and contain production and input data for manufacturing, mining and power activity: they exclude small establishments (employing less than five persons), which account for about 5 per cent of the total manufacturing, mining and power output.

The data acquired annually from establishments for these statistics are rather detailed. They consist of information on output by commodities. Commodities are usually measured both in physical and monetary units (at producer's price). Material inputs are also recorded by commodities: they are measured in physical units and at purchaser's price. Domestic and imported inputs are separated. Among value-added items it is possible to record labour cost and man-hours separately. But service inputs are not separately recorded in the industrial statistics of Finland.

The number of establishments included as industrial establishments is rather small: about 7,000 altogether. This makes their reclassification possible. In practice it is difficult to obtain more detailed information from establishments than that described above; this is due to the characteristics of the statistical unit involved. The following observations apply to these statistics alone.

The statistical unit in industrial statistics is the establishment. This is a unit more directly associated with the location of activity than with the activity itself. There is no way to distinguish between production methods or inputs for different commodities when they are manufactured in one and the same establishment. Consequently

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[1] Changes in input coefficients due to aggregation are examined by making use of this formula in Michio Hatanabe, *The Workability of Input-output Analysis*, Ludwigshafen am Rhein, pp. 53–55.

the classification of such statistical units is based on what type of principal methods of production is used or on the principal commodities produced. This gives rise to the problem of secondary methods of production and by-products.

An establishment frequently has various auxiliary departments in addition to its principal production line, among them the managerial, repair, transport, packaging, storage, loading, construction and laboratory departments. In so far as these serve only one establishment they are treated as an integral part of a single unit. This may be considered as a kind of vertical aggregation. When auxiliary departments serve more than one establishment either they are allocated among the establishments under consideration or their data are combined with those on the largest establishment operating in the commune. In this case the validity of the solution for the constancy of input coefficients depends upon the extent to which the output of the relevant establishments moves in a parallel fashion.

Alternatively, auxiliary departments such as repair shops, steam plants and electric power plants may be considered as independent establishments (since independent establishments specialized in such activities usually do exist). In so far as an input material produced inside as well as outside an establishment is not treated as a single input, the magnitude of those input coefficients also depends upon the relative importance of such materials acquired within and outside the establishment.

In industrial statistics it has generally proved possible to separate the raw material inputs required for auxiliary departments from those required for principal production lines. In the case of labour inputs this distinction has been appreciably less clear, however, because one and the same person may engage in both types of activities. Since the activity in auxiliary departments is generally labour-intensive this gives rise to difficulties in the estimation of labour input coefficients in particular. The existence of auxiliary departments within establishments creates the problem of secondary productive activities, in the same manner as the output of commodities other than those produced in the main production line creates the problem of by-products. The activity of auxiliary departments is not registered in terms of specific output and consequently the outcome of their activity is not evident in the commodity-mix of the establishment.

Thus the extent of specialization greatly affects the substantive aspects of statistical units in industrial statistics. The classification of establishments has therefore been based upon various criteria, consideration being taken of particular external conditions and historical circumstances.

The following criteria may be distinguished in the classification of establishments:

(*a*) similarity of commodities to be produced;

(*b*) similarity of methods of production, and

(*c*) structural cohesiveness or integratedness of establishments engaging in related activities.

In practice more than one of these criteria have often to be applied simultaneously. Similarity of commodities produced is frequently accompanied by similarity of production methods used, and the integration of establishments often implies the aggregation of different stages of production for given final products.

The classification of activities in Finnish industrial statistics follows the system of classification of the International Standard Industrial Classification of All Economic Activities (ISIC), adapted to Finnish conditions. Use is made of two-, three- and four-digit classifications of activities. "Manufacturing" contains the following groups:

two-digit classification: 20 groups

three-digit classification: 86 groups

four-digit classification: 211 groups

The four-digit groups furnished the point of departure for the construction of the input-output table. In the published version they are reduced to 86 groups.

The classification of establishments in industrial statistics was designed to yield groups representing consecutive technical stages of production. The following stages are generally distinguished: processing of raw materials into basic materials of industry, production of semi-fabricated materials, and assembling of products from the outputs of the previous stages. In addition each one of these stages is generally subdivided according to the properties of the commodity produced or the difference in the methods of production. It seems that this classification has in fact almost exclusive reference to the types of productive activities. No particular attention is given to the criteria relating to the use of the commodities produced. The latter type of classification occurs only when the activity basis coincides with the commodity basis.

The classification of establishments would pose no serious problems if various stages of production could be allocated to different establishments. When many of these stages fall within the same establishment the best that can be done is to classify the establishment on the basis of the characteristics of its principal products. This practice contradicts classification based on the activity concept but unfortunately rather frequently the conditions of the Finnish economy are such that a wide range of commodities tend to be produced by a single establishment.

III. Homogeneity of output

There are some 1,400 commodities produced by the manufacturing industry. This number is derived from the item classification of output given in the industrial statistics. If the value of output of a given commodity fails to exceed 1 per cent of the value of output of the group concerned, that commodity is not treated separately. The principal commodities have been identified through the joint efforts of persons compiling the

TABLE 1 : DISTRIBUTION OF THE NUMBER OF MANUFACTURING GROUPS AND THE VALUE OF OUTPUT BY THE NUMBER OF PRODUCTS PRODUCED PER GROUP, 1959[a]

(Percentages)

Value of output (million marks)		*Number of products*					
		1–4	*5–9*	*10–14*	*15–19*	*20 or more*	*Total*
less than 30	Number	31·7	24·3	8·7	1·5	—	66·2
	Output	3·8	4·8	1·5	0·4	—	10·5
30–90..............	Number	4·8	5·3	4·7	1·0	1·0	16·8
	Output	5·2	5·3	5·3	0·6	0·7	17·1
more than 90	Number	5·7	7·3	1·5	1·5	1·0	17·0
	Output	20·8	31·8	7·5	7·3	5·0	72·4
TOTAL	Number	42·2	36·9	14·9	4·0	2·0	100·0
	Output	29·8	41·9	14·3	8·1	5·7	100·0

[a] A more disaggregated table is presented in O. Forssell, "Panos-tuotosmalliu perusyksiköiden luokittelun ongelmat", in Kokonaistaloudellisia ongelmia, *Kansantaloudellisia tutkimuksia XXV* (Helsinki, 1964).

statistics and those supplying the information. It should be noted that when the item classification of commodities was revised in 1964 the number of items increased to about 2,500.

The commodity classification gives information nearly seven times as detailed as the information given by classification by grouped industrial processes and about 15 times as detailed as that given by classification by manufacturing groups, employed in the input-output table. This apparently reflects the difficulties in securing information on establishments. It is possible to use an appreciably more detailed classification for output than for input and output commodities.

Table 1 illustrates the number of commodities produced by the 223 four-digit manufacturing groups. These groups are divided into three classes on the basis of value of production per group. Joint distributions of the number of groups and the value of output by the number of commodities produced per group are given for these classes.

Nearly one third of industrial production takes place in groups where the number of commodities produced is four or less, and a little over 40 per cent in groups producing five to nine commodities. The number of commodities varies markedly from one group to another. In the chemical, metal and engineering industries the average production is 10 commodities, whereas in the food, paper, clay, glass and stone industries it is only five commodities.

The above distribution clearly indicates that the output of a four-digit industry group within the manufacturing sector generally comprises a large number of commodities.

IV. HOMOGENEITY OF INPUT STRUCTURE

To investigate the homogeneity of the input structure, those of establishments in six groups were analyzed. The groups were chosen among the various manufacturing activities in such a way that each group would represent a sufficiently large share of the total output of the relevant two-digit group. For the purpose of comparative analysis the number of establishments was limited to thirty. The number of input coefficients to be considered was also restricted for the same reason. The following inputs were distinguished: (1) raw and semi-fabricated materials; (2) other commodity inputs; (3) value-added; and (4) for raw and semi-fabricated materials, "principal input material"—the largest single input item—was distinguished from the rest. The raw and semi-fabricated materials include those which are directly used as constituent parts of the commodities produced. Other

TABLE 2 : DISPERSION OF INPUT COEFFICIENTS AMONG ESTABLISHMENTS

		Raw and semi-fabricated materials (1)		*Other commodity inputs (2)*		*Value-added (3)*		*Principal input material (4)*	
Group	*Number of establishments*	*Range*	*Coefficient of variation*	*Range*	*Coefficient of variation*	*Range*	*Coefficient of variation*	*Range*	*Coefficient of variation*
Breweries	25	0·154	0·126	0·332	0·457	0·323	0·201	0·321	0·444
Plywood mills	24	0·250	0·129	0·313	0·552	0·409	0·192	0·338	0·235
Sulphite pulp mills	20	0·240	0·105	0·204	0·284	0·210	0·220	0·626	0·307
Sulphate pulp mills	9	0·248	0·131	0·176	0·308	0·311	0·450	0·527	0·490
Glass factories..................	12	0·268	0·639	0·188	0·167	0·338	0·176	0·091	0·673
Nail and steel wire factories	14	0·445	0·171	0·074	0·250	0·398	0·554	0·513	0·239
Average	17	0·268	0·217	0·215	0·336	0·332	0·299	0·403	0·398

TABLE 3 : DISPERSION OF INPUT COEFFICIENTS AMONG GROUPS

Major group	*Number of groups*	*Raw and semi-fabricated materials (1)*		*Other commodity inputs (2)*		*Value added (3)*	
		Range	*Coefficient of variation*	*Range*	*Coefficient of variation*	*Range*	*Coefficient of variation*
Beverage industry	7	0·342	0·305	0·203	0·472	0·320	0·323
Manufacture of wood....	16	0·520	0·316	0·175	0·700	0·540	0·326
Manufacture of paper and paper products	11	0·404	0·216	0·284	0·583	0·428	0·351
Manufacture of non-metallic mineral products	18	0·596	0·632	0·310	0·530	0·492	0·237
Manufacture of metal products	12	0·514	0·337	0·057	0·250	0·509	0·272
Average	13	0·475	0·361	0·206	0·507	0·458	0·302

commodity inputs include containers, fuel, purchased steam and electric power, lubricants, other auxiliary materials and accessories, and contract work performed by other establishments. The principal components of value-added are labour and capital costs, although it also contains such items as office supplies, post and telephone charges, advertising expenditure etc.

Table 2 gives the variation among establishments of these four categories of coefficients. The smallest dispersion revealed was for raw and semi-fabricated materials; the dispersion of the value-added coefficients was distinctly larger. The share of other commodity inputs varied slightly more than that of value-added. The largest variation of input coefficients between establishments was generally displayed by the largest single input item (principal input) in the commodity inputs. This is what one would expect: since the other coefficients are averages of the coefficients of individual input items, dispersion of the individual input coefficients is apparently evened out through aggregation.

Table 3 enables comparison to be made between the magnitudes of the input coefficients of establishments and those of groups. A comparison of tables 2 and 3 now reveals quite distinctly (in 22 cases out of 30) that greater dispersions prevail among the coefficients of groups than among those of establishments. This implies that a more detailed breakdown of groups tends to reduce the dispersion of input coefficients in cases where the breakdown of inputs is rather rough. Of course, the variation grows larger when individual input items are examined.

The variation in the input coefficients of establishments may be due to differences in:

the unit price of inputs;

the commodity-mix produced;

production methods.

The unit price of inputs, when measured in terms of buyer's price, can be influenced by transport costs, the volume of purchases, the quality of inputs etc. Differences in the quality of inputs may be associated with differences in the types of commodities produced, since commodities of different types and qualities require different inputs.

Establishments within a group may be specialized in the production of various commodity-mixes within the range of commodities applicable to the group. Differences in commodity-mix and in production methods are thus at least partly dependent on each other. Differences in production methods may also be explained by factors such as the scope of productive activity, combination of different production methods, age of establishments etc.

Analytical isolation of the factors accounting for the

TABLE 4 : DISPERSION OF AVERAGE-PRICE INPUT COEFFICIENTS OF ESTABLISHMENTS

Group	*Average-price input coefficients*		*Difference between input coefficients at actual prices and at average prices*	
	Range	*Coefficient of variation*	*Range*	*Coefficient of variation*
Breweries	0·340	0·453	−0·019	−0·009
Plywood mills	0·414	0·292	−0·076	−0·057
Sulphite pulp mills	0·532	0·284	0·094	0·023
Sulphate pulp mills	0·531	0·458	−0·004	0·032
Glass factories	0·084	0·625	0·007	0·048
Nail and steel wire factories	0·506	0·242	0·007	−0·003
Average	0·401	0·392	0·002	0·006

TABLE 5 : DISPERSION OF PHYSICAL INPUT COEFFICIENTS OF ESTABLISHMENTS

Group	*Principal physical input coefficient* [a]			*Difference between coefficient of variation of input coefficients in value terms and in quantity terms*
	Average	*Range*	*Coefficient of variation*	
Breweries	0·112	0·115	0·233	0·211
Plywood mills	0·287	0·318	0·220	0·015
Sulphite pulp mills	0·414	0·659	0·319	−0·012
Sulphate pulp mills	0·259	0·426	0·456	0·034
Nail and steel wire factories	0·939	0·221	0·085	0·154
Average	0·402	0·348	0·263	0·135

[a] The principal input coefficients are calculated in terms of the following units: breweries, kg/litre; plywood mills, 10m³; pulp mills, 10 m³/long ton; nail and steel wire factories, kg/kg.

dispersion of input coefficients is rendered difficult because such factors are often intercorrelated. The dispersion due to differences in unit prices and commodity-mix can nevertheless be isolated to some extent by recalculating the coefficients with the use of uniform or average unit prices and rearranging commodity-mixes. The residual dispersion may then be attributed chiefly to differences in production methods.

To eliminate differences in unit price the coefficient for the largest input item of each establishment was recomputed by multiplying the quantity of input used by the average unit price of the input in the group. The dispersions of these input coefficients and the differences between these dispersions and those calculated at actual buyer's prices (see last column in table 2) are shown in table 4.

Differences between the dispersions of input coefficients valued at actual prices and at average prices appear to be rather small. Hence it may be concluded that in these cases the variation of unit prices of inputs among establishments is not large enough to account for the dispersion of input coefficients. This analysis however is insufficient because differences in the unit prices of commodities produced were not eliminated. On the other hand, differences in commodity prices may often be an indication of different commodity-mixes. This aspect will be explored in the next section.

V. COMMODITY-MIX AND DISPERSION OF INPUT COEFFICIENTS

Manipulation of input coefficients in physical terms is rendered difficult by the existence of a large number of commodities in the output of each establishment. These commodities have to be measured in different units, and thus their aggregation is not possible. Such a difficulty nevertheless was of a minor order for the six groups considered above, except in the case of glass factories. The results of the calculation are illustrated in table 5.

A substantial reduction in the dispersion of input coefficients was observed in two groups. A closer analysis revealed that this was due to an increase in the homogeneity of the outputs in these groups. This fact was disclosed in the process of rearranging output and input items, which was necessary because a particular input was often used for the production of only a part of the commodity-mix of an establishment. In the case of breweries, for example, the quantities of inputs had to be specifically assigned to the production of beverages; the remaining part of the commodity-mix was consequently omitted. The use of physical-unit data for the outputs and inputs of nail and steel wire factories contributed to a greater homogeneity of the output of this group in value terms.

In table 6 each group is divided into two sub-groups: the first sub-group comprises those establishments for which the "principal" commodity or commodity-mix of the group accounted for more than half of the total output of given establishments.[2] The second sub-group comprises all other establishments. Their input coefficients were also calculated in quantity terms save for the glass factories, where value data were employed.

It appears that a more detailed commodity classification tends to reduce the dispersion of input coefficients. Differences of the average input coefficients between sub-groups I and II are in four cases significant at the 10 per cent level; in the other two cases differences were found significant. The variance ratio test also confirms the conclusion regarding these differences arising from differences in the degree of homogeneity of output.

In the cases of sulphite and sulphate pulp mills a closer inspection revealed that dispersion was due largely to the existence of substitutable inputs. When use of substitutes was allowed for, the dispersion coefficient for sub-group I of the sulphite pulp mills diminished from 0·400 to 0·140, those for sub-group I of the sulphate pulp mills from 0·500 to 0·036, and for sub-group II from 0·124 to 0·045. The relatively large dispersion coefficients for breweries, plywood mills and glass factories are still due to the heterogeneity of the commodity-mix of establishments.

From the above analysis it may be said that about two-thirds of the explained dispersion of input coefficients among establishments (about 60 per cent of the original dispersion[3]) can be attributed to heterogeneity in

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[2] The commodity-mixes of these six manufacturing groups are presented in annex I.

[3] See table 2.

TABLE 6 : DISPERSION OF PRINCIPAL INPUT COEFFICIENTS AMONG ESTABLISHMENTS; BY TWO SUB-GROUPS DISTINGUISHED WITH RESPECT TO RELATIVE HOMOGENEITY OF OUTPUT

Group and sub-group	*Number of establishments*	*Average input coefficient*	*Coefficient of variation*	*Significance of differences between input coefficients*	*Variance ratio test*
Breweries I	10	0·096	0·172		
II	15	0·136	0·129	0·005	—
Plywood mills I	12	0·302	0·092		
II	12	0·271	0·314	0·10	$F_{\cdot 9995}$
Sulphite pulp mills I	10	0·408	0·400		
II	10	0·430	0·067	0·40	$F_{\cdot 99}$
Sulphate pulp mills I	6	0·203	0·500		
II	3	0·372	0·124	0·01	$F_{\cdot 90}$
Glass factories I	3	0·088	0·091		
II	9	0·036	0·750	0·005	$F_{\cdot 95}$
Nail and steel factories I	7	0·962	0·100		
II	7	0·916	0·058	0·20	$F_{\cdot 90}$
Average	9	0·352	0·233		

commodity-mix, and one-third to replacement of the particular principal inputs by other inputs. Prices were found to exert practically no influence upon the variation of input coefficients among establishments.

The above analysis is of course too limited in its scope to warrant far-reaching general conclusions. It suggests, however, that the commodity-mix in the output of an industry or group bears great significance as regards the magnitude of input coefficients of that industry or group.

VI. OUTLOOK FOR INTERNATIONAL COMPARISONS

This analysis of the statistical units in the basic data for input-output compilation and of the principles to be applied in the classification of these units indicates that the basic data in some respects fall short of requirement for the construction of an input-output table. Only in an ideal situation where an establishment produces a single commodity does the statistical unit meet the full requirement. Deficiencies in the basic data result in the formation of a group of units producing diverse commodity-mixes which are particularly responsible for the wide variation of input coefficients as among the establishments of which the group is composed. The constancy of input coefficients is thus made very dependent upon the constancy of the commodity composition of the output. Great importance should therefore be attached to the problem of by-products.

The basic statistical materials should therefore be regrouped and analyzed before they are transformed into input-output concepts. This could not be done for the 1959 input-output table, chiefly because of lack of resources. The group data in industrial statistics had to be accepted as the original data, and some groups had to be further combined where demands for their outputs were expected to behave in an approximately parallel manner.

When an input-output table is used for international comparison, some of the problems to be faced would be quite similar to those arising when an input-output model is applied to a national economy. Among these, dependence of input structure upon commodity-mix is to be particularly noted. At the national level it may be plausible to assume an approximate constancy of the shares of different commodities in the output, at least in the short run, but at the international level production conditions frequently differ so markedly between countries that plausibility of this assumption becomes rather questionable. Scope of input substitution and variation of unit prices are likely to be greater in an intercountry comparison.

The range of commodity-mix may be narrowed down, and dispersion of input coefficients among establishments reduced, by forming smaller groups. To make the results as reliable as possible and to enable the inputs to be related to the commodities in as correct proportions as possible, it will become necessary to examine the data gathered on an establishment basis. It seems that even if rather detailed groups are used it is still necessary to define each group clearly and to indicate the proportions in which various commodities enter in its output. Only then can the data assume a homogeneous foundation for international comparisons.

In calculating input coefficients the possibility of substitution between domestic and foreign inputs should also be closely examined. This may lead to a combination of different groups, since those formed at the first stage may engage in the production of substitutes. The approach to such problems would be facilitated by a systematic study of substitutable products based on technological information. When the input structure is analyzed on a commodity basis some commodities will have to be combined in any comparison of input coefficients, so as to reduce the scope of substitution. The resulting table would contain a greater number of columns than rows.

The data tabulated at the first stage of data gathering should be as detailed as possible to ensure a degree of flexibility in their use. This is also important because such tables may have various analytical uses in the future. When establishment is the statistical unit for industry and interindustry statistics it is likely that the most detailed table will have more rows than columns. Rows may then be classified by commodities and columns by industrial processes.

The calculation of quantity coefficients is to be recommended for the most flexible solution of the pricing problem. This also calls for rather detailed classification of groups. Input coefficients based upon quantity data should be completed, together with data on relative commodity prices in the countries to be compared. This would also be a great help if value coefficients would have to be employed for international comparisons. It seems generally possible to calculate quantity coefficients or at least average price coefficients for Finland. The use of average prices makes it possible to calculate input coefficients for a mix of commodities measured in different units.

Specialization of establishments is an important factor affecting the suitability of data available for international comparison. Input structures related to specific commodities can be identified, even if only approximately, when establishments are rather highly specialized. Errors of estimation arising from heterogeneity of output can then be partly avoided. When the available Finnish data are evaluated on this criterion it seems that the data for groups such as paper, woodworking and non-metallic mineral products are the best suited for international comparison. Data for textiles, leather, apparel, food-processing and other miscellaneous consumer products, as well as chemicals and rubber products, provide a somewhat weaker basis for international comparison than the former groups. In the metallurgical, metal-working and machine-building, petroleum and coal industries one establishment produces many products, while in some groups there are only a small number of establishments; these industries in Finland are thus likely to fit uneasily into the scheme for international comparison of input coefficients.

ANNEX I

Commodity-mixes of selected manufacturing groups

Breweries	*Percentage*
Beer	
Class I (mild)	32
Class III (strong)	33
Sweet non-alcoholic beverages	25
Home-made beer	6
Mineral waters	3
Other products	1
Total	100

Plywood mills

Plywood	
birch	70
birch, sheets for plywood	1
common or warted birch	1
for aircraft	1
for aircraft, sheets for plywood	1
Batten-board	18
Hacked wood	4
Fuel wood	1
Other products	3
Total	100

Sulphite pulp mills

Sulphite cellulose	
bleached	52
semi-bleached	4
hard	42
Sulphite waste lye	1
Other products	1
Total	100

Sulphate pulp mills

Sulphate cellulose	
bleached	6
semi-bleached	16
hard	73
Sulphate waste lye	3
Raw pine oil	1
Other products	1
Total	100

Manufacture of glass and glass products from raw materials

Window-glass	32
Bottles	16
Glassware for households	15
Glassware for technical purposes	11
Glassware for medical purposes	7
Glassware for lighting	6
Glass wool	7
Other products	6
Total	100

Manufacture of nails and steel wire

Wire, nails and tacks	45
Iron or steel wire, galvanized	20
Iron or steel wire, other	15
Fittings for buildings	7
Wire for fencing	4
Nettings of wire	2
Axles	1
Other products	6
Total	100

ANNEX II

A note on the 1959 Finnish input-output table

The first Finnish input-output table, which had 39 production sectors, was compiled for 1956. The second table relates to the year 1959 and is more detailed in several respects.

The major characteristics of the 1959 table are that—

1. the statistical unit is the establishment; as a rule adjustments were made for secondary products;

2. the industrial classification of establishments is based on the ISIC;

3. Domestic commodities are valued at producers' prices, and imports at c.i.f. prices, less customs duties and freights paid to domestic ships. All transactions are evaluated at actual, not average, prices;

4. Separate transactions tables have been prepared for domestic goods and services and for imports.

Some of these characteristics will be considered below.

The establishment is the unit of observation in the most important basic statistics of Finnish input-output tables. This is not an entirely satisfactory statistical unit for input-output tables: however, the statistical unit utilized in available data and a shortage of available personnel necessitated the use of the establishment as the basic statistical unit for the input-output tables.

The concept of establishment used in the industrial statistics of Finland, which are the main source of data for the input-output table, serves the purpose of input-output study rather well. It was considered necessary to change this concept only in one respect. The value of own-account transport services and the inputs used for that purpose were transferred to the transport sector. Other secondary activities of an establishment (such as own-account construction, laboratory work and loading) were in fact of such minor magnitude that they were left among the principal activities of the establishment.

When the secondary products of some sectors were significant these sectors were combined with those producing mainly these products. The criterion of product homogeneity was then only roughly fulfilled. In the aggregation of sectors, the criterion that the demand for products could be expected to change at least approximately in the same way was also considered.

Classification of sectors has been done on the basis of the International Standard Industrial Classification system. At the first stage of compilation about 300 production sectors were separated. It was not possible, however, to complete an input-output table with so detailed a classification because basic data are scarce and unreliable. Input-output tables are to be published in three different alignments: (*a*) a large table consisting of 124 producing sectors; (*b*) a medium-sized table consisting of 44 sectors; and (*c*) a small table consisting of only eight sectors.

Cross-classification of input-output sectors in the 124-sector table, of those in the 44-sector table, and of the ISIC code number is presented in table 1 of this annex.

ANNEX TABLE 1: CLASSIFICATION OF INDUSTRIES

Finnish 44-sector table	*Code number of the ISIC*	*Finnish 124-sector table*
01 Agriculture	010	Agriculture
02 Livestock production	010	Livestock production
03 Forestry and logging	020	Forestry and logging
04 Hunting and fishing	030, 040	Hunting and fishing
05 Metal mining	121	Iron-ore mining
	122	Non-ferrous metal mining
06 Other mining	140	Stone quarrying, clay and sand pits
	140	Limestone quarrying
	199	Mineral quarrying and pits not elsewhere classified
	199	Digging and preparation of peat
07 Food manufacturing industries	201	Slaughtering, preparation and preserving of meat
	202	Processing of dairy products
	203, 204	Canning and preserving of fruits, vegetables and fish
	209	Preparation of animal feed
	205, 206	Grain mills and manufacture of bakery products
	207	Sugar refineries
	208	Manufacture of chocolate and sugar confectionery
	209	Manufacture of starch
	209	Manufacture of cooking fats
	209	Coffee roasting
	209	Food manufacturing not elsewhere classified
08 Beverage industries	211	Manufacture of spirits
	212	Manufacture of wines and liqueurs
	213, 214	Breweries and manufacture of soft drinks
09 Tobacco manufactures	220	Tobacco industries
10 Textile manufactures	231	Spinning, weaving and finishing of textiles
	232	Knitting mills
	233	Cordage, rope and twine industries
	239	Manufacture of felt, wadding and their products
	239	Manufacture of other textiles
11 Wearing apparel industries	241, 242	Manufacture and repair of footwear
	243, 292	Fur-dressing and manufacture of wearing apparel, except footwear

Annex table 1: Classification of industries (*continued*)

Finnish 44-sector table	*Code number of the ISIC*	*Finnish 124-sector table*
	244	Manufacture of other made-up textile goods
12 Manufacture of wood and cork	251, 252	Sawmills, planing and wood excelsior manufacturing
	251	Plywood mills
	251	Wood preservation
	251	Manufacture of wood-particle boards
	251	Prefabrication of wooden houses
	251, 252	Other manufacture of wood
13 Manufacture of furniture (except metal furniture) and fixtures	260	Manufacture of furniture (except metal furniture) and fixtures
14 Manufacture of paper and paper products	271	Wood pulp mills
	271	Pulp mills
	271	Paper and cardboard mills
	271	Wallboard mills
	272	Manufacture of articles of paper and paperboard
15 Printing and publishing	280	Printing and etching of steel and copper plates
	280	Bookbinding
	280	Publishing
16 Manufacture of leather products	291	Tanneries and leather finishing
	293	Manufacture of leather products
17 Manufacture of rubber products	300	Manufacture of rubber products
	300	Vulcanizing
18 Manufacture of chemicals and chemical products	311	Manufacture of inorganic chemicals, except fertilizers
	311	Manufacture of fertilizers
	311	Manufacture of organic chemicals, except synthetic fibres
	311	Manufacture of synthetic fibres
	312	Manufacture of vegetable and animal oils and fats
	311, 313	Manufacture of paints, varnishes and lacquers
	319	Manufacture and packing of cosmetics, toilet preparations, washing compounds and candles
	319	Manufacture of medical and pharmaceutical preparations
	319	Manufacture of other chemical products
19 Manufacture of products of petroleum and coal	321	Petroleum refineries
	329	Manufacture of other petroleum and coal products
	329	Manufacture of lubricating oils and greases
20 Manufacture of non-metallic mineral products, except products of petroleum and coal	331	Manufacture of structural clay products
	332	Manufacture of glass and glass products
	333	Manufacture of pottery, china and earthenware
	334	Manufacture of cement
	339	Manufacture of lime and chalk
	339	Manufacture of concrete products and mortar
	339	Manufacture of stone products
	339	Manufacture of other clay and stone products
21 Basic metal industries	341	Iron and steel basic industries
	342	Copper and nickel basic industries
	342	Basic metal industries not elsewhere classified
22 Manufacture of metal products, except machinery and transport equipment	350	Manufacture of metal products such as wire, nails, files, springs, cutlery, metal furniture, plating, etc.
	350	Repair of metal products
	350	Manufacture of metal products not elsewhere classified
23 Manufacture of machinery, except electrical	360	Manufacture of machinery
	360	Machinery repair shops
24 Manufacture of electrical machinery, apparatus, appliances and supplies	370	Manufacture of insulated wires and cables
	370	Manufacture of electric lamps and lighting
	370	Fixtures
	370	Manufacture of accumulators and batteries
	370	Manufacture of strong and weak current apparatus and supplies
	370	Electrotechnical repair shops
25 Manufacture of transport equipment	381	Building and repairing of ships and boats
	382	Manufacture and repair of railway and tramway equipment
	383	Manufacture of motor vehicles
	384	Repair of motor vehicles
	385	Manufacture of motor cycles and bicycles
	386	Manufacture and repair of aircraft
	389	Manufacture of other transport equipment
26 Miscellaneous industries	391, 392, 395	Manufacture of precision and musical instruments
	394	Manufacture of jewellery and related articles
	399	Manufacture of plastic products not elsewhere classified

ANNEX TABLE 1: CLASSIFICATION OF INDUSTRIES (*continued*)

Finnish 44-sector table	*Code number of the ISIC*	*Finnish 124-sector table*
	259, 399	Manufacturing industries not elsewhere classified
27 House construction	400	House construction
28 Other construction	400	Other construction
29 Electricity, gas and water services	511	Electric light and power
	512	Gas manufacturing and distribution
	513	Production and distribution of steam
	521	Water supply
30 Commerce	610	Wholesale and retail trade
31 Banking and insurance	620	Financial institutions
	630	Insurance
32 Ownership of dwellings	640	Ownership of dwellings
33 Water transport	715, 716	Water transport
34 Services incidental to transport	718	Services incidental to transport
35 Railway transport	711	Railway transport
36 Tramway and bus transport	712	Tramway and bus transport
	712, 713, 714	Other road transport
38 Air transport	717	Air transport
39 Communications	730	Communications
40 Public administration and defence	810	State government
	810	Local government
41 Community services	821, 823, 827	Educational services
	822	Medical services
	824, 825	Religious organizations
42 Business services not elsewhere classified	829, 830	Business services not elsewhere classified
43 Recreation services, hotels and restaurants	840	Recreation services
	852, 853	Hotels and restaurants
44 Other personal services	826	Associations and institutions
	851	Personal domestic services
	854, 855, 856, 859	Other personal services

Unallocated outputs and inputs are treated as an exogenous sector, in order not to mix the identified intermediate inputs with uncertain estimates. The unallocated items are due to three different causes:

(*a*) the production in different sectors of commodities used for the same purpose;

(*b*) observed stock changes (net);

(*c*) observation and compilation errors.

The first group consists of unallocated office materials, packaging materials, scrap and repairs. Stock changes could be observed only in a few cases. As a rule they are included in the observation errors, which on an average amount to about 1 per cent of the total production. In "Financial institutions" the unallocated item consists of intermediate bank services. In "Insurance" this item shows the difference between intermediate insurance payments and the value of corresponding insurance services (operating costs).

The primary inputs are (*a*) labour income, (*b*) capital income, (*c*) indirect taxes less subsidies, and (*d*) imported goods and services. Labour income includes wages and salaries, national pension premiums, family allowances and other social expenditures paid by employers, and income from unincorporated enterprises (except income from forestry and ownership of dwellings). Capital income includes the two last-mentioned items, interests, rent, corporate profits before deduction of direct taxes, and depreciation.

Imported inputs are treated in the basic table as an input of the using industry. To improve the analytical usefulness of the table a separate table for imports has been compiled. Imported goods and services are cross-classified in this table by both the using industries and the counterpart domestic industries. They are also divided into competitive and non-competitive imports, according to whether they are produced in Finland or not.

Domestic transactions are valued at producers' prices. Imported goods and services are valued at prices which were obtained by subtracting the freights paid to domestic ships from the c.i.f. prices (excluding customs duties). All the transactions are valued at their actual prices, although these may vary according to the use of the commodity.

The gross value of output in manufacturing sectors consists of the sales value of primary and secondary products at producers' prices and of miscellaneous receipts from repairs, contract work and sales of scrap.

On the basis of worksheet information it is possible to construct tables for commercial margins, transport charges and indirect taxes. By means of these tables the transaction table valued at purchasers' prices, although not readily available, can be compiled. Worksheet tables also permit the retabulation of the freights paid to domestic ships as a supporting table for the import table. Information on principal quantity flows is also available in worksheets.

The data on the value and quantity of commodities produced at different manufacturing sectors (product-mix) as well as the value at purchasers' prices and the quantities of commodities used as inputs in these sectors are put on punchcards. These data are not entirely consistent with the final input-output table. In spite of these inconveniences they may serve as a useful source of additional information for international comparisons.

In connexion with the attempt to compile an input-output table of the Finnish economy by the RAS method[4] for 1963, some information on the constancy of input coefficients was obtained. The trial was made by using the 124-sector input-output model for 1959. In testing the constancy of 1959 input coefficients the following formulae were used:

$$\overline{X}_{i.} = \sum_{j=1}^{124} \frac{p_i}{p_j} a_{ij}^{59}\, X_j^{63} \qquad \overline{X}_{.j} = \sum_{i=1}^{124} \frac{p_i}{p_j}\, {}^{59}_{j} \quad X_i^{63}$$

where X_j^{63}=total output for 1963; X_i=forecasted intermediate demand for 1963; $\overline{X}_{.j}$=forecast intermediate inputs for 1963; a_{ij}=input coefficient for 1959; p_i or p_j=price relatives for output (period 1963 divided by period 1959).

When intermediate demand $(\overline{X_i}.)$ and intermediate inputs $(X._j)$ were estimated for 1963 the forecasts could be compared with corresponding actual observations. Table 2 to this annex outlines some results of the comparisons.

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[4] See University of Cambridge Department of Applied Economics, *Input-Output Relationships, 1954–1966: A Programme for Growth*, Series 3 (1963), pp. 27–38.

ANNEX TABLE 2: FORECASTING ERRORS FOR 1963

	Intermediate demand			*Intermediate inputs*		
Group of industries	$\overline{X}_{i\cdot}$	$\overline{X}_{i\cdot}—X_{i\cdot}$	*Ratio percentage error to* $\overline{X}_{i\cdot}$	$\overline{X}_{\cdot j}$	$\overline{X}_{\cdot j}—X_{\cdot j}$	*Ratio percentage error to* $X_{i\cdot}$
Agriculture, forestry, hunting and fishing	41,259	5,534	0·136	15,867	2,545	0·160
Mining and quarrying	3,902	597	0·153	508	46	0·091
Manufacture of food, beverages and tobacco	10,471	1,554	0·148	30,390	2,216	0·072
Manufacture of wood, furniture, paper and paper products	14,908	2,570	0·172	29,040	2,263	0·078
Manufacture of metal and metal products	26,926	2,579	0·096	19,308	1,602	0·083
Other manufacturing industries	24,519	4,589	0·187	18,255	2,173	0·119
Electricity, gas, water and sanitary services	7,869	648	0·082	2,626	703	0·268
Construction	3,411	207	0·061	20,748	1,413	0·068
Trade and transport	18,906	2,738	0·145	11,395	1,044	0·092
Other services	5,664	474	0·084	9,698	694	0·072
TOTAL	157,835	21,490	0·136	157,835	14,699	0·093

Projection errors are not due solely to the changes of input coefficients at constant prices: in some cases the revisions in basic production statistics undertaken after 1959 account for rather great errors (for instance in agriculture). Another major cause of errors lies in the inaccuracy of price relative estimates. Even if these statistical errors are taken into consideration, however, technical changes for certain industries seem rather significant during the period 1959–63.

Owing to some conceptual and statistical divergences the 1956 and the 1959 input-output table are not directly comparable with each other. The stability of input coefficients during this period has therefore not yet been studied.

In table 3, which is in producers' prices, all imports are classified by using sectors (row 400). In table 4, which is at c.i.f. prices, excluding customs duties and freight paid to domestic ships, a=non-competitive imports, and b=competitive imports. In both tables, columns 45 to 49 read as follows:

Column 45: Exports

Column 46: Private consumption

Column 47: Government consumption

Column 48: Investment

Column 49: Unallocated, including net changes in stock.

ANNEX TABLE 3: INPUT-OUTPUT TABLE FOR FINLAND, 1959

(Each row shows the output required from the industry named at the beginning of the row

		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	Agriculture	1,072	5,637	—	—	—	—	1,234	81
2	Livestock production	1,102	329	523	—	—	—	9,305	0
3	Forestry	10	207	—	—	4	0	48	6
4	Hunting and fishing	—	22	—	—	—	—	30	—
5	Metal mining	—	—	—	—	46	—	—	—
6	Non-metallic mining and quarrying	49	—	—	—	0	26	9	1
7	Food manufacturing industries	—	1,531	—	—	—	—	4,223	41
8	Beverage industries	—	2	—	—	—	—	4	179
9	Tobacco manufactures	—	—	—	—	—	—	—	—
10	Manufacture of textiles	—	14	—	—	—	—	1	0
11	Manufacture of footwear, other wearing apparel and made-up textile goods	—	—	—	—	0	—	—	—
12	Manufacture of wood and cork, except furniture	—	—	—	—	3	4	3	0
13	Manufacture of furniture and fixtures	—	—	—	—	—	—	—	—
14	Manufacture of paper and paper products	—	—	—	—	—	—	2	0
15	Printing, publishing and allied industries	9	14	—	—	—	—	—	5
16	Manufacture of leather and leather products, except footwear	—	—	—	—	—	1	—	—
17	Manufacture of rubber products	—	—	—	—	3	1	1	1
18	Manufacture of chemicals and chemical products	1,065	180	—	5	29	1	558	21
19	Manufacture of products of petroleum and asphalt	72	6	18	3	3	1	20	2
20	Manufacture of non-metallic mineral products	24	—	—	—	6	—	0	—
21	Basic metal industries	—	—	—	—	10	4	1	0
22	Manufacture of metal products, except machinery and transport equipment	15	24	—	—	7	5	6	3
23	Manufacture of machinery, except electrical machinery	—	—	—	—	21	16	68	4
24	Manufacture of electrical machinery, apparatus, appliances and supplies	—	—	—	—	2	0	—	0
25	Manufacture of transport equipment	—	—	—	—	—	—	—	—
26	Miscellaneous industries	—	—	—	—	—	—	0	—
27	House construction	36	320	55	—	1	1	31	3
28	Other construction	18	2	—	—	0	0	1	0
29	Electricity, gas steam and water services	—	137	—	—	45	18	195	18
30	Trade	258	140	40	9	15	6	138	16
31	Banking and insurance	20	56	24	1	3	1	32	5
32	Ownership of dwellings	—	—	—	—	—	—	—	—
33	Water transport	37	4	—	—	1	1	134	3
34	Services incidental to transport	—	—	—	—	—	—	—	—
35	Railway transport	159	43	2	0	6	1	261	14
36	Tramway and bus transport	—	—	—	—	—	—	—	—
37	Other road transport	138	56	2	0	14	31	949	70
38	Air transport	—	—	—	—	—	—	—	—
39	Communications	1	1	—	—	1	2	61	5
40	Government services	—	—	—	—	—	—	—	—
41	Education, health and related services	—	—	—	—	—	—	—	—
42	Business services not elsewhere classified	59	26	148	—	1	1	118	27
43	Recreation services	—	—	—	—	—	—	—	—
44	Personal services	—	—	—	—	—	—	—	—
1–44	*Total, intermediate inputs*	*4,144*	*8,751*	*812*	*18*	*221*	*121*	*17,433*	*505*
100	Labour incomes	5,164	6,353	3,431	559	192	162	1,884	207
200	Capital incomes	1,047	915	5,452	58	439	128	2,015	213
300	Indirect taxes	−159	−87	−1	8	30	14	2,033	97
400	Imports	342	108	26	—	14	7	2,504	99
100–400	*Total primary inputs*	*6,394*	*7,289*	*8,908*	*625*	*675*	*311*	*8,436*	*616*
000	*Unallocated items*	227	153	122	22	15	27	424	74
	TOTAL PRODUCTION	**10,765**	**16,193**	**9,842**	**665**	**911**	**459**	**26,293**	**1,195**

(in 100,000 markka (nmk) at producers' prices)

by the industry named at the head of the column and the output delivered to final demand)

9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
—	0	—	—	—	—	—	—	—	139	—	—	—	—	—	—	—	—	—	—
—	21	7	—	—	—	—	28	—	0	—	—	—	—	—	—	—	—	—	2
0	10	4	3,718	4	2,979	1	1	1	26	0	24	2	5	7	0	13	1	578	97
—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	38	—	—	—	7	0	5	536	—	—	—	—	—	—	4
—	0	0	1	—	18	—	0	5	3	5	188	2	3	1	1	5	3	49	29
1	1	1	0	—	1	—	125	0	71	—	—	—	0	—	0	—	3	—	0
—	—	—	—	—	—	—	—	—	8	—	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	542	1,442	1	89	41	14	5	47	8	1	1	2	9	1	2	22	5	15	—
—	0	85	2	—	—	—	—	—	—	—	—	0	—	—	—	0	—	—	—
1	5	15	464	324	608	0	2	0	6	2	22	5	12	17	0	53	25	517	361
—	—	0	1	10	—	—	—	—	—	—	0	0	2	—	37	—	5	505	1
23	2	1	6	8	4,446	561	2	—	108	22	9	—	1	1	19	2	2	362	2
—	0	0	1	0	—	931	0	0	2	0	—	—	—	—	0	—	0	—	—
—	2	442	1	1	0	3	53	0	1	0	1	—	3	14	0	6	2	—	—
—	2	50	2	1	7	0	0	55	5	1	1	0	2	10	1	17	1	104	—
1	158	22	39	47	258	39	8	3	662	12	9	9	21	29	18	32	10	372	144
0	13	3	14	1	21	2	1	5	17	38	21	14	7	8	3	11	1	111	62
—	—	—	0	2	68	—	1	—	8	2	231	15	2	8	50	3	4	1,371	475
0	1	—	2	23	3	9	—	—	14	0	35	2,989	470	302	422	143	75	191	201
0	5	30	24	62	60	3	4	1	5	4	25	12	138	154	35	126	7	489	108
1	17	10	72	7	357	16	1	3	35	14	33	35	11	454	26	177	5	200	147
0	2	—	5	—	0	0	—	—	10	0	1	1	11	83	198	61	1	425	377
—	—	—	2	—	—	—	—	—	—	—	—	—	0	8	1	349	0	16	26
15	7	49	—	3	1	0	6	—	4	—	1	—	1	7	4	5	17	116	0
1	6	3	18	3	37	3	0	1	5	0	3	3	2	6	6	6	1	—	14
—	0	0	5	0	8	0	0	—	1	0	0	1	0	0	—	1	0	—	—
3	83	28	214	32	1,789	26	8	24	164	20	93	110	59	97	31	70	16	127	30
6	21	11	22	6	81	3	2	4	51	11	39	19	14	17	9	20	3	533	237
1	10	10	50	12	31	10	2	4	19	14	15	11	9	15	6	32	5	32	12
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	15	2	11	3	34	1	2	2	33	53	24	27	14	13	9	21	2	4	18
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8
10	47	23	111	12	332	14	5	10	119	18	60	80	29	30	21	34	10	180	127
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	51	40	417	32	777	37	11	22	137	39	182	62	52	67	30	98	25	744	2,237
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	12	24	13	9	28	78	2	4	17	2	11	5	12	21	9	28	8	27	45
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27	2	65	10	15	26	42	2	8	197	3	17	1	9	18	13	73	15	—	2
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
110	*1,035*	*2,371*	*5,226*	*706*	*12,049*	*1,793*	*271*	*199*	*1,882*	*261*	*1,051*	*3,941*	*898*	*1,388*	*951*	*1,408*	*252*	*7,068*	*4,766*
105	1,523	1,572	1,838	596	2,216	1,183	153	195	705	82	852	460	1,130	1,808	781	1,990	388	5,806	4,821
157	708	516	666	169	2,439	762	50	209	994	308	469	321	337	727	392	836	162	385	669
33	57	142	68	29	214	13	9	17	267	23	65	37	69	98	51	157	14	1,421	282
201	1,499	476	145	68	551	39	168	191	1,076	337	162	413	636	1,020	652	1,663	165	869	328
496	*3,787*	*2,706*	*2,717*	*862*	*5,420*	*1,997*	*380*	*612*	*3,042*	*750*	*1,548*	*1,231*	*2,172*	*3,653*	*1,876*	*4,646*	*729*	*8,481*	*6,100*
34	104	83	81	38	276	15	3	33	245	14	95	417	68	128	46	199	50	0	595
640	**4,926**	**5,160**	**8,024**	**1,606**	**17,745**	**3,805**	**654**	**844**	**5,169**	**1,025**	**2,694**	**5,589**	**3,138**	**5,169**	**2,873**	**6,253**	**1,031**	**15,549**	**11,461**

ANNEX TABLE 3: INPUT-OUTPUT TABLE FOR FINLAND, 1959

		29	*30*	*31*	*32*	*33*	*34*	*35*	*36*
1	Agriculture	—	—	—	—	—	—	—	—
2	Livestock production	—	—	—	—	—	—	—	—
3	Forestry	95	—	—	1,333	3	—	—	—
4	Hunting and fishing	—	—	—	—	—	—	—	—
5	Metal mining	0	—	—	—	—	—	—	—
6	Non-metallic mining and quarrying	34	—	—	—	—	—	—	—
7	Food manufacturing industries	—	—	—	—	—	—	—	—
8	Beverage industries	—	—	—	—	—	—	—	—
9	Tobacco manufactures	—	—	—	—	—	—	—	—
10	Manufacture of textiles	1	—	—	—	—	—	—	—
11	Manufacture of footwear, other wearing apparel and made-up textile goods	—	—	—	—	—	—	—	—
12	Manufacture of wood and cork, except furniture	227	—	—	63	—	—	2	—
13	Manufacture of furniture and fixtures	—	—	10	—	—	—	1	—
14	Manufacture of paper and paper products	137	—	—	—	—	—	0	—
15	Printing, publishing and allied industries	0	—	58	—	—	—	7	—
16	Manufacture of leather and leather products, except footwear	0	—	—	—	—	—	—	—
17	Manufacture of rubber products	1	—	—	—	—	—	1	23
18	Manufacture of chemicals and chemical products	7	—	—	—	—	—	3	—
19	Manufacture of products of petroleum and asphalt	64	—	—	116	8	1	15	47
20	Manufacture of non-metallic mineral products	4	—	—	—	—	—	—	—
21	Basic metal industries	5	—	—	—	—	—	—	—
22	Manufacture of metal products, except machinery and transport equipment	15	—	—	—	1	—	9	—
23	Manufacture of machinery, except electrical machinery	77	—	—	—	—	5	2	—
24	Manufacture of electrical machinery, apparatus, appliances and supplies	12	—	—	—	—	—	33	0
25	Manufacture of transport equipment	—	—	—	—	141	—	422	271
26	Miscellaneous industries	—	—	—	—	—	—	—	—
27	House construction	8	135	45	624	4	6	63	1
28	Other construction	13	—	—	—	35	—	359	—
29	Electricity, gas steam and water services	726	100	43	1,223	3	3	26	21
30	Trade	87	—	14	130	—	2	2	102
31	Banking and insurance	55	134	3	85	115	6	—	43
32	Ownership of dwellings	—	207	—	—	—	—	—	—
33	Water transport	73	—	5	96	460	0	22	10
34	Services incidental to transport	—	—	—	—	25	—	—	—
35	Railway transport	119	7	38	85	—	—	—	—
36	Tramway and bus transport	—	—	36	—	—	—	—	—
37	Other road transport	53	8	37	59	—	1	1	35
38	Air transport	—	—	15	—	—	—	—	—
39	Communications	52	400	108	5	7	34	—	—
40	Government services	—	—	—	—	—	—	—	—
41	Education, health and related services	—	—	—	—	—	—	—	—
42	Business services not elsewhere classified	5	534	148	20	4	9	—	—
43	Recreation services	—	—	—	—	—	—	—	—
44	Personal services	—	—	—	—	—	—	—	—
1–44	*Total, intermediate inputs*	*1,870*	*1,525*	*560*	*3,839*	*806*	*67*	*968*	*553*
100	Labour incomes	932	7,581	1,458	335	1,162	173	1,749	656
200	Capital incomes	2,697	4,243	1,118	8,469	683	101	137	494
300	Indirect taxes	72	62	—	82	17	4	34	230
400	Imports	418	—	100	578	796	1	140	68
100–400	*Total primary inputs*	*4,119*	*11,886*	*2,676*	*9,464*	*2,658*	*279*	*2,060*	*1,448*
000	*Unallocated items*	110	175	109	85	− 15	18	− 25	—
	TOTAL PRODUCTION	**6,099**	**13,586**	**3,345**	**13,388**	**3,449**	**364**	**3,003**	**2,001**

(in 100,000 markka (nmk) at producers' prices) (*continued*)

37	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*1–44*	*45*	*46*	*47*	*48*	*44–48*	*49*	*1–49*
—	—	—	—	—	—	—	—	*8,163*	9	1,987	27	—	*2,023*	579	**10,765**
—	—	—	—	—	—	—	—	*11,317*	384	4,388	7	—	*4,779*	97	**16,193**
—	—	—	—	—	—	—	—	*9,177*	1,629	4	114	—	*1,747*	−1,082	**9,842**
—	—	—	—	—	—	—	—	*56*	3	607	—	—	*610*	− 1	**665**
—	—	—	—	—	—	—	—	*636*	270	—	—	—	*270*	5	**911**
—	—	—	—	—	—	—	—	*432*	8	5	17	—	*30*	− 3	**459**
—	—	—	—	—	—	—	—	*5,998*	2,326	17,449	492	—	*20,267*	28	**26,293**
—	—	—	—	—	—	—	—	*193*	8	994	—	—	*1,002*	0	**1,195**
—	—	—	—	—	—	—	—	*10*	0	630	—	—	*630*	0	**640**
—	—	—	—	—	—	—	—	*2,263*	159	2,411	—	35	*2,605*	58	**4,926**
—	—	—	—	—	—	—	—	*87*	30	4,930	96	3	*5,059*	14	**5,160**
—	—	—	—	—	—	—	—	*2,741*	5,713	95	—	24	*5,832*	− 549	**8,024**
—	—	—	—	—	—	—	—	*572*	41	928	—	61	*1,030*	4	**1,606**
—	—	—	—	—	—	—	—	*5,716*	11,144	172	—	—	*11,316*	713	**17,745**
—	—	14	—	—	711	—	—	*1,752*	16	1,239	187	—	*1,442*	611	**3,805**
—	—	—	—	—	—	—	—	*530*	2	109	—	20	*131*	− 7	**654**
120	—	—	—	—	—	—	—	*410*	20	416	—	—	*436*	− 2	**844**
—	—	—	—	—	—	—	3	*3,765*	333	922	169	—	*1,424*	− 20	**5,169**
306	—	—	—	—	—	—	—	*1,035*	1	51	13	—	*65*	− 75	**1,025**
—	—	—	—	—	—	—	—	*2,274*	132	228	—	25	*385*	35	**2,694**
—	—	—	—	—	—	—	—	*4,900*	483	0	—	2	*485*	204	**5,589**
—	—	—	—	—	—	—	—	*1,377*	144	543	—	656	*1,343*	418	**3,138**
—	—	31	—	—	—	28	7	*1,880*	1,514	251	62	1,011	*2,838*	451	**5,169**
0	—	50	—	—	—	—	—	*1,272*	312	574	—	465	*1,351*	250	**2,873**
685	63	2	—	—	—	—	—	*1,986*	1,949	713	—	1,284	*3,946*	321	**6,253**
—	—	—	—	—	—	—	—	*236*	26	683	—	79	*788*	7	**1,031**
—	1	32	—	—	20	55	19	*1,578*	—	121	497	12,977	*13,595*	376	**15,549**
—	—	159	—	—	—	—	—	*603*	—	28	1,294	9,443	*10,765*	93	**11,461**
—	—	37	—	—	—	—	—	*5,619*	8	84	291	—	*383*	97	**6,099**
715	21	—	—	—	9	25	4	*2,842*	70	8,998	336	1,343	*10,747*	− 3	**13,586**
144	6	8	—	—	—	4	1	*1,046*	183	1,080	36	—	*1,299*	1,000	**3,345**
—	—	—	—	—	110	116	25	*458*	—	12,930	—	—	*12,930*	—	**13,388**
66	2	0	—	—	—	—	—	*1,204*	1,916	194	60	330	*2,500*	− 255	**3,449**
—	—	—	—	—	—	20	—	*53*	—	311	—	—	*311*	—	**364**
—	2	63	—	—	9	4	3	*2,088*	558	523	93	62	*1,236*	− 321	**3,003**
—	—	10	—	—	—	—	—	*46*	—	1,850	55	—	*1,905*	50	**2,001**
217	16	7	—	—	6	4	1	*6,772*	511	1,951	254	70	*2,786*	− 39	**9,519**
—	0	6	—	—	—	—	2	*23*	92	141	40	—	*273*	41	**337**
—	2	4	—	—	—	16	2	*1,057*	—	955	188	—	*1,143*	—	**2,200**
—	—	—	—	—	—	—	—	—	—	808	4,556	—	*5,364*	—	**5,364**
—	—	—	—	—	—	—	—	—	—	3,163	5,253	—	*8,416*	—	**8,416**
—	8	3	—	—	—	—	—	*1,656*	—	68	—	—	*68*	− 2	**1,722**
—	—	—	—	—	—	—	—	—	—	1,812	—	—	*1,812*	—	**1,812**
—	—	—	—	—	—	—	—	—	—	1,258	—	—	*1,258*	—	**1,258**
2,253	*121*	*426*	—	—	*865*	*272*	*67*	*93,823*	*29,994*	*76,604*	*14,137*	*27,890*	*148,625*	*3,093*	**245,541**
4,219	97	1,335	5,179	7,567	799	1,168	1,053	*81,619*	—	—	—	—	—	—	**81,619**
871	36	342	185	448	135	310	101	*41,913*	—	—	—	—	—	—	**41,913**
1,322	18	15	—	—	− 106	8	4	*6,763*	− 870	8,009	217	2,073	*9,429*	93	**16,285**
854	21	—	—	—	—	—	—	*16,735*	—	3,831	461	5,516	*9,808*	378	**26,921**
7,266	*172*	*1,692*	*5,364*	*8,015*	*828*	*1,486*	*1,158*	*147,030*	*− 870*	*11,840*	*678*	*7,589*	*19,237*	*471*	**166,738**
—	44	82	—	401	29	54	33	*4,688*	185	−1,417	1,564	—	*332*	—	**5,020**
9,519	**337**	**2,200**	**5,364**	**8,416**	**1,722**	**1,812**	**1,258**	**245,541**	**29,309**	**87,027**	**16,379**	**35,479**	**168,194**	**3,564**	**417,299**

Note: Column 45 = exports; column 46 = private consumption; column 47 = government consumption; column 48 = investment and column 49 = unallocated including net changes in stock.

ANNEX TABLE 4: IMPORT TABLE FOR FINLAND, 1959 (in 100,000 markka (nmk)

(Each row shows the import of products characteristic to the industry named at the beginning of the row and

			1	*2*	*3*	*4*	*5*	*6*	*7*
1	Agriculture	a	35	21	—	—	—	—	987
		b	72	—	—	—	—	—	692
2	Livestock production	b	—	2	—	—	—	—	1
3	Forestry	a	—	—	—	—	—	—	9
		b	—	—	—	—	—	—	—
4	Hunting and fishing	b	—	—	—	—	—	—	52
5	Coal-mining	a	—	—	—	—	0	2	20
6	Metal-mining	b	—	—	—	—	—	—	—
7	Non-metallic mining and quarrying	a	—	—	—	—	—	—	—
		b	88	5	17	—	2	1	14
8	Food manufacturing industries	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	3
9	Beverage industries	a	—	13	—	—	—	—	442
		b	—	—	—	—	—	—	—
10	Manufacture of textiles	a	—	3	—	—	—	—	2
		b	—	—	—	—	—	—	—
11	Manufacture of footwear, other wearing apparel and made-up textile goods	a	—	—	—	—	—	—	0
		b	—	—	—	—	—	—	—
12	Manufacture of wood and cork, except manufacture of furniture	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
13	Manufacture of paper and paper products	b	—	—	—	—	—	—	—
14	Printing, publishing and allied industries	b	—	—	—	—	—	—	—
15	Manufacture of leather and leather products, except footwear	b	—	—	—	—	—	—	—
16	Manufacture of rubber products	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	1
17	Manufacture of chemicals and chemical products	a	63	39	—	—	3	1	25
		b	72	22	—	—	3	—	244
18	Manufacture of products of petroleum and asphalt	a	—	—	—	—	—	—	—
		b	12	3	9	—	1	0	6
19	Manufacture of non-metallic mineral products	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
20	Basic metal industries	a	—	—	—	—	—	—	1
		b	—	—	—	—	—	—	0
21	Manufacture of metal products, except machinery and transport equipment	b	—	—	—	—	5	3	4
22	Manufacture of machinery, except electrical machinery	b	—	—	—	—	—	—	2
23	Manufacture of electrical machinery, apparatus, appliances and supplies	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
24	Manufacture of transport equipment	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
25	Miscellaneous industries	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
26	Electricity, gas steam and water services	b	—	—	—	—	—	—	—
27	Banking and insurance	b	—	—	—	—	—	—	—
28	Water transport	b	—	—	—	—	—	—	—
29	Services incidental to transport	b	—	—	—	—	—	—	—
30	Railway transport	b	—	—	—	—	—	—	—
31	Communication	b	—	—	—	—	—	—	—
	TOTAL		**342**	**108**	**26**	—	**14**	**7**	**2,505**

Note: a = non-competitive imports; b = competitive imports.

at c.i.f. prices, excluding customs duties and domestic freights)

required by the industry named at the head of the column and the imports delivered to final demand.)

8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*
1	192	348	—	—	—	—	—	—	30	84	—	—	—	—	—	5	—	—	—
14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
—	—	—	—	2	0	—	—	—	—	4	—	—	—	—	—	—	—	—	—
—	—	—	—	36	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	1	18	2	1	1	16	2	4	1	10	1	65	47	8	12	5	9	1	—
—	—	—	—	—	—	—	—	—	—	—	—	0	1	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	0	32	—	—	—	—	—	—
2	0	6	1	1	0	120	1	1	20	77	266	13	8	3	3	1	4	1	9
—	—	—	0	—	—	0	—	0	—	0	—	5	2	0	—	—	—	—	—
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—
19	—	2	12	—	—	—	—	105	—	10	—	—	—	—	—	—	—	5	—
24	—	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	14	4	—	—	0	—	—	—	3	—	—	—	—	—	—	—	—	—
—	—	709	347	0	18	58	4	4	24	5	0	1	—	0	0	12	4	2	—
—	—	—	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	0	—	3	18	—	—	—	—	—	—	3	—	1	2	—	2	—	—
3	—	—	3	8	14	—	—	—	—	1	—	0	—	1	—	—	4	2	10
—	0	—	—	—	0	14	2	0	—	—	—	—	—	—	—	0	—	0	13
—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—
—	—	1	45	0	0	1	2	5	—	0	—	0	—	1	4	—	1	0	—
—	—	—	—	—	—	—	—	—	83	—	—	—	—	—	—	—	0	0	105
0	—	5	2	0	0	—	0	—	9	1	—	0	—	2	4	—	7	10	—
1	0	113	5	3	1	66	0	32	9	428	2	30	2	11	5	29	2	7	—
1	8	270	3	80	4	174	14	5	7	399	—	5	0	4	4	12	13	109	110
—	—	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	—
1	0	4	1	3	1	21	1	0	6	12	65	6	4	2	3	3	4	0	2
—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	3	0	—	—	4	—	21	4	0	1	23	3	2	86
6	—	—	—	1	—	22	2	—	—	13	—	3	36	310	253	270	380	3	50
—	—	0	—	1	3	—	4	—	—	8	1	2	242	205	159	67	137	5	147
0	0	1	12	4	2	47	3	7	0	7	1	4	14	69	100	29	117	2	231
—	—	7	2	1	1	8	1	0	0	5	1	3	2	12	427	21	247	4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	99	56	—	—
—	—	—	—	1	—	—	—	—	—	2	—	—	18	5	41	52	53	1	27
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	126	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	493	0	—
—	—	—	—	—	—	—	4	—	—	0	—	—	—	1	—	25	—	1	—
—	—	0	5	0	4	—	1	1	—	1	—	—	—	0	1	0	2	8	80
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99	**201**	**1,498**	**476**	**145**	**67**	**550**	**41**	**166**	**189**	**1,077**	**337**	**162**	**412**	**635**	**1,019**	**653**	**1,665**	**167**	**870**

ANNEX TABLE 4: IMPORT TABLE FOR FINLAND, 1959 (in 100,000 markka (nmk)

			28	29	30	31	32	33	34
1	Agriculture	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
2	Livestock production	b	—	—	—	—	—	—	—
3	Forestry	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
4	Hunting and fishing	b	—	—	—	—	—	—	—
5	Coal-mining	a	—	349	—	—	333	35	—
6	Metal-mining	b	—	—	—	—	—	—	—
7	Non-metallic mining and quarrying	a	—	—	—	—	—	—	—
		b	33	37	—	—	191	289	1
8	Food manufacturing industries	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
9	Beverage industries	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
10	Manufacture of textiles	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
11	Manufacture of footwear, other wearing apparel and made-up textile goods	a	—	0	—	—	—	—	—
		b	—	—	—	—	—	—	—
12	Manufacture of wood and cork, except manufacture of furniture	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
13	Manufacture of paper and paper products	b	—	—	—	—	—	—	—
14	Printing, publishing and allied industries	b	—	—	—	—	—	—	—
15	Manufacture of leather and leather products, except footwear	b	—	—	—	—	—	—	—
16	Manufacture of rubber products	a	—	—	—	—	—	—	—
		b	—	0	—	—	—	—	—
17	Manufacture of chemicals and chemical products	a	—	2	—	—	—	—	—
		b	67	2	—	—	—	—	—
18	Manufacture of products of petroleum and asphalt	a	8	—	—	—	—	—	—
		b	16	18	—	—	—	—	—
19	Manufacture of non-metallic mineral products	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
20	Basic metal industries	a	6	0	—	—	—	—	—
		b	1	3	—	—	—	—	—
21	Manufacture of metal products, except machinery and transport equipment	b	10	3	—	—	—	—	—
22	Manufacture of machinery, except electrical machinery	b	150	3	—	—	—	—	—
23	Manufacture of electrical machinery, apparatus, appliances and supplies	a	—	0	—	—	—	—	—
		b	37	1	—	—	—	—	—
24	Manufacture of transport equipment	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	88	—
25	Miscellaneous industries	a	—	—	—	—	—	—	—
		b	—	—	—	—	—	—	—
26	Electricity, gas steam and water services	b	—	—	—	—	55	—	—
27	Banking and insurance	b	—	—	—	100	—	19	—
28	Water transport	b	—	—	—	—	—	313	—
29	Services incidental to transport	b	—	—	—	—	—	52	—
30	Railway transport	b	—	—	—	—	—	—	—
31	Communication	b	—	—	—	—	—	0	—
	TOTAL		**328**	**418**	—	**100**	**579**	**796**	**1**

at c.i.f. prices, excluding customs duties and domestic freights) (*continued*)

35	36	37	38	39	40	41	42	43	44	1–44	46	47	48	46–48	49	1–49
—	—	—	—	—	—	—	—	—	—	*1,703*	384	27	—	*411*	— 29	**2,085**
—	—	—	—	—	—	—	—	—	—	*778*	326	—	—	*326*	256	**1,360**
—	—	—	—	—	—	—	—	—	—	*4*	2	—	—	*2*	2	**8**
—	—	—	—	—	—	—	—	—	—	*15*	—	—	—	—	21	**36**
—	—	—	—	—	—	—	—	—	—	*36*	—	—	—	—	18	**54**
—	—	—	—	—	—	—	—	—	—	*52*	7	—	0	7	—	**59**
32	—	—	—	—	—	—	—	—	—	*979*	53	94	—	*147*	— 53	**1,073**
—	—	—	—	—	—	—	—	—	—	*1*	—	—	—	—	21	**22**
—	—	—	—	—	—	—	—	—	—	*32*	—	—	—	—	32	**64**
73	38	291	21	—	—	—	—	—	—	*1,638*	162	22	—	*184*	— 309	**1,513**
—	—	—	—	—	—	—	—	—	—	*7*	0	14	—	*14*	47	**68**
—	—	—	—	—	—	—	—	—	—	*8*	35	—	—	*35*	— 2	**41**
—	—	—	—	—	—	—	—	—	—	*608*	200	—	—	*200*	52	**860**
—	—	—	—	—	—	—	—	—	—	*24*	21	—	—	*21*	—	**45**
—	—	—	—	—	—	—	—	—	—	*27*	31	—	—	*31*	— 1	**57**
—	—	—	—	—	—	—	—	—	—	*21*	37	—	—	*37*	—	**58**
—	—	—	—	—	—	—	—	—	—	*1,188*	404	—	9	*413*	13	**1,614**
—	—	—	—	—	—	—	—	—	—	*32*	86	—	0	*86*	0	**118**
—	—	—	—	—	—	—	—	—	—	*29*	—	—	—	—	— 4	**25**
—	—	—	—	—	—	—	—	—	—	*46*	11	—	3	*14*	10	**70**
—	—	—	—	—	—	—	—	—	—	*29*	24	—	—	*24*	— 6	**47**
—	—	—	—	—	—	—	—	—	—	*0*	64	9	—	73	26	**99**
—	—	—	—	—	—	—	—	—	—	*61*	4	—	—	*4*	7	**72**
—	—	—	—	—	—	—	—	—	—	*188*	—	—	—	—	— 5	**183**
—	23	121	—	—	—	—	—	—	—	*185*	129	—	16	*145*	5	**335**
—	—	—	—	—	—	—	—	—	—	*879*	2	—	—	*2*	53	**934**
—	—	—	—	—	—	—	—	—	—	*1,632*	126	111	—	*237*	145	**2,014**
—	—	—	—	—	—	—	—	—	—	*11*	—	—	—	—	—	**11**
3	7	49	—	—	—	—	—	—	—	*263*	26	2	—	*28*	7	**298**
—	—	—	—	—	—	—	—	—	—	*2*	—	—	—	—	6	**8**
—	—	—	—	—	—	—	—	—	—	*147*	22	—	25	*47*	22	**216**
—	—	—	—	—	—	—	—	—	—	*1,356*	—	—	—	—	76	**1,280**
—	—	—	—	—	—	—	—	—	—	*985*	—	—	—	—	28	**1,013**
—	—	—	—	—	—	—	—	—	—	*675*	67	—	146	*213*	—	**888**
—	—	—	—	—	—	—	—	—	—	*897*	7	8	2,865	2,880	—	**3,777**
—	—	—	—	—	—	—	—	—	—	*155*	75	—	160	*235*	47	**437**
—	—	—	—	—	—	—	—	—	—	*238*	153	—	653	*806*	7	**1,051**
—	—	—	—	—	—	—	—	—	—	*126*	801	—	69	*870*	—	**996**
—	—	393	—	—	—	—	—	—	—	*974*	71	—	1,426	*1,497*	25	**2,496**
—	—	—	—	—	—	—	—	—	—	*31*	173	—	21	*194*	51	**276**
—	—	—	—	—	—	—	—	—	—	*103*	214	—	124	*338*	—	**441**
—	—	—	—	—	—	—	—	—	—	*55*	—	—	—	—	—	**55**
—	—	—	—	—	—	—	—	—	—	*119*	—	—	—	—	—	**119**
—	—	—	—	—	—	—	—	—	—	*313*	—	—	—	—	—	**313**
—	—	—	—	—	—	—	—	—	—	*52*	—	—	—	—	—	**52**
32	—	—	—	—	—	—	—	—	—	*32*	—	—	—	—	—	**32**
—	—	—	—	—	—	—	—	—	—	*0*	—	—	—	—	—	—
140	**68**	**854**	**21**	—	—	—	—	—	—	**16.736**	**3,717**	**287**	**5,517**	**9,521**	**416**	**26,673**

Note: Column 45 = exports; column 46 = private consumption; column 47 = government consumption; column 48 = investment; column 49 = unallocated including net changes in stock.

FACTORS AFFECTING TECHNICAL COEFFICIENTS—SOME FINDINGS FROM THE HUNGARIAN INTERINDUSTRY DATA

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I. COMPILATORY FACTORS—AGGREGATION, VALUATION AND TREATMENT OF IMPORTS

The technical coefficients obtained from a conventional input-output transactions matrix are greatly influenced by the compilatory conventions involved in it. Adjustments for the effects of diverse compilatory gaps are therefore important in a comparison between countries of the structure of production as revealed by their input-output balances. This note considers only a few aspects of the problem. For empirical demonstrations, only the data for the Hungarian economy are used; it is hoped that an inspection of within-country data can still shed some light upon some of the questions relating to inter-country comparisons.

1. *Aggregation*

The level of aggregation is one of the most important factors influencing the technical coefficients of input-output balances. While some statisticians prefer large detailed tables, others favour small aggregated ones. A detailed table, say 100×100 or larger, is undoubtedly suitable for many purposes connected with industrial planning. It should be borne in mind however that, with detailed breakdown of sectors, many coefficients tend to be small in their apparent magnitude; detection of major coefficients as distinguished from minor ones would thus require a careful evaluation of individual coefficients with respect to their strategic weights in the over-all balance or in relation to given particular objectives of programming for which such a table can offer an expedient analytical tool. Moreover it is quite likely that the magnitude of individual coefficients in a large table may easily be affected by slight errors or gaps in sector and product classification which could be left unquestioned in the case of a smaller table. This point may prove especially important when tables of different countries are to be compared.

For the economy of Hungary in 1961, both 26×26 and 54×54 alignments are officially available. In table 1 the coefficient matrix of the 54×54 order is reproduced. The underlying transaction table is compiled at producers' prices, including turnover taxes; input coefficients are on the total supply basis—i.e. they include both domestically produced goods and imports (this is type A treatment of imports, and will be discussed below). The 26-sector classification corresponding to the 54 intermediate sectors is indicated in the first column of the table.

Disaggregation of the 26 sectors concentrates on only some half-dozen sectors, such as Mining (1–5), Basic metals (6–9), Non-metallic mineral building materials (16–19), Chemicals (20–26), Wood manufactures (28–31), Textiles (34–37), and Food manufactures (41–45). A comparison with similarly compiled data for 1959 shows that coefficients in the aggregated table tend to appear more stable than those in the large table; this is because of the law of averages. In the case of the Precision engineering sector for example, 17 coefficients defined in terms of 26-sector alignment changed by more than 10 per cent from 1959 to 1961, whereas in the 54-sector alignment only 7 coefficients changed by less than 10 per cent. Within the input from each aggregative sector the direction of changes in the coefficients of sub-items varies. For example, the coefficient of input from " basic metals " for the Precision engineering sector changed from 0·1246 in 1959 to 0·0956 in 1961. The details of these coefficients in terms of the 54-sector classification are as follows:

Coefficient of input to Precision engineering from	*Year*		*Percentage change*
	1959	*1961*	
(6) Iron and steel	·0560	·0421	−25
(7) Alumina and light metals ..	·0044	·0013	−71
(8) Heavy metals	·0410	·0247	−30
(9) Foundries	·0232	·0275	+19
Total Basic metals	·1246	·0956	−23

The extent of aggregation influences the magnitude of inverse coefficients. In other words, the inverse coefficients derived from an aggregated table do not equal the weighted aggregates of the inverse coefficients derived from a more detailed table, even if the same composition of final demand as in the base year is used as weights for the aggregation of the latter inverse. In table 2 inverse coefficients obtained from the 26×26 transactions table and those obtained from the 54×54 transactions table are compared. Since the selected six sectors remain single sectors in both tables, the figures in each sub-column (*a*) are obtained directly from the 54×54 inverse without involving weighted aggregation of its columns. However, the process of inversion itself is not free from the particular weights (reflecting the production structure of 1961) involved in the aggregation of the basic transactions table. In our particular examples aggregation errors fortunately turn out to be mostly negligible.

When total (both direct and indirect) labour requirement per unit of output is computed for each sector by

TABLE 1: INPUT-COEFFICIENT

(*Type A: Column total=10,000; the last eight*

26-sector classification	*Selling sector* / *Buying sector (54-sector classification)*	*1*	*2*	*3*	*4*	*5*
(1)	1. Coal, peat and briquettes	807	1	202	111	133
	2. Crude oil and natural gas		195			
	3. Bauxite mining				1	16
	4. Other metal mining					
	5. Industrial minerals mining	1	25	4	1	535
(2)	6. Iron and steel	487	224	231	706	146
	7. Alumina and nonferrous light metals		2		1	3
	8. Nonferrous heavy metals	8	4	11	32	
	9. Foundries	23			8	67
(3)	10. Machinery	164	300	202	219	336
(4)	11. Electric machinery and appliances	106	51	87	123	168
	12. Vacuum tubes and telecommunication equipment	6	6	11	3	3
(5)	13. Precision engineering	1	22	7	16	3
(6)	14. Other fabricated metal products	74	241	281	144	73
(7)	15. Electric energy	453	209	538	456	482
(8)	16. Bricks, roofing tiles and refractories	7	10	11	19	13
	17. Stone and pebble quarrying	4	11	14	17	25
	18. Lime and cement	116	18		61	35
	19. Glass, ceramics and grinding wheels	4	4	4	8	3
(9)	20. Petroleum refineries	112	120	170	170	149
	21. Municipal gas and coal processing	81	9	11	35	41
	22. Industrial gas and heavy chemicals	138	11	43	123	130
	23. Dyestuffs		5	4	3	10
	24. Pharmaceutical products	2	3			
	25. Household chemicals and starch	2				10
	26. Other organic chemicals	24	9	11	24	13
(10)	27. Rubber and plastic products	41	9		110	101
(11)	28. Timber and plywood	65	4	25	53	63
	29. Joinery and wooden building materials	2	3	4	1	3
	30. Furniture	1	2		3	3
	31. Other wood products	35	6	11	49	
(12)	32. Paper	1	1	4	9	282
(13)	33. Printing	14		14	4	22
(14)	34. Cotton textiles		1	4	1	
	35. Woollen textiles		1	4		
	36. Hard fibre and silk textiles				3	9
	37. Haberdashery	1	1	4	1	
(15)	38. Leather processing	2	16		4	3
(16)	39. Textile clothing and hosiery	1		69	59	57
	40. Leather and fur apparel	2		47	20	19
(17)	41. Grain mills and bakery	6	2	4	3	6
	42. Meat, poultry and dairy products	4	6	18	13	13
	43. Sugar, confectionery and coffee		3			
	44. Canned and frozen food		2	7		3
	45. Other food manufactures	6	15	14	28	32
(18)	46. Miscellaneous manufactures	2	3		3	
	Socialist industry, total (1 to 46)	2,803	1,553	2,068	2,646	3,010
(19)	47. Private craftsmen					
(20)	48. Socialist building industry	29		54		13
(21)	49. Private building activities					
(22)	50. Agriculture	509	4	321	158	181
(23)	51. Transport and communication	285	614	79	134	656
(24)	52. Domestic trade	31	12	32	47	51
(25)	53. Foreign trade agents	21	23	14	32	13
(26)	54. Other productive activities	20	102	263	3	3
	Total intermediate inputs	3,698	2,309	2,833	3,019	3,926
(27)	55. Amortization	1,072	2,351	1,537	1,912	947
(28)	56. Wages, other incomes and accumulation	5,229	5,340	5,630	5,069	5,127
	Total gross production	10,000	10,000	10,000	10,000	10,000

MATRIX: HUNGARY 1961
columns in millons of forints at producers' prices.)

6	7	8	9	10	11	12	13	14	15
69	266	27	8	65	44	87	29	51	2,941
63		1	3	7		1	1	1	25
1	427								
597		124		1				2	
11		13	54	2	13	15	4	4	1
2,910	93	741	2,235	1,498	891	312	421	2,121	119
31	2,647	1,557	364	45	309	45	13	229	3
145	55	2,743	542	113	1,094	290	247	528	43
237	13	40		685	438	70	275	597	11
261	21	123	243	1,731	294	224	380	140	36
35	8	13	70	408	1,278	379	312	126	127
4	1			58	129	1,693	225	31	25
11	2	13		59	64	99	740	20	12
53	1	77	291	434	337	158	312	511	27
491	1,830	203	379	144	120	159	103	130	708
179	19	10	96	6	2	8	3	9	7
7		1	105			1			4
4	55	2	2	14	4	6	15	7	26
10		1	82	29	112	247	101	86	13
157	141	85	23	48	55	17	23	38	132
725	359	31	378	37	31	27	27	85	171
31	328	8	92	29	61	81	19	59	4
1	1	3		75	53	73	68	79	2
					1	7	3		
1		5		2	2		4	1	1
8	1	8	3	12	111	40	75	135	3
5	5	13	1	180	225	106	61	43	18
3	1		36	22	5	22	17	14	
				3	1	2	1	1	
1			1	8	12	13	15	5	1
4	10			12	23	42	34	28	38
5	3	41		11	78	159	39	30	
3	7			7	6	36	23	4	3
				23	28	14	15	8	1
1	1	3		15	2	10	12	53	
2	2			18	18	1	4	17	2
3	4	2		5	25	7	15	22	1
3		5		15	1	6	25	10	1
18	5	31		16	12	25	23	31	2
6	1	10		2	2		1	3	
	1				2		1	1	1
	1				1		5	1	
					1	1	1	1	1
						3	2	7	
3	7			2	16	13	3	2	2
2	10	4		15	35	66	65	37	5
6,101	6,327	5,938	5,007	5,855	5,936	4,567	3,764	5,304	4,518
						87	37	52	21
2	1	9	6	1	18	5	3	12	
221	134	247	114	105	44	43	30	117	540
120	86	180	318	66	79	64	51	64	55
84	36	119	43	47	59	46	34	38	33
239	324	1,351	769	11	21	183	122	139	35
6,766	6,909	7,844	6,257	6,085	6,157	4,995	4,041	5,725	5,202
648	705	276	413	396	271	404	300	290	2,047
2,586	2,386	1,880	3,329	3,519	3,572	4,601	5,659	3,986	2,750
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

TABLE 1: INPUT-COEFFICIENT MATRIX:

(*Type A: Column total=10,000; the last eight columns*

26-sector classification	*Buying sector (54-sector classification)* *Selling sector*	*16*	*17*	*18*	*19*	*20*
(1)	1. Coal, peat and briquettes	1,063	139	1,149	714	1
	2. Crude oil and natural gas	68			98	4,484
	3. Bauxite mining					
	4. Other metal mining			6	1	
	5. Industrial minerals mining	777	73	194	278	
(2)	6. Iron and steel	148	235	989	108	43
	7. Alumina and nonferrous light metals	39		2	175	
	8. Nonferrous heavy metals	15	20	44	14	
	9. Foundries	100		224		
(3)	10. Machinery	128	480	186	91	22
(4)	11. Electric machinery and appliances	45	69	24	15	3
	12. Vacuum tubes and telecommunication equipment	26	20	8	5	1
(5)	13. Precision engineering	2	8	9	3	2
(6)	14. Other fabricated metal products	67	90	123	63	41
(7)	15. Electric energy	259	304	408	176	33
(8)	16. Bricks, roofing tiles and refractories	425	24	68	96	1
	17. Stone and pebble quarrying	20	19	73	9	
	18. Lime and cement	110	79	724	24	2
	19. Glass, ceramics and grinding wheels	17	5	22	680	2
(9)	20. Petroleum refineries	74	155	155	80	539
	21. Municipal gas and coal processing	10	8	162	166	10
	22. Industrial gas and heavy chemicals	17	149	31	358	44
	23. Dyestuffs	5	7	11	44	
	24. Pharmaceutical products				1	1
	25. Household chemicals and starch	2	2	4	5	1
	26. Other organic chemicals	3	51	7	97	21
(10)	27. Rubber and plastic products	48	144	40	26	2
(11)	28. Timber and plywood	33	22	12	34	20
	29. Joinery and wooden building materials	5	2	3	2	
	30. Furniture	5	5	6	8	
	31. Other wood products	21	7	72	67	22
(12)	32. Paper	13	14	275	96	2
(13)	33. Printing		12	4	7	
(14)	34. Cotton textiles	1	3	4	151	
	35. Woollen textiles	1	5	8	18	
	36. Hard fibre and silk textiles	3	3	5	14	
	37. Haberdashery	4	3	1	1	
(15)	38. Leather processing	14	2	13	4	
(16)	39. Textile clothing and hosiery	38	64	28	15	
	40. Leather and fur apparel	7	30	8	2	
(17)	41. Grain mills and bakery	12	10	6	2	1
	42. Meat, poultry and dairy products	18	17	23	17	11
	43. Sugar, confectionery and coffee	3	3	3	3	
	44. Canned and frozen food	3	5	3	7	1
	45. Other food manufactures	13	3	20	63	40
(18)	46. Miscellaneous manufactures	2	2	6	35	1
	Socialist industry, total (1 to 46)	3,665	2,293	5,163	3,874	5,352
(19)	47. Private craftsmen					
(20)	48. Socialist building industry					
(21)	49. Private building activities					
(22)	50. Agriculture	35	8	20	28	2
(23)	51. Transport and communication	330	671	313	217	25
(24)	52. Domestic trade	25	10	46	31	9
(25)	53. Foreign trade agents	37	10	30	20	115
(26)	54. Other productive activities	14	2	14	27	25
	Total intermediate inputs	4,106	2,995	5,586	4,196	5,527
(27)	55. Amortization	1,089	1,494	676	739	199
(28)	56. Wages, other incomes and accumulation	4,805	5,511	3,738	5,065	4,274
	Total gross production	10,000	10,000	10,000	10,000	10,000

HUNGARY 1961 (*continued*)
in millions of forints at producers' prices.)

21	22	23	24	25	26	27	28	29	30	31
7,985	579	36	142	111	579	64	79	11	25	33
140	62	23				76				
	2	5								
	183									
1	748	190	2	5	7	95				
65	99	6	17	29	30	27	19	5	75	82
	25	56	6	1	14	11	13	11	1	1
6	99	404	5	3	93	21		65	6	1
55	47		17			17				
48	157	34	59	36	149	105	34	372	41	70
7	69	17	17	5	29	30	18	3	12	12
1	6		1	2	9	3	3		3	
6	31	8	22	4	21	35	30			11
159	54	353	102	429	166	94	158	117	229	68
485	1,213	55	166	47	265	119	156	98	159	135
4	15	2	3	2	5	2	3	3	12	1
	2	1	2		1	1	1	2	4	
34	15	5	4	8	18	5	10	12	4	7
35	49	54	239	120	35	8	4	58	126	15
24	72	301	19	133	125	102	36	8	16	37
492	906	116	86	166	243	47		9	5	123
51	1,058	312	445	268	906	229	170	86	48	5
6	27	516	4	23	66	16	4	54	175	67
	62	1	1,097	6	43	1				3
3	28	22	34	562	16	5	3	2	3	3
23	365	751	379	280	1,863	691	140	52	147	14
24	52	39	77	11	41	136	10	17	54	3
	9	9	10	2	14	2	86	3,418	2,313	2,262
	5		3					48	1	1
	1		1			1	1	9	495	123
2	11	21	18	40	27	5	1	2	428	679
1	395	13	105	178	499	24	2	20	40	30
	21	9	78	38	2	8	2	2	2	5
1	13	3	11	2	7	392		42	164	14
1	3				4	12		12	271	8
5	10	13	3	7		232	2	323	445	31
2	11		3	3	5	270	1	12	29	215
3	4	1	2	1	10	8	5	2		2
22	38	9	18	5	14	30	21	14	26	1
9	14		7	2	7	7			2	
	9		16	89	1	1	5			
1	20	5	66	510	69	6	7			56
	2	1	28	1	4		1			
	3	5	5	4	8					
11	109	918	185	939	731	65	9		54	14
2	21	13	39	24	35	21	9	37	114	61
9,713	6,726	4,327	3,542	4,093	6,161	3,023	1,041	4,925	5,527	4,194
4	45	10	367	424	1	864	4,616	48	89	1,474
243	301	199	104	238	135	77	426	105	252	177
105	96	95	45	64	114	61	123	186	88	52
185	113	82	58	58	133	85	57	102	70	108
	66	1	66	1	294	8	31	199	13	46
10,250	7,348	4,714	4,182	4,878	6,839	4,118	6,294	5,563	6,039	6,052
824	1,291	188	369	152	642	203	247	172	189	132
—1,074	1,362	5,097	5,449	4,969	2,520	5,678	3,460	4,264	3,773	3,817
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

TABLE 1: INPUT-COEFFICIENT MATRIX:
(Type A: Column total=10,000; the last eight columns

26-sector classification	*Selling sector* / *Buying sector (54-sector classification)*	*32*	*33*	*34*	*35*	*36*
(1)	1. Coal, peat and briquettes	149	18	98	134	94
	2. Crude oil and natural gas		1			
	3. Bauxite mining					
	4. Other metal mining					
	5. Industrial minerals mining	32	1	1		
(2)	6. Iron and steel	15	6	10	10	6
	7. Alumina and nonferrous light metals	31	5	1	1	3
	8. Nonferrous heavy metals	3		4	3	2
	9. Foundries	9		12	9	13
(3)	10. Machinery	27	42	83	72	97
(4)	11. Electric machinery and appliances	7	8	8	8	7
	12. Vacuum tubes and telecommunication equipment	7	6			2
(5)	13. Precision engineering	4	6	2	2	3
(6)	14. Other fabricated metal products	65	73	16	15	31
(7)	15. Electric energy	543	124	182	126	133
(8)	16. Bricks, roofing tiles and refractories	2	1	6	4	4
	17. Stone and pebble quarrying					1
	18. Lime and cement	7	1	4	3	6
	19. Glass, ceramics and grinding wheels	2	3	4	2	5
(9)	20. Petroleum refineries		10	43	22	15
	21. Municipal gas and coal processing	7	17	3	2	2
	22. Industrial gas and heavy chemicals	188	104	43	22	21
	23. Dyestuffs	54	203	30	23	6
	24. Pharmaceutical products			1		
	25. Household chemicals and starch	13	6	18	1	11
	26. Other organic chemicals	105	4	195	136	458
(10)	27. Rubber and plastic products	61	19	37	11	16
(11)	28. Timber and plywood	3	2	2	3	11
	29. Joinery and wooden building materials	1	1		1	
	30. Furniture	1	3		1	1
	31. Other wood products	4	6	14	13	15
(12)	32. Paper	2,967	3,989	16	11	14
(13)	33. Printing	13	51	6	6	7
(14)	34. Cotton textiles	9	128	1,713	304	575
	35. Woollen textiles	119	2	61	2,103	18
	36. Hard fibre and silk textiles	34	33	179	72	1,593
	37. Haberdashery	23	11	2	2	12
(15)	38. Leather processing	3	26	9	12	47
(16)	39. Textile clothing and hosiery	16	14	8	18	14
	40. Leather and fur apparel	5				
(17)	41. Grain mills and bakery					
	42. Meat, poultry and dairy products				3	3
	43. Sugar, confectionery and coffee					
	44. Canned and frozen food					
	45. Other food manufactures	52	9	11	9	1
(18)	46. Miscellaneous manufactures	4	12	5	8	33
	Socialist industry, total (1 to 46)	4,586	4,944	2,829	3,171	3,283
(19)	47. Private craftsmen					
(20)	48. Socialist building industry					
(21)	49. Private building activities					
(22)	50. Agriculture	709	14	1,323	1,409	384
(23)	51. Transport and communication	198	51	39	126	230
(24)	52. Domestic trade	161	43	20	216	38
(25)	53. Foreign trade agents	94	75	73	81	50
(26)	54. Other productive activities	230	1	79	73	80
	Total intermediate inputs	5,978	5,127	4,362	5,075	4,064
(27)	55. Amortization	444	433	364	319	382
(28)	56. Wages, other incomes and accumulation	3,579	4,439	5,274	4,606	5,554
	Total gross production	10,000	10,000	10,000	10,000	10,000

HUNGARY 1961 (*continued*)
in millions of forints at producers' prices.)

37	38	39	40	41	42	43	44	45	46	47
35	172	19	7	65	45	190	120	141	17	2
			6	1	1	1		1	3	
2	8		6	13	10	2	24		1	
6	24	2	23	2	4	11	760	9	287	319
3		2	1		8	8	3	2	6	1
	11	7	4		1	14	8	3	38	3
								3	19	
84	58	32	41	24	9	37	70	51	36	138
9	14	4	5	2	3	11	14	7	127	55
2	3	2	1	1		1	3	1	10	23
12	8	4	6	3	1	4	3	7	13	15
31	392	34	58	10	19	17	96	73	224	133
63	79	48	42	112	46	41	208	194	111	51
3	2		2	2	2	7	5	3	85	
	1		1			6		5	26	
4	11	1	6	1	1	4	4	7	92	1
2	4	4	2		5	8	203	70	38	10
5	8	4	7	29	12	91	31	48	17	19
4	6	2	6	16	2	43	3	6	6	13
11	20	4	17	1	2	5	32	28	48	20
3	82	3	21			1	14	6	35	5
14	19			14	67	4	4	4	1	
4	7	2	16	1	8	100	14	19	6	
891	279	164	193			20	40	49	189	6
151	161	229	196	2	2	11	175	17	88	104
2	13	1	2	1		3	54	2	158	330
2					1				5	
	6	1	4	1	1		7	2	24	1
11	11	8	40	3	44	2	322	18	21	83
51	30	20	104	19	46	164	188	79	75	34
24	16	8	9	13	10	44	49	53	20	3
1,098	53	2,021	137		1	3	3	5	1,083	193
163	28	1,389	36			1	2	1	327	690
794	84	589	165	2	1	9	2	10	439	36
187	0	204	50			2	3	3	102	131
3	797	5	2,238	1	1	1	3	1	147	171
21	39	45	158	7	8	9	34	15	36	
	33	4	353	1	4	3	10	6	1	
	5		2	2,145	3	33	56	10	1	72
51	2,954	2	26	130	2,028	79	797	149	382	23
				15	22	594	578	178	26	15
				5	42	14	421	69	2	
7	47	2	6	127	7	138	32	1,421	6	8
45	52	61	34	21	6	11	14	22	298	3
3,797	5,548	4,927	4,033	2,795	2,474	1,748	4,407	2,796	4,677	2,710
										5
										15
										8
3	33	3	80	4,750	5,717	3,389	1,778	1,465	321	30
16	175	54	114	264	370	330	219	234	214	131
47	290	45	169	280	270	227	494	132	127	1,178
76	104	17	13	40	32	51	52	30	19	13
1		9	70	4	2	2		8	39	623
3,939	6,151	5,054	4,478	8,133	8,865	5,746	6,950	4,664	5,397	4,713
189	278	78	94	189	78	195	284	322	77	34
5,872	3,571	4,868	5,427	1,677	1,057	4,059	2,766	5,014	4,527	5,254
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

TABLE 1: INPUT-COEFFICIENT MATRIX
(Type A: Column total=10,000; the last eight

26-sector classification	*Selling sector*	*Buying sector (54-sector classification)*				
		48	*49*	*50*	*51*	*52*
(1)	1. Coal, peat and briquettes	80	9	7	847	111
	2. Crude oil and natural gas	4			2	
	3. Bauxite mining					
	4. Other metal mining			1		
	5. Industrial minerals mining	10		5		8
(2)	6. Iron and steel	750	183	15	48	10
	7. Alumina and nonferrous light metals	21			5	
	8. Nonferrous heavy metals	45	16	11	32	
	9. Foundries	3		2	34	
(3)	10. Machinery	445	127	68	445	40
(4)	11. Electric machinery and appliances	350	129	4	74	3
	12. Vacuum tubes and telecommunication equipment	16	6	2	53	
(5)	13. Precision engineering	18	40	4	29	11
(6)	14. Other fabricated metal products	243	292	74	142	33
(7)	15. Electric energy	59		31	206	94
(8)	16. Bricks, roofing tiles and refractories	198	793	9	20	25
	17. Stone and pebble quarrying	110	62	1	17	
	18. Lime and cement	501	986	1	6	14
	19. Glass, ceramics and grinding wheels	105	90	3		40
(9)	20. Petroleum refineries	95	2	155	394	36
	21. Municipal gas and coal processing	46		3	26	27
	22. Industrial gas and heavy chemicals	16		174	7	2
	23. Dyestuffs	58	7		7	10
	24. Pharmaceutical products			17		2
	25. Household chemicals and starch			1	7	49
	26. Other organic chemicals	2			5	11
(10)	27. Rubber and plastic products	27	43	10	167	16
(11)	28. Timber and plywood	104	420	2	12	13
	29. Joinery and wooden building materials	117	478		1	11
	30. Furniture	2		1		
	31. Other wood products	56		17	21	40
(12)	32. Paper	15		17	29	57
(13)	33. Printing	4		1	12	62
(14)	34. Cotton textiles				1	3
	35. Woollen textiles	1			2	1
	36. Hard fibre and silk textiles	4		23	9	50
	37. Haberdashery					
(15)	38. Leather processing	4		20	1	1
(16)	39. Textile clothing and hosiery	34		3	129	32
	40. Leather and fur apparel	2		1	5	8
(17)	41. Grain mills and bakery			102	19	
	42. Meat, poultry and dairy products			20	4	
	43. Sugar, confectionery and coffee			27	1	
	44. Canned and frozen food			1	2	14
	45. Other food manufactures	1		24	9	17
(18)	46. Miscellaneous manufactures	24	95	14	8	135
	Socialist industry, total (1 to 46)	3,571	3,777	871	2,838	986
(19)	47. Private craftsmen	1	85	74	5	10
(20)	48. Socialist building industry	995		39	98	103
(21)	49. Private building activities			21		17
(22)	50. Agriculture	84	120	3,609	94	7
(23)	51. Transport and communication	1,038	706	19	84	1,558
(24)	52. Domestic trade	50	511	172	62	69
(25)	53. Foreign trade agents	12	14	11	14	2
(26)	54. Other productive activities	138	563	110	14	66
	Total intermediate inputs	5,890	5,775	4,927	3,209	2,819
(27)	55. Amortization	323	7	352	2,703	480
(28)	56. Wages, other incomes and accumulation	3,787	4,218	4,721	4,088	6,701
	Total gross production	10,000	10,000	10,000	10,000	10,000

HUNGARY 1961 (*continued*)
columns in millions of forints at producers' prices.)

	54	*Value in millions of forints*							
53		*Total intermediate*	*Consumption*	*Gross investment*	*Changes in stocks*	*Exports*	*Total end-use*	*Imports (—)*	*Gross production*
5	47	9,205	2,294	199	362	36	2,892	— 1,843	10,254
3	1	2,708	10	80	118		207	— 1,320	1,595
		145		38	— 2	96	133		277
		1,197		36	30	485	551	— 1,000	748
	20	746	41	19	2	28	90	— 520	316
1	17	17,684	52	799	1,095	3,128	5,074	— 4,067	18,691
	4	2,152	10	86	145	914	1,155	— 43	3,264
13	10	3,361	43	19	140	112	313	— 1,451	2,223
	2	3,681	8	332	73	91	504		4,185
134	65	10,100	1,749	12,861	2,604	10,658	27,872	— 7,989	29,983
6	24	4,292	695	1,565	244	875	3,378	— 401	7,269
45	16	1,456	918	367	528	2,058	3,871	— 378	4,949
23	23	829	633	984	449	1,031	3,096	— 1,008	2,917
22	66	5,127	2,090	366	857	1,180	4,492	— 2,015	7,604
13	153	6,419	1,007	145	1	18	1,172	— 286	7,304
	10	1,879	40	147	— 4	138	321	— 53	2,147
	5	506		83	5		88	— 2	592
	40	2,681	58	81	44	41	224	— 43	2,862
2	9	1,359	410	38	234	330	1,011	— 449	1,921
9	125	3,739	321	16	444	1,324	2,105	— 535	5,308
3	5	2,932	557	61	41	38	697	— 1,296	2,333
4	55	2,816	127	61	214	292	694	— 1,067	2,443
2	17	875	35		92	162	289	— 65	1,100
8		687	1,561	26	322	1,605	3,515	— 364	3,837
2	25	365	844	2	1	60	908	— 76	1,197
6	14	2,269	72	14	20	80	186	— 1,598	857
6	17	2,217	748	26	331	645	1,749	— 317	3,650
17	6	2,201	11	6	—193	120	— 55	— 1,071	1,075
4		705		16	12	7	35	— 90	650
4	5	217	1,351	480	— 6	178	2,002	— 304	1,915
4	3	1,096	202	163	155	125	646	— 78	1,664
3	36	2,613	359	15	141	36	551	— 857	2,308
186	20	495	805	5	81	150	1,040	— 99	1,436
52	4	5,695	1,573	120	163	2,880	4,736	— 209	10,222
1	3	3,206	717	36	41	439	1,234	— 631	3,809
20	9	2,527	796	52	223	733	1,804	— 628	3,704
		635	422	8	11	104	544	— 52	1,127
5	4	1,750	114	40	3	223	380	— 101	2,029
15	7	871	7,493	26	769	2,416	10,705	— 146	11,431
2	2	290	2,744	20	322	1,763	4,849	— 44	5,095
		2,819	6,477	18	285	48	6,829	— 274	9,374
1	13	4,448	7,876	20	319	2,640	10,855	— 1,504	13,799
3		956	4,253	23	516	1,022	5,814	— 107	6,662
2	2	291	1,128	18	117	1,314	2,577	— 98	2,769
3	4	2,084	5,177	24	362	648	6,211	— 573	7,722
20	25	1,072	2,764	732	287	998	4,781	— 66	5,787
651	913	125,397	58,585	20,273	11,998	41,270	132,126	— 35,118	222,405
3	35	583	3,961			51	4,012		4,595
13	6	3,418	1,094	22,217			23,311		26,728
1	9	171	600	6,328			6,928		7,099
32	1,351	44,920	19,271	2,120	−865	3,750	24,275	— 5,502	63,693
6,137	118	12,117	4,994	987	38	1,190	7,210	— 37	19,290
117	28	4,927	9,809	419	300	508	11,035		15,962
2	2	1,313	185	237	105	961	1,488		2,801
		3,809	2,562		50		2,612	— 57	6,364
6,956	2,463	196,555	101,061	52,581	11,626	47,729	212,997	— 40,715	368,937
49	270	19,524							
2,995	7,267	152,758							
10,000	10,000	368,937							

TABLE 2: TOTAL INPUT (INVERSE) COEFFICIENTS FOR SELECTED HUNGARIAN SECTORS, 1961
(Col. (a): 54×54 Col. (b): 26×26)

Selected sectors / *Inputs (26-sector alignment)*	*Machinery*		*Precision engineering*		*Metal products*		*Electricity*		*Rubber and plastic products*		*Paper*	
	(a)	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*
1. Mining	4·20	4·11	2·42	2·42	4·89	4·60	34·21	33·01	3·21	3·13	5·74	5·68
2. Basic metals	33·60	33·28	14·96	14·86	43·59	43·43	6·14	5·71	2·08	2·08	2·20	2·09
3. Machinery	118·92	118·84	4·69	4·71	3·04	3·06	1·67	1·70	1·13	1·12	0·84	0·84
4. Electrical machinery	6·64	6·69	5·64	5·65	2·31	2·33	1·89	1·87	0·59	0·60	0·53	0·52
5. Precision engineering	0·78	0·79	105·71	105·71	0·32	0·32	0·20	0·21	0·41	0·41	0·11	0·10
6. Metal products	3·05	2·93	3·76	3·71	104·51	104·47	0·74	0·74	0·58	0·58	0·47	0·46
7. Electricity	4·33	4·58	2·57	2·70	4·90	4·91	105·70	105·57	1·96	1·99	7·78	7·57
8. Building materials	1·52	1·48	1·35	1·36	1·90	1·96	1·28	1·22	0·35	0·38	0·43	0·43
9. Chemicals	4·61	4·56	3·10	3·12	5·91	5·94	5·28	5·25	3·67	3·73	3·86	3·75
10. Rubber and plastic products	2·13	2·12	0·90	0·89	0·69	0·69	0·40	0·41	101·43	101·41	0·82	0·82
11. Wood products	0·72	0·74	0·97	1·00	0·75	0·78	0·37	0·37	0·19	0·20	0·27	0·27
12. Paper	0·37	0·41	0·75	0·75	0·59	0·61	0·15	0·19	0·43	0·43	121·04	121·01
13. Printing	0·16	0·17	0·30	0·31	0·11	0·12	0·12	0·12	0·14	0·14	0·24	0·24
14. Textiles	1·51	1·50	1·27	1·25	1·81	1·80	0·32	0·33	11·37	11·32	1·76	1·77
15. Leather and fur products	0·23	0·25	0·33	0·35	0·17	0·19	0·04	0·05	0·13	0·15	0·08	0·09
16. Wearing apparel	0·40	0·41	0·39	0·39	0·56	0·55	0·19	0·22	0·46	0·46	0·37	0·37
17. Food, beverages and tobacco	0·26	0·33	0·39	0·42	0·43	0·46	0·26	0·36	1·04	1·05	0·00	1·02
18. Miscellaneous manufacturing	0·29	0·30	0·82	0·82	0·49	0·49	0·12	0·13	0·29	0·28	0·14	0·14
19. Private small-scale industry	0·02	0·02	0·02	0·02	0·03	0·03	0·02	0·02	0·01	0·02	0·06	0·06
20. Socialist construction	0·11	0·13	0·52	0·53	0·70	0·70	0·46	0·45	0·06	0·06	0·14	0·14
21. Private construction	0·01	0·01	0·01	0·01	0·01	0·01	0·01	0·01	0·00	0·01	0·02	0·02
22. Agriculture	1·05	1·07	1·26	1·20	1·76	1·74	1·68	1·62	1·08	1·67	5·15	5·40
23. Transport and communications	3·46	3·46	1·79	1·79	3·75	3·71	7·66	7·68	2·09	2·08	4·47	4·42
24. Domestic trade services	1·65	1·56	1·09	1·04	1·65	1·59	0·96	0·96	0·85	0·90	2·30	2·29
25. Foreign trade services	0·99	0·99	0·64	0·63	0·92	0·89	0·60	0·57	1·04	1·04	1·29	1·28
26. Other producing activities	1·83	1·72	2·35	2·11	3·69	3·42	0·79	0·83	0·37	0·35	3·05	3·05

Note: Figures relate to the production requirements of row sectors per 100 demand for the products of column sectors. The basic transactions tables (54 × 54 and 26 × 26) are both type B, i.e. input coefficients relate to domestically produced goods and services alone.

means of the inverse matrix, aggregation errors are reinforced. This is due to the fact that the direct labour coefficients applied to aggregated sectors are themselves derived as weighted averages of the original coefficients applicable to detailed sectors; the weights involved are values of gross production, and not the inverse coefficients, of the detailed sectors. An example of the calculation is shown in table 3. Again, fortunately, aggregation errors appear almost negligible in this particular example.

TABLE 3: TOTAL (DIRECT AND INDIRECT) LABOUR REQUIREMENTS FOR SELECTED HUNGARIAN INDUSTRIES IN 1961
(Person/million forints)

	Total labour requirement	
Selected sectors (26-sector alignment)	*Based on the 26 × 26 compilation*	*Based on the 54 × 54 compilation*
Machinery	12·09	12·18
Instruments	14·57	14·61
Metal products	12·86	12·94
Electricity	10·87	11·26
Rubber and plastic products	6·84	6·57
Paper	9·16	9·20
Leather and fur products	12·02	13·04
Socialist building industry	18·54	18·35

Note: The underlying transaction tables are type B, i.e. input coefficients relate to domestic products alone.

Such an outcome may not be expected however when one is concerned with the aggregation errors in the context of projections. Aggregation weights involved in the smaller inverse matrix, which derive from the base-year production structure, are no longer consistent with the production structure to be revealed by the projections based on the detailed matrix.

2. *Valuation of transactions*

As to the prices applied to the valuation of inter-industry transactions, two factors may be mentioned here: treatment of turnover taxes and of forwarding costs. As to the former, different countries employ different taxation systems: some turnover taxes may be levied on producers, others on consumers or even on wholesale trade agents. Similar variations are possible with respect to transport charges.

Hungarian practice is to draw balances at producers' prices including turnover taxes. In addition, a balance was experimentally compiled at producers' prices, excluding turnover taxes. Such prices are of a hypothetical nature, not corresponding to the prices used in actual transactions; but they are supposed to help to stabilize input coefficients, since turnover taxes are determined mainly by the central authorities and only in part by the producers, thus being subject to frequent alterations. In table 4 the input coefficients based on the

TABLE 4: INPUT COEFFICIENTS FOR SELECTED SECTORS, HUNGARY, 1961

(Based on the 26×26 matrix, type B)

((a) including net turnover taxes (b) excluding net turnover taxes)

Inputs / *Selected sectors*	*Machinery*		*Precision engineering*		*Wood products*		*Textiles*		*Food, beer and tobacco*		*Socialist construction*		*Agriculture*	
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
1. Mining	0·57	0·57	0·30	0·32	0·37	0·40	1·01	1·44	0·99	1·12	0·94	0·94	0·13	0·12
2. Basic metals	18·94	18·92	7·53	7·91	0·61	0·65	0·24	0·35	0·18	0·21	7·45	7·43	0·28	0·26
3. Machinery	14·82	14·72	3·12	3·27	0·79	0·84	0·58	0·82	0·25	0·28	4·31	4·42	0·67	0·69
4. Electrical machinery	4·49	4·33	4·14	4·20	0·13	0·14	0·09	0·12	0·07	0·07	3·66	3·67	0·06	0·06
5. Precision engineering	0·53	0·52	5·31	5·43	0·04	0·04	0·03	0·04	0·03	0·04	0·17	0·17	0·04	0·04
6. Metal products	1·89	1·87	2·93	3·03	1·17	1·25	0·17	0·23	0·30	0·33	1·94	1·80	0·65	0·57
7. Electricity	1·44	1·45	1·03	1·08	1·44	1·53	1·54	2·19	1·00	1·13	0·59	0·60	0·31	0·31
8. Building materials	0·43	0·37	0·68	0·71	0·70	0·75	0·13	0·18	0·30	0·30	8·97	8·80	0·13	0·12
9. Chemicals	1·75	1·21	1·44	1·20	2·64	2·44	1·35	2·02	1·21	1·12	2·03	1·43	2·71	3·14
10. Rubber and plastic products	1·56	0·97	0·59	0·62	0·19	0·20	0·35	0·36	0·18	0·14	0·23	0·11	0·08	0·04
11. Wood products	0·39	0·35	0·67	0·70	12·09	11·69	0·18	0·26	0·45	0·42	2·13	1·78	0·20	0·17
12. Paper	0·11	0·09	0·39	0·41	0·20	0·22	0·16	0·23	0·55	0·57	0·15	0·12	0·17	0·14
13. Printing	0·07	0·08	0·23	0·24	0·03	0·03	0·07	0·10	0·27	0·31	0·04	0·04	0·01	0·01
14. Textiles	0·60	0·39	0·46	0·48	4·41	3·01	16·70	21·75	0·08	0·09	0·04	0·04	0·24	0·14
15. Leather and fur products	0·15	0·12	0·25	0·27	0·02	0·02	0·10	0·14	0·01	0·01	0·04	0·04	0·21	0·20
16. Wearing apparel	0·19	0·19	0·25	0·26	0·16	0·17	0·12	0·17	0·15	0·17	0·37	0·37	0·03	0·03
17. Food, beverages and tobacco	0·03	0·03	0·13	0·13	0·41	0·44	0·11	0·15	15·25	16·83	0·01	0·01	1·45	1·44
18. Miscellaneous manufacturing	0·15	0·14	0·65	0·69	0·67	0·66	0·14	0·19	0·13	0·15	0·24	0·21	0·14	0·13
Socialist industry (total 1–18)	48·11	46·32	30·10	30·95	26·07	24·48	23·07	30·74	21·40	23·29	33·31	31·98	7·51	7·61
19. Private small-scale industry	—	—	—	—	—	—	—	—	—	—	0·01	0·01	0·74	0·74
20. Socialist construction	—	—	0·37	0·39	—	—	—	—	—	—	9·95	9·98	0·39	0·39
21. Private construction	—	—	—	—	—	—	—	—	—	—	—	—	0·21	0·21
22. Agriculture	0·01	0·01	0·03	0·03	11·05	11·77	2·61	3·72	36·65	41·40	0·52	0·53	34·94	34·94
23. Transport and communication	1·05	1·05	0·30	0·31	2·46	2·62	0·93	1·31	3·02	3·41	10·38	10·38	0·19	0·19
24. Domestic trade	0·66	0·67	0·51	0·54	0·96	1·02	0·64	0·92	2·54	3·06	0·51	0·40	1·72	1·35
25. Foreign trade	0·47	0·47	0·34	0·36	0·83	0·88	0·70	0·99	0·38	0·43	0·12	0·12	0·11	0·11
26. Other producing activities	0·11	0·11	1·22	1·28	0·50	0·52	0·73	0·96	0·04	0·04	1·39	1·39	1·10	1·10
Turnover taxes	—	1·94	—	0·64	—	3·29	—	2·15	—	0·69	—	1·58	—	0·27
Total intermediate inputs	50·41	50·57	32·87	34·50	41·87	44·58	28·68	40·79	64·03	72·32	56·19	56·37	46·91	46·91

TABLE 5: TOTAL (INVERSE) COEFFICIENTS FOR SELECTED SECTORS, HUNGARY, 1961

(Based on the 26×26 matrix, type B)

((a) including net turnover taxes (b) excluding net turnover taxes)

Selected sectors / *Inputs*	*Machinery*		*Precision engineering*		*Wood products*		*Textiles*		*Food, beer and tobacco*		*Socialist construction*		*Agriculture*	
	(a)	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*
1. Mining	4·11	4·10	2·42	2·61	2·62	2·86	2·65	4·16	3·32	3·95	5·69	5·65	1·68	1·99
2. Basic metals	33·28	33·27	14·86	15·70	2·80	3·02	1·26	1·94	2·01	2·31	16·81	16·83	2·02	2·02
3. Machinery	118·84	118·84	4·71	4·95	1·77	1·86	1·14	1·72	1·45	1·66	7·38	7·44	1·58	1·62
4. Electrical machinery	6·69	6·47	5·65	5·78	0·51	0·54	0·31	0·48	0·45	0·51	5·70	5·70	0·36	0·37
5. Precision engineering	0·79	0·77	105·71	105·85	0·11	0·12	0·07	0·11	0·13	0·15	0·37	0·36	0·12	0·12
6. Metal products	2·93	2·89	3·71	3·85	1·80	1·89	0·39	0·60	1·10	1·21	30·06	2·87	1·31	1·20
7. Electricity	4·58	4·59	2·70	2·89	2·59	2·78	2·36	3·62	2·22	2·61	3·21	3·21	1·13	1·22
8. Building materials	1·48	1·39	1·36	1·42	1·16	1·23	0·32	0·50	0·80	0·85	11·41	11·48	0·56	0·55
9. Chemicals	4·56	3·74	3·12	2·84	4·72	4·56	2·39	3·71	4·38	4·94	5·11	4·05	5·17	5·86
10. Rubber and plastic products	2·12	1·33	0·89	0·85	0·43	0·39	0·52	0·58	0·46	0·36	0·83	0·51	0·26	0·17
11. Wood products	0·74	0·67	1·00	1·04	113·96	113·44	0·33	0·50	0·94	0·93	3·05	2·59	0·57	0·51
12. Paper	0·41	0·37	0·75	0·79	0·48	0·50	0·34	0·51	1·16	1·24	0·63	0·56	0·45	0·41
13. Printing	0·17	0·17	0·31	0·33	0·11	0·12	0·13	0·20	0·41	0·47	0·13	0·13	0·07	0·08
14. Textiles	1·50	1·18	1·25	1·28	6·57	4·83	120·33	128·18	0·78	0·79	0·96	0·88	0·85	0·64
15. Leather and fur products	0·25	0·22	0·35	0·38	0·12	0·14	0·16	0·25	0·21	0·26	0·16	0·17	0·39	0·39
16. Wearing apparel	0·41	0·41	0·39	0·42	0·32	0·33	0·21	0·32	0·34	0·39	0·76	0·75	0·13	0·14
17. Food, beer and tobacco	0·33	0·34	0·42	0·48	1·15	1·27	0·37	0·61	119·39	121·91	0·45	0·46	2·92	3·03
18. Miscellaneous manufacturing	0·30	0·30	0·82	0·86	0·89	0·89	0·22	0·32	0·37	0·42	0·43	0·39	0·32	0·29
19. Private small-scale industry	0·02	0·02	0·02	0·02	0·16	0·17	0·05	0·07	0·51	0·59	0·05	0·05	1·17	1·17
20. Socialist construction	0·13	0·13	0·53	0·55	0·19	0·20	0·08	0·12	0·43	0·50	111·29	111·32	0·75	0·75
21. Private construction	0·01	0·01	0·01	0·01	0·05	0·05	0·01	0·02	0·15	0·18	0·01	0·01	0·34	0·34
22. Agriculture	1·07	1·09	1·20	1·37	20·79	22·18	5·50	8·43	68·00	78·46	2·79	2·79	156·11	156·46
23. Transport and communication	3·46	3·49	1·79	1·94	4·45	4·76	2·23	3·43	5·43	6·34	13·62	13·63	1·54	1·56
24. Domestic trade	1·56	1·55	1·04	1·10	1·75	1·78	1·01	1·51	4·50	5·12	1·27	1·12	3·09	2·52
25. Foreign trade	0·99	0·99	0·63	0·68	1·15	1·23	0·93	1·42	0·66	0·78	0·52	0·53	0·30	0·33
26. Other producing activities	1·72	1·60	2·11	2·17	1·08	1·14	1·06	1·50	1·06	1·22	2·52	2·46	2·01	2·01

valuation of transactions at producers' prices including turnover taxes are compared with those obtained when turnover taxes are excluded.

In the column headed "Machinery" for example, there are four coefficients which differ significantly between the two treatments. These are the inputs of chemicals, rubber and synthetic materials, textiles, and building materials. Other input coefficients show only negligible variations. In the case of the column headed "Textiles" a greater number of input coefficients are influenced. These variations reflect the actual turnover tax system adopted in Hungary.

The effects of different treatments of turnover taxes on total input (inverse) coefficients and on total labour requirements respectively are illustrated in tables 5 and 6. Although in some cases the differences are considerable, the over-all effect resulting from the inversion is one of moderation as compared with the case of direct coefficients.

TABLE 6: INFLUENCE OF THE TREATMENT OF TURNOVER TAXES UPON THE COMPUTED VALUES OF TOTAL (DIRECT AND INDIRECT) LABOUR COEFFICIENTS

(Based on the inverse coefficients shown in table 5)

((a) including net turnover taxes (b) excluding net turnover taxes)

	Total labour coefficients (person/million forints)		$\left(\frac{b-a}{a}\right)$ (%)
Selected sectors	*(a)*	*(b)*	
Machinery	12·09	12·39	2·5
Precision engineering	14·57	15·49	6·3
Metal products	12·86	13·74	6·8
Electricity	10·87	10·92	0·5
Chemicals	8·52	10·76	26·3
Paper	9·16	10·97	19·7
Leather and fur products	12·02	14·93	24·2
Socialist construction	18·54	18·45	−0·5

3. *Treatment of imports*

The value of input coefficients obtained from input-output balances naturally varies a great deal according to the way imports are treated. This is particularly true for such a small country as Hungary, which has to import various raw and semi-finished materials.

There are at least four different ways to treat imports. In the first, which has been referred to above as type A, intersectoral transactions include both domestically produced and imported materials and services; all imports are treated as competitive with domestic products. Input coefficients derived from this type of balance may be more closely associated with the term "technological" coefficients than those derived from type B and type D balances, explained below. Under type A treatment each row sum represents the total supply of goods and services, exceeding the value of gross production of the counterpart industry by the amount equal to imports. Imports, classified according to counterpart domestic industries and not to using industries, are thus entered either as negative elements in an additional column in the final demand quadrant or as positive elements in an additional row below the row for gross production (so as to let each column total equal the corresponding row total).

Type B distinguishes imported materials from those domestically produced; the former are classified according to using industries and presented in an additional row above the value-added quadrant. Intersectoral transactions under this type of treatment relate only to domestic products.

In type C every row in the intersectoral transaction quadrant is divided into two: one relates to domestically produced materials and the other to imported materials. The intermediate transactions are thus presented in a $2n \times n$ matrix, where n is the number of producing sectors.

Finally, in type D distinction is made between competitive and non-competitive imports. The former are treated in the same manner as in type A, i.e. incorporated in the deliveries of domestic competitive industries; the latter are classified according to using industries and presented in an additional row, as in the case of type B. The competitive imports are entered as such either as negative elements in the final-demand quadrant or as positive elements in an additional row below the row for gross production, as in the case of type A.

For Hungary type C treatment of imports is available, and consequently types A and B are also available. No distinction is made between competitive and non-competitive imports. In table 7 differences between the input coefficients resulting from type A and from type B treatments are illustrated for several selected sectors. Take for example the textile sector. Use of imported materials in this sector decisively affects the input coefficients relating to three categories in particular: chemical inputs, agricultural inputs, and textile inputs. Out of 3·79 forints worth of chemicals needed to produce 100 forints worth of textiles, 2·44 forints or 64 per cent was imported in 1961.

The industrial structure of Hungary is greatly influenced by the fact that many producing sectors use significant amounts of imports coming from some two to five sectors. While imports are not dispersed over so very many types of materials, the share of total imports in material inputs is certainly significant. In the case of textile production about one-third of the total intermediate inputs (15·5 out of 44·2) is imported.

The structure of imports is indeed an important factor affecting the inter-industry patterns of industrially less developed economies. To the extent that the bulk of imports consists of semi-manufactured and manufactured goods the production of which involves relatively strong backward linkages, the over-all inter-industrial chain effects may generally be expected to be weaker in developing than in developed countries.

Where however the initial scale of industrial activities is small relative to the whole economy, the rate of changes in the industrial structure to be envisaged in the course of future development would appear all the greater because of the small starting base. An analysis of the

TABLE 7: INPUT COEFFICIENTS AND IMPORT COEFFICIENTS OF SELECTED HUNGARIAN INDUSTRIES, 1961

Import coefficient / *Inputs*	*Machinery*			*Electrical machinery*			*Precision engineering*			*Metal products*			*Rubber and plastic products*			*Textiles*		
	Type A	*Type B*	*Difference*	*Type A*	*Type B*	*Difference*	*Type A*	*Type B*	*Difference*	*Type A*	*Type B*	*Difference*	*Type A*	*Type B*	*Difference*	*Type A*	*Type B*	*Difference*
1. Mining	0·74	0·57	0·17	0·77	0·62	0·15	0·34	0·30	0·04	0·57	0·56	0·01	2·35	1·44	0·91	1·01	1·01	—
2. Basic metals	23·40	18·94	4·46	19·15	13·19	5·96	9·56	7·53	2·03	34·75	29·53	5·22	0·76	0·74	0·02	0·24	0·24	—
3. Machinery	17·31	14·82	2·49	2·65	2·04	0·61	3·80	3·12	0·68	1·40	1·18	0·22	1·06	0·60	0·46	0·83	0·58	0·25
4. Electrical machinery	4·66	4·49	0·17	16·77	14·76	2·01	5·37	4·14	1·23	1·57	1·41	0·16	0·33	0·31	0·02	0·09	0·09	0·00
5. Precision engineering	0·59	0·53	0·06	0·78	0·55	0·23	7·40	5·31	2·09	0·20	0·19	0·01	0·35	0·35	0·00	0·03	0·03	—
6. Metal products	4·34	1·89	2·45	2·65	2·01	0·64	3·12	2·93	0·19	5·11	3·66	1·45	0·94	0·35	0·59	0·20	0·17	0·03
7. Electricity	1·44	1·44	—	1·36	1·36	—	1·03	1·03	—	1·30	1·30	—	1·19	1·19	—	1·54	1·54	—
8. Building materials	0·49	0·43	0·06	1·77	1·12	0·65	1·19	0·68	0·51	1·03	0·72	0·31	0·16	0·16	—	0·13	0·13	—
9. Chemicals	2·02	1·75	0·27	2·85	2·07	0·78	2·19	1·44	0·75	3·97	2·89	1·08	10·91	2·75	8·16	3·79	1·35	2·44
10. Rubber and plastic products	1·80	1·56	0·24	1·77	1·32	0·45	0·61	0·59	0·02	0·43	0·42	0·01	1·36	1·24	0·12	0·35	0·35	0·00
11. Wood products	0·46	0·39	0·07	0·56	0·56	—	0·67	0·67	—	0·46	0·46	—	0·08	0·08	0·00	0·18	0·18	—
12. Paper	0·11	0·11	—	1·11	0·71	0·40	0·39	0·39	—	0·30	0·30	—	0·24	0·24	0·00	0·17	0·16	0·01
13. Printing	0·07	0·07	—	0·18	0·18	—	0·23	0·23	—	0·04	0·04	—	0·08	0·08	—	0·07	0·07	—
14. Textiles	0·60	0·60	0·00	0·57	0·57	0·00	0·46	0·46	—	0·99	0·99	—	9·05	9·04	0·01	21·26	16·70	4·56
15. Leather and fur products	0·15	0·15	0·00	0·03	0·03	—	0·25	0·25	—	0·10	0·10	—	0·08	0·08	—	0·17	0·10	0·07
16. Wearing apparel	0·19	0·19	—	0·19	0·19	—	0·25	0·25	—	0·34	0·34	—	0·37	0·37	—	0·12	0·12	—
17. Food, beverage and tobacco	0·03	0·03	—	0·18	0·18	—	0·13	0·13	—	0·11	0·11	—	0·71	0·71	0·00	0·13	0·11	0·02
18. Miscellaneous manufacturing	0·15	0·15	—	0·47	0·47	—	0·65	0·65	—	0·37	0·36	0·01	0·21	0·21	—	0·14	0·14	—
Socialist industry (total 1–18)	58·55	48·11	10·44	53·81	41·93	11·88	37·64	30·10	7·54	53·04	44·56	8·48	30·23	19·94	10·29	30·45	23·07	7·38
19. Private small-scale industry	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20. Socialist construction	—	—	—	0·35	0·35	—	0·37	0·37	—	0·52	0·52	—	—	—	—	—	—	—
21. Private construction	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
22. Agriculture	0·01	0·01	0·00	0·13	0·13	—	0·03	0·03	—	0·11	0·11	—	8·64	0·18	8·46	10·77	2·61	8·16
23. Transport and communications	1·05	1·05	—	0·43	0·43	—	0·30	0·30	—	1·17	1·17	—	0·77	0·77	—	0·93	0·93	—
24. Domestic trade	0·66	0·66	—	0·73	0·73	—	0·51	0·51	—	0·64	0·64	—	0·61	0·61	—	0·64	0·64	—
25. Foreign trade	0·47	0·47	—	0·54	0·54	—	0·34	0·34	—	0·38	0·38	—	0·85	0·85	—	0·70	0·70	—
26. Other producing activities	0·11	0·11	—	0·87	0·87	—	1·22	1·22	—	1·39	1·39	—	0·08	0·08	—	0·73	0·73	—
Total intermediate inputs	60·85	50·41	10·44	56·86	44·98	11·88	40·41	32·87	7·54	57·25	48·77	8·48	41·18	22·43	18·75	44·22	28·68	15·54
Imports	—	10·44	—	—	11·88	—	—	7·54	—	—	8·48	—	—	18·75	—	—	15·54	—
Amortization	3·96	3·96	—	3·25	3·25	—	3·00	3·00	—	2·89	2·89	2·03	2·03	—	—	3·48	3·48	—
Wages, other incomes and accumulation	35·19	35·19	—	39·89	39·89	—	56·59	56·59	—	39·86	39·86	56·79	56·79	—	—	52·30	52·30	—
Gross production	100·0	100·0	—	100·0	100·0	—	100·0	100·0	—	100·0	100·0	—	100·0	100·0	—	100·0	100·0	—

impact of the establishment of new industries and the consequent changes in the import pattern would thus require a rather large table, with enough detailed industry classification to permit working links with the information regarding individual development projects. As for the treatment of imports, type C is obviously the most recommendable for the conditions of the developing economies, as well as for the purpose of intercountry comparisons.

II. INPUT-OUTPUT BALANCES OF THE HUNGARIAN NATIONAL ECONOMY FOR THE YEARS 1959–64

The Hungarian Central Statistical Office has compiled and published the aggregated input-output balances of the Hungarian national economy for the years 1959–64. These balances are compiled for 13 producing branches of the national economy, seven sectors of which represent industry. The seven industrial branches comprise the following groups:

1. *Basic materials and energy industry:*
    - Mining
    - Electric energy
    - Metallurgy
    - Construction materials
2. *Machine-building industry:*
    - Production of machines and machinery equipment
    - Production of vehicles
    - Production of electric machines and apparatus
    - Telecommunication and vacuum techniques
    - Precision industry
    - Mass metal products
3. *Chemical industry:*
    - Branches of the chemical and rubber industries
4. *Light industries:*
    - Wood processing
    - Paper
    - Printing
    - Textile
    - Leather, fur and shoes
    - Textile clothing
    - Others
    - Handicraft and domestic
5. *Food industry:*
    - Food, beverages and tobacco production
6. *Other industry:*
    - This branch contains the value of industrial activity in enterprises not included elsewhere.
7. *Private small-scale industries:*
    - This branch contains data on private craftsmen.

The delimitation of the branches above was carried out according to the principle of activity. Each of the balances contains comparable data. Between 1962 and 1964 a significant reorganization took place in Hungary and a number of enterprises were united to form large centralized industrial enterprises and trusts. To ensure inter-temporal comparability of the data the state of organization of industry on 1 January 1964 was taken as base and the data on earlier years were made comparable.

The balances were compiled at 1964 prices. This was done by correcting, with the help of relevant price indexes, balances that had been drawn up primarily at current prices.

1. *Changes in technical (flow) coefficients*

On the basis of the coefficient tables for the six years presented in tables 8A to 8F, it is possible to examine in relatively great detail the changes in technical coefficients and the problem of their stability. Since the balances for the six years are rather contracted, the statements below are valid only in respect of balances at an equally high order of aggregation and no categorical conclusions can be drawn from them as to more detailed balances. However it is possible to compare the changes in technical coefficients of the type A balances with those of the type B balances. Investigations show that the technical coefficients of the type A balances are more stable than those of the type B balances, the technical coefficients of which are largely dependent on the size and structure of foreign trade. Thus from the point of view of the stability of technical coefficients the analysis of the type A balances is of primary importance.

Factors causing changes of technical coefficients of different branches of industry and of those of the national economy may be divided into four groups.

(*a*) different rates of development of different branches: different rates of increase in their output (and in the case of type A balance, rates of increase in the volume of imported products entering the profile of individual branches);

(*b*) changes in the structure of the national economy with regard to the 13 contracted branches;

(*c*) changes in the inner structure of individual branches;

(*d*) changes in the structure of final demand and its reaction upon the changing structure of production and imports.

These four factors will now be examined in more detail.

(*a*) During the six years the joint output of the producing branches increased by almost 40 per cent (gross social product at producers' prices of 1964). Of this, the increase in the output of socialist industry was almost 58 per cent, of the building industry 33 per cent, of agriculture about 8 per cent, and of transport 45 per cent. This non-proportional pattern of sectoral growth brought about considerable changes in the structure of material inputs.

(*b*) The differential increase in sectoral output resulted naturally in a change in the over-all structure of the national economy. A greater share was given to industry, especially the machine-building and the chemical industry.

TABLE 8A: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1959

(Gross production=1,000)

Number	Branch	1 Basic materials industry	2 Machine-building industry	3 Chemical industry	4 Light industry	5 Food industry	6 Other industry	7 Private small-scale industries	8 Building industry	9 Agriculture	10 Transport	11 Home trade	12 Foreign trade	13 Other producing activities
1.	Basic materials industry	0·3384	0·2725	0·3245	0·0315	0·0205	0·1555	0·0575	0·2056	0·0056	1·1080	0·0661	0·0047	0·0590
2.	Machine-building industry .	0·0275	0·2028	0·0173	0·0115	0·0062	0·1147	0·0387	0·1087	0·0104	0·0749	0·0138	0·0242	0·0338
3.	Chemical industry	0·0567	0·0395	0·1357	0·0400	0·0090	0·0573	0·0190	0·0178	0·0221	0·0545	0·0213	0·0043	0·0165
4.	Light industry	0·0130	0·0263	0·0350	0·2692	0·0166	0·0999	0·2406	0·0348	0·0082	0·0312	0·0632	0·0385	0·2124
5.	Food industry	0·0012	0·0011	0·0383	0·0206	0·1241	0·0072	0·0130	0·0021	0·0134	0·0029	0·0015	0·0008	0·0000
6.	Other industry	0·0340	0·0036	0·0000	0·0000	0·0048	0·0000	0·0000	0·0637	0·0099	0·0387	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0004	0·0019	0·0061	0·0004	0·0013	0·0004	0·0000
8.	Building industry	0·0184	0·0172	0·0342	0·0096	0·0147	0·0000	0·0022	0·0161	0·0065	0·0097	0·0173	0·0013	0·0000
9.	Agriculture	0·0117	0·0024	0·0224	0·0801	0·4712	0·1336	0·0034	0·0135	0·3346	0·0130	0·0091	0·0034	0·0621
10.	Transport	0·0261	0·0087	0·0121	0·0105	0·0172	0·0631	0·0109	0·0823	0·0004	0·0102	0·1340	0·5869	0·0139
11.	Home trade	0·0130	0·0057	0·0052	0·0086	0·0296	0·0197	0·1013	0·0137	0·0126	0·0062	0·0087	0·0121	0·0065
12.	Foreign trade	0·0058	0·0049	0·0040	0·0056	0·0019	0·0000	0·0032	0·0028	0·0007	0·0008	0·0000	0·0008	0·0047
13.	Other producing activities ..	0·0071	0·0012	0·0021	0·0020	0·0003	0·0000	0·0000	0·0057	0·0004	0·0013	0·0007	0·0004	0·0000

TABLE 8B: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1960

(Gross production=1,000)

Number	Branch	1 Basic materials industry	2 Machine-building industry	3 Chemical industry	4 Light industry	5 Food industry	6 Other industry	7 Private small-scale industries	8 Building industry	9 Agriculture	10 Transport	11 Home trade	12 Foreign trade	13 Other producing activities
1.	Basic materials industry	0·3369	0·2534	0·2996	0·0302	0·0197	0·1470	0·0457	0·1892	0·0060	0·1059	0·0423	0·0047	0·0527
2.	Machine-building industry ..	0·0312	0·2171	0·0198	0·0137	0·0074	0·1040	0·0422	0·0937	0·0128	0·0723	0·0091	0·0246	0·0382
3.	Chemical industry	0·0630	0·0407	0·1418	0·0439	0·0118	0·0574	0·0224	0·0169	0·0305	0·0544	0·0177	0·0039	0·0179
4.	Light industry	0·0088	0·0209	0·0279	0·2618	0·0161	0·0993	0·2215	0·0307	0·0104	0·0281	0·0574	0·0374	0·2242
5.	Food industry	0·0012	0·0011	0·0345	0·0188	0·1297	0·0072	0·0122	0·0025	0·0161	0·0031	0·0025	0·0007	0·0000
6.	Other industry	0·0350	0·0023	0·0000	0·0000	0·0044	0·0000	0·0000	0·0649	0·0117	0·0278	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0003	0·0022	0·0064	0·0004	0·0012	0·0003	0·0000
8.	Building industry	0·0172	0·0144	0·0263	0·0168	0·0122	0·0000	0·0023	0·0144	0·0068	0·0086	0·0147	0·0015	0·0000
9.	Agriculture	0·0108	0·0012	0·0260	0·0702	0·4451	0·1279	0·0031	0·0090	0·3366	0·0126	0·0044	0·0035	0·0535
10.	Transport	0·0215	0·0066	0·0103	0·0122	0·0249	0·0619	0·0096	0·0869	0·0014	0·0720	0·1353	0·6170	0·0234
11.	Home trade	0·0078	0·0052	0·0080	0·0095	0·0278	0·0195	0·1178	0·0164	0·0179	0·0079	0·0081	0·0151	0·0074
12.	Foreign trade	0·0054	0·0040	0·0110	0·0054	0·0031	0·0000	0·0009	0·0010	0·0005	0·0012	0·0010	0·0000	0·0000
13.	Other producing activities ..	0·0042	0·0011	0·0020	0·0018	0·0003	0·0000	0·0000	0·0060	0·0004	0·0012	0·0007	0·0003	0·0000

TABLE 8C: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1961

(*Gross production*=*1,000*)

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing activities*
1.	Basic materials industry	0·3473	0·2442	0·2865	0·0292	0·0245	0·1269	0·0639	0·1983	0·0069	0·1160	0·0387	0·0054	0·0624
2.	Machine-building industry ..	0·0340	0·2262	0·0244	0·0172	0·0069	0·0961	0·0435	0·1148	0·1270	0·0681	0·0115	0·0285	0·0408
3.	Chemical industry	0·0642	0·0415	0·1376	0·0391	0·0112	0·0463	0·0187	0·0191	0·3250	0·0539	0·0202	0·0045	0·0191
4.	Light industry	0·0112	0·0229	0·0399	0·2726	0·0182	0·0793	0·2121	0·0293	0·0098	0·0229	0·0542	0·0421	0·2218
5.	Food industry	0·0015	0·0008	0·0300	0·0186	0·1306	0·0093	0·0119	0·0017	0·0183	0·0037	0·0034	0·0009	0·0000
6.	Other industry	0·0180	0·0021	0·0000	0·0000	0·0044	0·0000	0·0000	0·0695	0·0140	0·0245	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0004	0·0023	0·0069	0·0005	0·0010	0·0004	0·0000
8.	Building industry	0·0173	0·0149	0·0255	0·0168	0·0114	0·0000	0·0021	0·0164	0·0060	0·0113	0·0186	0·0018	0·0000
9.	Agriculture	0·0111	0·0005	0·0250	0·0685	0·4459	0·1675	0·0032	0·0080	0·3499	0·0110	0·0007	0·0040	0·0547
10.	Transport	0·0238	0·0075	0·0125	0·0107	0·0212	0·0490	0·0108	0·0784	0·0029	0·0073	0·1409	0·7804	0·0209
11.	Home trade	0·0076	0·0051	0·0063	0·0075	0·0236	0·0157	0·1033	0·0123	0·0142	0·0060	0·0064	0·0131	0·0066
12.	Foreign trade	0·0042	0·0037	0·0086	0·0041	0·0029	0·0000	0·0008	0·0009	0·0008	0·0012	0·0001	0·0000	0·0006
13.	Other producing activities ..	0·0051	0·0009	0·0020	0·0014	0·0003	0·0000	0·0000	0·0062	0·0004	0·0011	0·0006	0·0004	0·0000

TABLE 8D: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1962

(*Gross production*=*1,000*)

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing activities*
1.	Basic materials industry	0·3417	0·2269	0·2637	0·0280	0·0242	0·1318	0·0507	0·1905	0·0062	0·1095	0·0387	0·0052	0·0657
2.	Machine-building industry ..	0·0356	0·2307	0·0124	0·0157	0·0082	0·0945	0·0386	0·1157	0·0114	0·0726	0·0105	0·0268	0·0261
3.	Chemical industry	0·0624	0·0455	0·1696	0·0409	0·0138	0·0508	0·0178	0·0207	0·0339	0·0543	0·0175	0·0048	0·0208
4.	Light industry	0·0112	0·0203	0·0360	0·2656	0·0181	0·0839	0·2164	0·0267	0·0084	0·0284	0·0519	0·0407	0·2363
5.	Food industry	0·0015	0·0088	0·0277	0·0184	0·1587	0·0096	0·0120	0·0018	0·0167	0·0031	0·0025	0·0008	0·0000
6.	Other industry	0·0223	0·0021	0·0000	0·0000	0·0051	0·0000	0·0000	0·0744	0·0148	0·0262	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0004	0·0023	0·0058	0·0004	0·0011	0·0004	0·0000
8.	Building industry	0·0157	0·0126	0·0226	0·0170	0·0114	0·0000	0·0024	0·0161	0·0063	0·0120	0·0193	0·0016	0·0000
9.	Agriculture	0·0104	0·0005	0·0234	0·0776	0·4313	0·1698	0·0033	0·0058	0·3469	0·0123	0·0047	0·0040	0·0525
10.	Transport	0·0230	0·0074	0·0119	0·0097	0·0263	0·0523	0·0144	0·0818	0·0016	0·0079	0·1438	0·7813	0·0245
11.	Home trade	0·0082	0·0053	0·0049	0·0082	0·0209	0·0173	0·1142	0·0117	0·0142	0·0057	0·0049	0·0122	0·0069
12.	Foreign trade	0·0040	0·0031	0·0076	0·0035	0·0028	0·0018	0·0014	0·0007	0·0012	0·0005	0·0003	0·0000	0·0069
13.	Other producing activities ..	0·0042	0·0008	0·0018	0·0011	0·0003	0·0000	0·0000	0·0032	0·0004	0·0010	0·0006	0·0004	0·0000

TABLE 8E: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1963

(Gross production=1,000)

Number	*Branch*	1 *Basic materials industry*	2 *Machine-building industry*	3 *Chemical industry*	4 *Light industry*	5 *Food industry*	6 *Other industry*	7 *Private small-scale industries*	8 *Building industry*	9 *Agriculture*	10 *Transport*	11 *Home trade*	12 *Foreign trade*	13 *Other producing activities*
1.	Basic materials industry	0·3377	0·2227	0·2525	0·0248	0·0221	0·1169	0·0505	0·1906	0·0077	0·1011	0·0516	0·0035	0·0699
2.	Machine-building industry ..	0·0324	0·2287	0·0206	0·0173	0·0069	0·0888	0·0360	0·1144	0·0151	0·0665	0·0120	0·0188	0·0371
3.	Chemical industry	0·0624	0·0487	0·1766	0·0429	0·0110	0·0493	0·0101	0·0239	0·0352	0·0502	0·0369	0·0035	0·0227
4.	Light industry	0·0120	0·0211	0·0297	0·2742	0·0130	0·0774	0·2127	0·0287	0·0078	0·0220	0·0566	0·0293	0·2344
5.	Food industry	0·0015	0·0008	0·0256	0·0237	0·1753	0·0127	0·0119	0·0019	0·0201	0·0029	0·0027	0·0005	0·0000
6.	Other industry	0·0241	0·0019	0·0000	0·0000	0·0054	0·0000	0·0000	0·0763	0·0267	0·0247	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0005	0·0018	0·0056	0·0004	0·0012	0·0002	0·0000
8.	Building industry	0·0153	0·0113	0·0208	0·0147	0·0091	0·0000	0·0025	0·0159	0·0076	0·0101	0·0187	0·0010	0·0000
9.	Agriculture	0·0133	0·0004	0·0216	0·0629	0·4084	0·2050	0·0031	0·0067	0·3246	0·0114	0·0052	0·0030	0·0519
10.	Transport	0·0302	0·0071	0·0113	0·0095	0·0198	0·0504	0·0155	0·0787	0·0016	0·0076	0·1348	0·5669	0·0234
11.	Home trade	0·0083	0·0051	0·0045	0·0080	0·0191	0·0171	0·1258	0·0115	0·0137	0·0055	0·0058	0·0082	0·0066
12.	Foreign trade	0·0052	0·0040	0·0089	0·0045	0·0038	0·0007	0·0015	0·0013	0·0014	0·0016	0·0002	0·0000	0·0107
13.	Other producing activities ..	0·0041	0·0009	0·0020	0·0011	0·0003	0·0000	0·0000	0·0038	0·0004	0·0010	0·0005	0·0002	0·0000

TABLE 8F: TECHNOLOGICAL COEFFICIENT MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1964

(Gross production=1,000)

Number	*Branch*	1 *Basic materials industry*	2 *Machine-building industry*	3 *Chemical industry*	4 *Light industry*	5 *Food industry*	6 *Other industry*	7 *Private small-scale industries*	8 *Building industry*	9 *Agriculture*	10 *Transport*	11 *Home trade*	12 *Foreign trade*	13 *Other producing activities*
1.	Basic materials industry	0·3427	0·2130	0·2295	0·0267	0·0220	0·0005	0·0434	0·2035	0·0083	0·1044	0·0392	0·0036	0·0680
2.	Machine-building industry ..	0·0307	0·2202	0·0190	0·0169	0·0064	0·0812	0·0463	0·1161	0·0181	0·0690	0·0096	0·0193	0·0332
3.	Chemical industry	0·0590	0·0570	0·1894	0·0486	0·0148	0·0487	0·0160	0·0326	0·0353	0·0540	0·0174	0·0036	0·0237
4.	Light industry	0·0120	0·0235	0·0309	0·2726	0·0157	0·0744	0·2021	0·0200	0·0080	0·0240	0·0422	0·0310	0·2609
5.	Food industry	0·0014	0·0007	0·0224	0·0183	0·1861	0·0112	0·0123	0·0018	0·0389	0·0030	0·0026	0·0005	0·0000
6.	Other industry	0·0277	0·0021	0·0000	0·0000	0·0060	0·0000	0·0000	0·0697	0·0274	0·0267	0·0000	0·0000	0·0000
7.	Private small-scale industries	0·0000	0·0000	0·0000	0·0000	0·0000	0·0000	0·0005	0·0014	0·0047	0·0004	0·0012	0·0002	0·0000
8.	Building industry	0·0154	0·0167	0·0203	0·0153	0·0150	0·0000	0·0024	0·0173	0·0079	0·0102	0·0187	0·0010	0·0000
9.	Agriculture	0·0090	0·0004	0·0174	0·0612	0·3828	0·1807	0·0032	0·0083	0·3055	0·0162	0·0103	0·0031	0·0474
10.	Transport	0·0276	0·0072	0·0111	0·0117	0·0245	0·0482	0·0160	0·0743	0·0017	0·0079	0·1504	0·6132	0·0253
11.	Home trade	0·0081	0·0064	0·0040	0·0078	0·0186	0·0166	0·1394	0·0117	0·0126	0·0051	0·0055	0·0078	0·0063
12.	Foreign trade	0·0055	0·0033	0·0088	0·0041	0·0033	0·0009	0·0018	0·0016	0·0011	0·0031	0·0001	0·0000	0·0142
13.	Other producing activities ..	0·0040	0·0010	0·0020	0·0011	0·0003	0·0000	0·0000	0·0012	0·0003	0·0006	0·0171	0·0002	0·0000

On the other hand, there was a decrease in the relative shares of the basic materials and the energy-producing branches.

(*c*) The inner structure of industry has undergone considerable changes. These changes are illustrated in table 9.

TABLE 9: CHANGES IN THE BRANCH STRUCTURE OF SOCIALIST INDUSTRY; PERCENTAGE COMPOSITION OF TOTAL PRODUCTION 1959 AND 1964

Industrial group/branch	*1959*	*1964*
Mining	7·9	6·7
Of which: Coal mining	5·7	4·2
Electrical energy industry	4·5	4·4
Metallurgy	13·5	12·1
Production of machines and machinery equipment	5·8	6·1
Production of vehicles	8·3	8·7
Production of electrical machines	3·1	3·6
Vacuum and telecommunication techniques	1·9	3·2
Precision industry	1·4	1·8
Metal mass products	3·5	3·9
Production of construction materials	3·6	3·3
Chemical and rubber industry	6·8	8·6
Of which: Pharmaceuticals	0·7	1·6
Rubber and synthetic materials processing	0·9	1·2
Wood-processing industry	2·4	2·8
Paper industry	0·8	0·8
Printing industry	0·7	0·7
Textile industry	7·5	6·8
Leather, fur and shoe industry	2·6	2·3
Textile clothing industry	3·5	3·1
Food industry	20·0	18·7
Of which: Canning	1·1	1·5
Poultry and egg processing	0·9	1·2
Other handicraft and domestic industries	2·2	2·4
Industry, total	100·0	100·0

(*d*) Changes in the structure of end-use are illustrated in tables 10A to 10F. As can be seen from these there was a considerable modification in the composition of exports, that of machine-industry products obtaining an increasing share in the total. There was a change also, although to a lesser degree, in the structure of non-productive consumption. The proportions moved in favour of industrial products, especially those of the chemical and light industries.

As a result the technical coefficients appear to have changed to a more or less appreciable extent during this period. The difference is less significant in the case of branches whose output increases but slowly. Significant differences are observed however in those branches whose output shows relatively rapid development, and are accompanied by changes in their inner structure. In this respect the branches which have undergone the most dynamic transformation are the machine industry and the chemical industry.

Between 1959 and 1964 the output of the chemical industry almost doubled, and that of the machine industry increased by 80 per cent: the development of these two branches surpassed that of the others. There was a significant change in the inner structure of both the machine and the chemical industry. Within the former a larger role has been given to the branches with more up-to-date techniques, such as the precision industry and telecommunication techniques. The output of the precision industry in 1964 was more than double that in 1959 and that of telecommunication techniques 2·6 times greater. The structural changes in the chemical industry were such that during these six years the output of the pharmaceutical industry increased 3·7 times, and that of rubber and synthetic materials processing by 2·2 times; within the latter the increase in the production of synthetic products was even more pronounced. These changes also influenced the input structure of the two branches.

Specific consumption of basic materials and energy in the machine industry steadily decreased between 1959 and 1964, although only to a small extent. The consumption of these items necessary for one million forints value of gross output gradually dropped from 272,500 forints in 1955 to 213,000 forints in 1964. The transformation of the input structure of the machine industry is not very clear-cut because of the fluctuations from year to year during the period investigated. A considerable increase in the use of chemical materials in the machine industry indicates again an increase in the share of the production of more up-to-date and technically more developed products and the use of more up-to-date materials and technologies. Other material consumption of the machine industry shows less fluctuation and the coefficients of this type can be regarded as relatively more stable.

A deeper and more clear-cut change can be seen in the input structure of the chemical industry. The consumption of basic materials and energy in this industry depends to a great extent on the changes in its inner structure: while in 1959 one million forints of gross output of the chemical industry required 324,500 forints of basic materials and energy, this latter figure had decreased gradually to only 229,500 forints by 1964. This change was due primarily to the fact that those branches which require a relatively large amount of basic materials and energy expanded faster than the other branches of this industry. The chemical industry needed more significant internal co-operation during the two last years of the period mainly as a result of an increase in the share of the products arising from vertically integrated processes. Various medicaments (principally packed medicaments), finished products of synthetic materials and some refined chemicals belong to this category; as a result the technical coefficients relating to the internal transactions of the chemical industry showed a fairly considerable increase from one year to another. Other technical coefficients of the chemical industry are relatively more stable.

The direct input structure of less dynamically developing branches of the Hungarian national economy shows even less fluctuation than these two branches. There are a few exceptions however. For example, during the six years there was a considerable increase in the consumption of chemical materials in agriculture, which reflects

TABLE 10A: THE STRUCTURE OF END-USE ON THE BASIS OF THE A-TYPE BALANCE, 1959

Number	*Branch*	*1* *Non-producing consumption*	*2* *Investments and renovations*	*3* *Changes in stocks*	*4* *Exports*	*5* *End-use, total*
1.	Basic materials and energy industry	0·037	0·040	0·089	0·121	0·056
2.	Machine-building industry	0·053	0·318	0·257	0·296	0·173
3.	Chemical industry	0·034	0·002	0·050	0·069	0·033
4.	Light industry	0·166	0·011	0·028	0·217	0·133
5.	Food industry	0·242	0·001	0·044	0·160	0·160
6.	Other industry	0·016	0·010	—	—	0·011
7.	Socialist industry (1–6) subtotal	0·548	0·382	0·468	0·864	0·566
8.	Private small-scale industries	0·059	—	—	0·001	0·031
9.	Building industry	0·013	0·565	—	—	0·147
10.	Agriculture	0·222	0·025	0·508	0·095	0·156
11.	Transport	0·046	0·013	0·010	0·016	0·031
12.	Home trade	0·093	0·008	0·012	—	0·052
13.	Foreign trade	0·002	0·007	0·002	0·023	0·007
14.	Other producing activities	0·018	—	—	0·001	0·010
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

TABLE 10B: THE STRUCTURE OF END-USE ON THE BASIS OF THE A-TYPE BALANCE, 1960

Number	*Branch*	*1* *Non-producing consumption*	*2* *Investments and renovations*	*3* *Changes in stocks*	*4* *Exports*	*5* *End-use, total*
1.	Basic materials and energy industry	0·044	0·044	0·338	0·119	0·070
2.	Machine-building industry	0·044	0·369	0·268	0·311	0·190
3.	Chemical industry	0·035	0·003	0·050	0·076	0·036
4.	Light industry	0·180	0·011	0·245	0·220	0·147
5.	Food industry	0·237	0·001	0·102	0·150	0·153
6.	Other industry	0·015	0·006	—	—	0·009
7.	Socialist industry (1–6) subtotal	0·555	0·434	1·003	0·876	0·605
8.	Private small-scale industries	0·045	—	—	0·001	0·023
9.	Building industry	0·014	0·518	—	—	0·141
10.	Agriculture	0·229	0·015	−0·038	0·081	0·134
11.	Transport	0·044	0·018	0·007	0·021	0·031
12.	Home trade	0·091	0·007	0·024	—	0·049
13.	Foreign trade	0·002	0·006	0·004	0·020	0·007
14.	Other producing activities	0·020	—	—	0·001	0·010
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

TABLE 10C: THE STRUCTURE OF END-USE ON THE BASIS OF THE A-TYPE BALANCE, 1961

Number	*Branch*	*1* *Non-producing consumption*	*2* *Investments and renovations*	*3* *Changes in stocks*	*4* *Exports*	*5* *End-use, total*
1.	Basic materials and energy industry	0·042	0·035	0·189	0·115	0·066
2.	Machine-building industry	0·055	0·306	0·342	0·331	0·192
3.	Chemical industry	0·037	0·002	0·122	0·080	0·043
4.	Light industry	0·188	0·010	0·196	0·217	0·152
5.	Food industry	0·249	0·001	0·181	0·142	0·162
6.	Other industry	0·015	0·006	—	—	0·009
7.	Socialist industry (1–6) subtotal	0·586	0·360	1·030	0·885	0·624
8.	Private small-scale industries	0·039	—	—	0·001	0·019
9.	Building industry	0·015	0·563	—	—	0·142
10.	Agriculture	0·195	0·046	−0·072	0·072	0·116
11.	Transport	0·048	0·019	0·004	0·025	0·034
12.	Home trade	0·095	0·008	0·032	—	0·049
13.	Foreign trade	0·001	0·004	0·006	0·016	0·006
14.	Other producing activities	0·021	—	—	0·001	0·010
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

Table 10D: The structure of end-use on the basis of the A-type balance, 1962

Number	*Branch*	*1 Non-producing consumption*	*2 Investments and renovations*	*3 Changes in stocks*	*4 Exports*	*5 End-use, total*
1.	Basic materials and energy industry	0·049	0·043	0·159	0·122	0·071
2.	Machine-building industry	0·061	0·330	0·437	0·322	0·209
3.	Chemical industry	0·040	0·002	0·094	0·092	0·046
4.	Light industry	0·182	0·010	0·135	0·223	0·146
5.	Food industry	0·242	0·001	0·203	0·140	0·156
6.	Other industry	0·018	0·007	—	—	0·010
7.	Socialist industry (1–6) subtotal	0·592	0·393	1·028	0·899	0·639
8.	Private small-scale industries	0·034	—	—	0·001	0·016
9.	Building industry	0·016	0·534	—	—	0·139
10.	Agriculture	0·185	0·044	−0·050	0·066	0·109
11.	Transport	0·049	0·018	0·004	0·015	0·031
12.	Home trade	0·102	0·007	0·011	—	0·050
13.	Foreign trade	0·002	0·004	0·007	0·018	0·006
14.	Other producing activities	0·020	—	—	0·001	0·010
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

Table 10E: The structure of end-use on the basis of the A-type balance, 1963

Number	*Branch*	*1 Non-producing consumption*	*2 Investments and renovations*	*3 Changes in stocks*	*4 Exports*	*5 End-use, total*
1.	Basic materials and energy industry	0·040	0·040	0·251	0·124	0·071
2.	Machine-building industry	0·065	0·373	0·336	0·298	0·213
3.	Chemical industry	0·045	0·003	0·097	0·090	0·048
4.	Light industry	0·171	0·011	0·224	0·213	0·143
5.	Food industry	0·257	0·001	0·112	0·147	0·158
6.	Other industry	0·024	0·006	—	—	0·012
7.	Socialist industry (1–6) subtotal	0·602	0·434	1·020	0·872	0·645
8.	Private small-scale industries	0·029	—	—	0·001	0·013
9.	Building industry	0·013	0·504	—	—	0·135
10.	Agriculture	0·183	0·033	−0·045	0·084	0·109
11.	Transport	0·047	0·017	0·004	0·016	0·030
12.	Home trade	0·103	0·006	0·013	—	0·050
13.	Foreign trade	0·002	0·006	0·008	0·026	0·009
14.	Other producing activities	0·021	—	—	0·001	0·009
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

Table 10F: The structure of end-use on the basis of the A-type balance, 1964

Number	*Branch*	*1 Non-producing consumption*	*2 Investments and renovations*	*3 Changes in stocks*	*4 Exports*	*5 End-use, total*
1.	Basic materials and energy industry	0·046	0·039	0·238	0·122	0·074
2.	Machine-building industry	0·062	0·379	0·319	0·322	0·219
3.	Chemical industry	0·048	0·004	0·101	0·082	0·048
4.	Light industry	0·178	0·009	0·183	0·217	0·146
5.	Food industry	0·248	0·002	0·084	0·145	0·152
6.	Other industry	0·024	0·006	—	—	0·013
7.	Socialist industry (1–6) subtotal	0·606	0·439	0·925	0·888	0·652
8.	Private small-scale industries	0·026	—	—	0·001	0·012
9.	Building industry	0·017	0·491	—	—	0·129
10.	Agriculture	0·183	0·038	0·051	0·072	0·113
11.	Transport	0·045	0·018	0·004	0·015	0·029
12.	Home trade	0·103	0·007	0·013	—	0·049
13.	Foreign trade	0·002	0·007	0·007	0·023	0·008
14.	Other producing activities	0·018	—	—	0·001	0·008
15.	Domestic use of materials, total	1·000	1·000	1·000	1·000	1·000

the big leap forward between 1959 and 1964 in the use of artificial fertilizers. The technical coefficient correspondingly increased by nearly 60 per cent.

2. *Changes in inverse coefficients*

The changes in the direct input structure of different branches naturally influence the pattern of indirect relations. In connexion with this, first taking the case of the A-type balance, our investigation showed that the elements of the inverse matrix are affected primarily by the coefficients of great values in the direct coefficient matrix: in other words, the tendencies noted in a comparison of direct technical coefficients would be more clearly revealed in terms of their inverse coefficients. Less significant changes in the coefficients of relatively small magnitudes are partly eliminated in the case of the inverse matrix.

By comparing the changes in the inverse coefficients of the A- and B-type balances it can be seen that inverse coefficients of the B-type show greater year-to-year fluctuations than those of the A-type. Table 11 examines the inverse coefficients of the chemical industry by A- and B-type balances for the first and the last year of the period.

As a result of rapid expansion and structural change the input structure of the chemical industry with regard to total input coefficients shows a significant difference between 1959 and 1964. As regards the direction of the changes, both A and B coefficients behave in the same way. In respect to the relative size of differences however the B-type balance generally indicates more intensive changes. For example, the total basic materials and energy requirement for the chemical industry decreased in the six years from 67·2 to 50·3 by some 25 per cent. When only domestic basic materials and energy-carriers are taken into consideration the decrease is more significant (about 36 per cent). The use of imported basic materials and energy carriers in the chemical industry underwent considerable changes during the period. Differences of a similar type can be found also in respect of other important coefficients, for example those relating to the requirements of the food industry and light industries.

TABLE 11: DIRECT AND INDIRECT PRODUCTION REQUIREMENTS PER 100 UNITS OF FINAL DEMAND; CHEMICAL INDUSTRY, 1959 AND 1964

Producing sectors	*1959*		*1964*	
	Type A	*Type B*	*Type A*	*Type B*
Basic materials and energy industry	67·2	31·6	50·3	20·4
Machine industry	7·1	4·0	6·8	3·4
Chemical industry	121·9	109·7	129·0	109·5
Light industries	9·0	6·0	7·5	4·7
Food industry	5·9	4·5	4·2	2·5
Other industry	3·0	1·6	2·0	1·0
Private small-scale industries	0·1	0·0	0·0	0·0
Building industry	6·0	4·7	3·9	2·8
Agriculture	11·5	5·6	7·7	4·5
Transport	5·1	3·4	4·7	3·1
Home trade	2·2	1·4	1·3	0·9
Foreign trade	1·0	0·7	1·5	1·1
Other producing activities	0·8	0·4	0·5	0·3

The inverse of the A-type coefficient matrices for the six years is shown in tables 12A to 12F. Attention is first drawn to the fact that the coefficients of relatively great magnitudes show changes in the same direction: that is true, for example, of the coefficient series indicating the direct and the indirect requirements of products of agriculture for the food industry. Whereas in 1959 it was necessary to employ 83·8 forints worth of agricultural products for the production of 100 forints of food industry products, this figure decreased steadily to the value of 71·8 forints in 1964. This indicates that, as a result of technological development and internal structural changes, the Hungarian food industry relies more and more on the products of branches other than agriculture; for example, the canning industry requires the use of more metallurgical materials, and an increase in packed food leads to an increasing need for the products of the paper industry and synthetic materials. The direct and indirect need for basic materials and energy by the machine industry clearly altered. A similar tendency could be seen, though less sharply, in the corresponding direct input coefficient.

Table 12A: Inverse matrix of variant A of the input-output balance, 1959

Number	Branch	1 Basic materials industry	2 Machine-building industry	3 Chemical industry	4 Light industry	5 Food industry	6 Other industry	7 Private small-scale industries	8 Building industry	9 Agriculture	10 Transport	11 Home trade	12 Foreign trade	13 Other producing activities
1.	Basic materials industry	1·653	0·622	0·672	0·144	0·112	0·416	0·193	0·489	0·067	0·293	0·192	0·207	0·171
2.	Machine-building industry	0·084	1·295	0·071	0·038	0·038	0·183	0·073	0·187	0·031	0·122	0·048	0·107	0·063
3.	Chemical industry	0·127	0·111	1·219	0·085	0·051	0·125	0·063	0·083	0·050	0·099	0·057	0·071	0·055
4.	Light industry	0·060	0·076	0·090	1·387	0·055	0·173	0·355	0·094	0·032	0·071	0·108	0·099	0·306
5.	Food industry	0·011	0·011	0·059	0·040	1·159	0·023	0·028	0·012	0·027	0·011	0·009	0·010	0·012
6.	Other industry	0·062	0·031	0·030	0·010	0·021	1·022	0·010	0·089	0·019	0·053	0·015	0·033	0·010
7.	Private small-scale industries	0·001	0·000	0·001	0·001	0·005	0·002	1·001	0·003	0·009	0·001	0·002	0·001	0·001
8.	Building industry	0·039	0·040	0·060	0·023	0·029	0·021	0·016	1·035	0·015	0·023	0·027	0·017	0·011
9.	Agriculture	0·065	0·045	0·115	0·205	0·838	0·258	0·079	0·074	1·534	0·057	0·045	0·050	0·147
10.	Transport	0·065	0·045	0·051	0·032	0·038	0·091	0·043	0·117	0·011	1·031	0·150	0·610	0·032
11.	Home trade	0·027	0·019	0·022	0·019	0·049	0·034	0·111	0·027	0·024	0·015	1·016	0·023	0·015
12.	Foreign trade	0·011	0·011	0·010	0·010	0·004	0·005	0·007	0·008	0·002	0·004	0·002	1·004	0·008
13.	Other producing activities	0·013	0·007	0·008	0·004	0·002	0·004	0·003	0·010	0·001	0·004	0·003	0·003	1·002

Table 12B: Inverse matrix of variant A of the input-output balance, 1960

Number	Branch	1 Basic materials industry	2 Machine-building industry	3 Chemical industry	4 Light industry	5 Food industry	6 Other industry	7 Private small-scale industries	8 Building industry	9 Agriculture	10 Transport	11 Home trade	12 Foreign trade	13 Other producing activities
1.	Basic materials industry	1·643	0·582	0·620	0·144	0·114	0·382	0·168	0·440	0·078	0·274	0·140	0·202	0·164
2.	Machine-building industry	0·090	1·317	0·075	0·045	0·043	0·172	0·078	0·169	0·039	0·119	0·039	0·109	0·072
3.	Chemical industry	0·139	0·115	1·229	0·094	0·064	0·129	0·068	0·081	0·069	0·099	0·050	0·074	0·061
4.	Light industry	0·045	0·059	0·071	1·372	0·054	0·164	0·323	0·079	0·038	0·059	0·094	0·092	0·318
5.	Food industry	0·011	0·010	0·054	0·038	1·169	0·023	0·026	0·011	0·033	0·011	0·009	0·010	0·012
6.	Other industry	0·062	0·027	0·028	0·010	0·022	1·020	0·009	0·087	0·023	0·040	0·011	0·027	0·009
7.	Private small-scale industries	0·001	0·000	0·001	0·001	0·005	0·002	1·001	0·003	0·010	0·001	0·002	0·001	0·001
8.	Building industry	0·036	0·034	0·048	0·031	0·027	0·019	0·017	1·030	0·016	0·020	0·023	0·017	0·013
9.	Agriculture	0·059	0·036	0·110	0·180	0·801	0·244	0·066	0·061	1·543	0·050	0·032	0·046	0·131
10.	Transport	0·055	0·037	0·049	0·035	0·049	0·087	0·042	0·116	0·015	1·026	0·148	0·638	0·039
11.	Home trade	0·019	0·016	0·022	0·021	0·052	0·033	0·127	0·027	0·033	0·015	1·014	0·026	0·016
12.	Foreign trade	0·011	0·010	0·018	0·010	0·006	0·005	0·005	0·006	0·003	0·005	0·003	1·004	0·004
13.	Other producing activities	0·008	0·005	0·006	0·004	0·002	0·003	0·002	0·009	0·001	0·003	0·002	0·003	1·002

TABLE 12C: INVERSE MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1961

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing activities*
1.	Basic materials industry	1·663	0·577	0·605	0·143	0·125	0·338	0·194	0·470	0·084	0·287	0·142	0·262	0·182
2.	Machine-building industry ..	0·096	1·335	0·084	0·053	0·045	0·162	0·084	0·201	0·042	0·116	0·045	0·133	0·079
3.	Chemical industry	0·140	0·116	1·223	0·088	0·066	0·111	0·063	0·086	0·074	0·098	0·053	0·091	0·063
4.	Light industry	0·050	0·066	0·092	1·393	0·058	0·139	0·315	0·080	0·039	0·054	0·091	0·105	0·321
5.	Food industry	0·011	0·009	0·048	0·037	1·172	0·025	0·025	0·011	0·038	0·011	0·809	0·012	0·013
6.	Other industry	0·035	0·017	0·017	0·008	0·022	1·014	0·007	0·084	0·025	0·033	0·009	0·027	0·007
7.	Private small-scale industries	0·001	0·000	0·001	0·001	0·006	0·002	0·001	0·003	0·011	0·001	0·001	0·001	0·001
8.	Building industry	0·037	0·036	0·048	0·032	0·026	0·017	0·017	1·034	0·016	0·023	0·027	0·023	0·013
9.	Agriculture	0·058	0·035	0·107	0·182	0·822	0·305	0·064	0·065	1·580	0·049	0·027	0·055	0·135
10.	Transport	0·058	0·039	0·051	0·033	0·046	0·072	0·042	0·108	0·018	1·026	0·153	0·806	0·037
11.	Home trade	0·017	0·014	0·018	0·017	0·043	0·027	0·111	0·022	0·027	0·012	1·011	0·024	0·014
12.	Foreign trade	0·009	0·009	0·014	0·008	0·006	0·004	0·004	0·005	0·003	0·004	0·002	1·004	0·004
13.	Other producing activities ..	0·009	0·005	0·006	0·003	0·002	0·003	0·002	0·010	0·002	0·003	0·002	0·003	1·002

TABLE 12D: INVERSE MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1962

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing activities*
1.	Basic materials industry	1·641	0·534	0·561	0·134	0·125	0·338	0·166	0·448	0·077	0·272	0·136	0·247	0·184
2.	Machine-building industry ..	0·097	1·340	0·064	0·049	0·046	0·161	0·077	0·203	0·037	0·121	0·044	0·135	0·074
3.	Chemical industry	0·141	0·125	1·265	0·093	0·075	0·123	0·064	0·091	0·078	0·103	0·051	0·095	0·070
4.	Light industry	0·048	0·059	0·084	1·379	0·057	0·143	0·317	0·075	0·034	0·060	0·087	0·107	0·338
5.	Food industry	0·011	0·009	0·047	0·038	1·210	0·026	0·026	0·011	0·035	0·011	0·008	0·012	0·013
6.	Other industry	0·042	0·019	0·019	0·009	0·025	0·016	0·007	0·091	0·027	0·036	0·010	0·030	0·009
7.	Private small-scale industries	0·000	0·000	0·001	0·001	0·005	0·002	1·001	0·003	0·009	0·001	0·002	0·001	0·001
8.	Building industry	0·033	0·031	0·043	0·031	0·026	0·017	0·017	1·032	0·015	0·023	0·027	0·022	0·013
9.	Agriculture	0·057	0·033	0·102	0·198	0·819	0·311	0·069	0·062	1·571	0·052	0·033	0·058	0·138
10.	Transport	0·056	0·037	0·048	0·031	0·052	0·077	0·047	0·111	0·016	1·026	0·156	0·806	0·046
11.	Home trade	0·018	0·014	0·016	0·018	0·041	0·029	0·122	0·022	0·027	0·012	1·010	0·023	0·015
12.	Foreign trade	0·009	0·008	0·013	0·007	0·006	0·006	0·004	0·005	0·003	0·003	0·002	1·003	0·010
13.	Other producing activities ..	0·008	0·004	0·005	0·003	0·002	0·002	0·001	0·006	0·001	0·003	0·002	0·003	1·002

TABLE 12E: INVERSE MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1963

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing activities*
1	Basic materials industry	1·628	0·520	0·541	0·127	0·118	0·308	0·161	0·441	0·087	0·250	0·162	0·165	0·189
2.	Machine-building industry	0·091	1·334	0·074	0·052	0·046	0·154	0·073	0·199	0·047	0·111	0·046	0·091	0·076
3.	Chemical industry	0·144	0·129	1·275	0·098	0·071	0·123	0·059	0·097	0·083	0·106	0·079	0·072	0·075
4.	Light industry	0·049	0·061	0·074	1·394	0·048	0·135	0·316	0·077	0·035	0·050	0·095	0·072	0·339
5.	Food industry	0·012	0·009	0·046	0·048	1·236	0·033	0·028	0·012	0·042	0·011	0·011	0·009	0·016
6.	Other industry	0·045	0·019	0·020	0·011	0·033	1·021	0·008	0·094	0·045	0·034	0·011	0·021	0·010
7.	Private small-scale industries	0·000	0·000	0·001	0·001	0·004	0·002	1·001	0·002	0·009	0·001	0·002	0·001	0·001
8.	Building industry	0·032	0·028	0·039	0·028	0·023	0·016	0·015	1·031	0·017	0·019	0·027	0·014	0·012
9.	Agriculture	0·064	0·034	0·094	0·169	0·768	0·354	0·061	0·068	1·528	0·048	0·035	0·039	0·129
10.	Transport	0·066	0·039	0·049	0·030	0·044	0·075	0·048	0·110	0·017	1·026	0·149	0·505	0·046
11.	Home trade	0·018	0·014	0·015	0·017	0·038	0·029	0·133	0·022	0·026	0·011	1·011	0·016	0·015
12.	Foreign trade	0·011	0·010	0·015	0·009	0·008	0·006	0·005	0·006	0·004	0·005	0·003	1·003	0·015
13.	Other producing activities	0·007	0·004	0·005	0·003	0·002	0·002	0·001	0·006	0·001	0·003	0·002	0·002	1·002

TABLE 12F: INVERSE MATRIX OF VARIANT A OF THE INPUT-OUTPUT BALANCE, 1964

Number	*Branch*	*1 Basic materials industry*	*2 Machine-building industry*	*3 Chemical industry*	*4 Light industry*	*5 Food industry*	*6 Other industry*	*7 Private small-scale industries*	*8 Building industry*	*9 Agriculture*	*10 Transport*	*11 Home trade*	*12 Foreign trade*	*13 Other producing aetivites*
1.	Basic materials industry	1·632	0·502	0·503	0·132	0·124	0·289	0·155	0·460	0·088	0·253	0·135	0·179	0·188
2.	Machine-building industry	0·087	1·319	0·068	0·051	0·049	0·140	0·086	0·197	0·052	0·113	0·043	0·098	0·072
3.	Chemical industry	0·140	0·141	1·290	0·109	0·078	0·120	0·066	0·109	0·085	0·104	0·055	0·076	0·081
4.	Light industry	0·049	0·065	0·075	1·392	0·053	0·129	0·301	0·064	0·035	0·053	0·080	0·079	0·375
5.	Food industry	0·012	0·009	0·042	0·042	1·268	0·036	0·028	0·012	0·076	0·012	0·010	0·010	0·017
6.	Other industry	0·051	0·021	0·020	0·011	0·035	1·020	0·009	0·090	0·046	0·038	0·011	0·024	0·011
7.	Private small-scale industries	0·000	0·000	0·000	0·001	0·004	0·002	1·001	0·002	0·007	0·001	0·002	0·001	0·001
8.	Building industry	0·032	0·035	0·039	0·029	0·032	0·016	0·017	1·034	0·019	0·020	0·027	0·016	0·014
9.	Agriculture	0·052	0·029	0·077	0·155	0·718	0·306	0·056	0·060	1·502	0·052	0·039	0·043	0·120
10.	Transport	0·063	0·038	0·047	0·034	0·052	0·072	0·054	0·106	0·018	1·027	0·164	0·633	0·052
11.	Home trade	0·018	0·015	0·013	0·016	0·037	0·027	0·147	0·022	0·024	0·011	1·010	0·016	0·014
12.	Foreign trade	0·011	0·009	0·015	0·008	0·007	0·005	0·005	0·007	0·004	0·006	0·003	1·005	0·018
13.	Other producing activities	0·007	0·004	0·005	0·003	0·002	0·002	0·004	0·004	0·002	0·002	0·018	0·002	1·002

Finally it may be noted that the total requirements of within-branch origin in different branches show changes in varying directions. It should be remembered that the data had already been adjusted for the organizational changes of enterprises, and consequently these changes should reflect some factors other than the forms of organization of the accounting units. The inverse coefficient series of own origin of some industries are shown in table 13.

TABLE 13: INVERSE COEFFICIENTS OF OWN-BRANCH ORIGIN (ON THE BASIS OF A-TYPE BALANCE)

Branch	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*
Basic materials and energy industry	65·3	64·3	66·3	64·1	62·8	63·2
Machine industry	29·5	31·7	33·5	33·9	33·4	31·9
Chemical industry	21·9	22·9	22·3	26·5	27·5	29·0
Light industry	38·7	37·2	39·3	37·9	39·4	39·1
Food industry	15·9	16·8	17·2	21·0	23·6	26·8
Agriculture	53·4	54·3	58·6	57·1	52·8	50·2

The greatest internal co-operation is required in the basic materials and energy industry and the next greatest in agriculture. In both branches the inverse coefficient of own-branch origin shows relatively less fluctuation during the period, some decrease being evident during the last two years of the period. The real nature of this apparent trend however is not very clear. There is no doubt that the internal requirements of the chemical industry had a strong upward trend during the period and the same applied also to the food industry.

In view of the fact that this investigation has so far relied on data of the A-type balance it is appropriate to examine the increase in use of imported materials during the period considered. Table 14 shows direct and indirect import requirements involved per 100 forints of production in various branches.

As can be seen from this table the direct use of direct imported materials has changed considerably and, by branches, in different proportions. The same is true of the indicator of accumulated imports content. This is why data of the A-type balance are preferred to those of the B-type balance for the purpose of analysis of the technological structure of the economy; the influence of the changes in import patterns shown in table 14 would be strongly reflected in the direct and inverse coefficients of the B-type balance.

TABLE 14: DIRECT AND INDIRECT IMPORT REQUIREMENTS PER 100 FORINTS OF PRODUCTION

Branch	*Direct use of imports per 100 forints of output*		*Accumulated imports content per 100 forints of output*	
	1959	*1964*	*1959*	*1964*
Basic materials and energy industry	11·01	14·38	18·31	22·31
Machine industry	7·92	10·47	16·85	19·86
Chemical industry	22·83	23·30	29·99	33·03
Light industry	11·38	11·54	17·35	18·02
Food industry	4·78	9·23	8·58	15·96
Other industry	0·00	2·41	9·38	11·05
Private small-scale industries .	1·43	4·72	8·38	11·00
Building industry	1·78	3·71	9·90	13·17
Agriculture	0·83	3·30	3·23	8·08
Transport	3·49	5·13	8·88	10·50
Home trade	0·03	0·66	5·67	5·02
Foreign trade	0·61	0·00	7·16	7·67
Other industrial activities	0·96	3·29	6·94	11·03

To sum up: it can be stated that in the case of fairly strongly aggregated balances the structure of technical coefficients changed relatively little during the six years. The change is more significant in very rapidly developing branches. The structure of input coefficients of the A-type balance expressing direct technological relations was more stable than that of the B-type balance. Changes in the coefficients of more significant value indicate less obscure tendencies.

The inverse coefficients, for both the A- and the B-type balances, give a more expressive picture of the underlying structural changes than do direct input coefficients; the influence of the factors causing the structural changes of the national economy appears to be inflated. The inverse coefficients of the A-type balance are also more stable than those of the B-type balance.

INPUT-OUTPUT STATISTICS AND ANALYSIS IN YUGOSLAVIA

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Input-output statistics and analysis in Yugoslavia began to develop rapidly after the compilation and publishing of the first input-output tables for 1955. Direct work on these tables commenced at the end of 1955 in the Federal Institute for Statistics, and the first results were published in mid-1957 under the title *Interindustry relations of the Yugoslav economy in 1955.* The relative shortness of the period required for the compilation of these tables can be explained by the use made of the experience of countries that already had their own national tables, and also of Yugoslavia's own experience of many years in the compilation of "material balances" for economic plans. The experience acquired in the compilation of these balances, and particularly the influence which it had on the structure and nature of the data system in the field of economic statistics, greatly facilitated the appraisal and solution of certain methodological and practical problems regarding the construction of the tables, especially the establishment of a compilatory framework best suited to the requirements and specific characteristics of the Yugoslav economic system.

In compiling the first input-output tables the Federal Institute for Statistics found it practically impossible, because of its own insufficient experience and the limited sources of data and of money resources, to produce a detailed table with a great number of sectors. For a practical application of the input-output technique, longer experience would have been needed as well as corresponding adaptations in other fields of economic statistics. The input-output tables for 1955 were therefore constructed for only 28 productive industries. The compilation was itself considered as a pilot work, intended mainly to study methodological and practical problems connected with input-output compilation and to establish the conditions for further development of empirical inquiries and application of the input-output method in Yugoslavia.

Further work on input-output statistics was directed towards a gradual elaboration of more developed tables with a greater number of sectors and a gradual adaptation of the existing system of economic statistics to the requirements for such an elaboration. It was considered that no attempt should be made to introduce expensive statistical inquiries primarily intended to serve the compilation of the input-output tables without undertaking a corresponding development of their practical application.

The input-output tables compiled subsequently for 1958 were also based only on readily available data. Besides the basic table which comprised 76 productive industries and five final demand sectors, tables at higher levels of aggregation were also compiled, with a view to complying with the International Standard Industrial Classification of All Economic Activities (ISIC). In the course of the compilation of the 1958 tables at the Federal Institute for Statistics a centre for electronic data processing was established, which made it possible for the first time to draw up the inverse matrices of technical coefficients. These were computed for all levels of aggregation and published with the basic tables in mid-1962.

During 1963 the input-output tables for 1960 were compiled: they contained 29 productive industries. Being drawn up in the form of an internal document for the Federal Institute for Economic Planning they were not published.

At the end of 1965 the input-output tables for 1962 were finished and partly published. The number of productive sectors in the basic table was increased to 98 together with five final demand sectors. In addition to total transactions the flow of imports by activities of origin as well as of destination, was also drawn up in a separate table; to the detailed elaboration and final definition of productive sectors of the table was added also an improvement in the compilation machinery, which was reflected in a shortening of the time spent on compilation and in the fact that the primary data, originally based on the regular statistical inquiries alone, were now supplemented by a considerable amount of data specially collected for the purpose of input-output compilation.

In view of the present possibilities and requirements the Federal Institute for Statistics is planning to compile input-output tables for every second year beginning with 1962 (table 1). Between these tables, drawn up on the basis of complete statistical documentation, up-dated tables will also be compiled, based on those for the previous year but with additional information on the most important sectors for the current year.

I. CHARACTERISTICS OF THE INPUT-OUTPUT TABLES

Yugoslav experience in the compilation and use of input-output tables has shown that they can be widely used not only for the type of economic analysis that is based on econometric techniques but also for other types of analyses where the starting point is detailed presentation of the structure of the national economy. Furthermore, in carrying out these analyses it often becomes necessary to change certain solutions adopted at the time of compilation and adapt them to a specific need arising in each context of analysis. In most cases this is a consequence of the presentation of complex economic transactions within one relatively simple scheme, or various simplifications used for practical compilation purposes (dummy industries, treatment of secondary products, negative items and so on). The input-output table is a part of the system of information derived from economic statistics which comprises all the most important indicators of economic structure and links partial statistical inquiries and estimates into one consistent system; it can therefore not be drawn up without taking into account the methodological and practical solutions involved in other fields of economic statistics, since the latter are used in most analyses as either supplementary or primary information. For this reason it is important for the compilation of tables to be designed to meet more than one purpose: it must provide a tool for the general economic balance which contains in one place all the basic indicators of production, distribution, intermediate and final demand, imports, exports and investment and which, at the same time, has to be easily adaptable to the requirements of the models of input-output analysis.

In Yugoslavia it was held that the compilation of tables should start therefore from uniform definitions and methodological solutions which were also applied to other domains of the system of economic balances, and in particular to the basic conception of material production in the system. The use of these definitions and methodological solutions caused the basic scheme of the Yugoslav input-output tables to show a certain difference from the schemes of some other countries. First of all, the field of productive sectors is limited to only those economic activities which produce material goods and "productive" services. Other service-rendering activities, such as financial organizations and institutions, health institutions, organizations for residential management, and for personal and other services, have been covered by the autonomous sectors of the table. For the same reasons the final demand sectors do not comprise expenditures of corresponding categories of "non-productive" services. Thus "personal consumption" excludes expenditures for rent, health and other personal services, as well as for other service activities not comprised in the productive segment of the table. Apart from the purely theoretical attitudes reflected in this procedure there also exist definite practical reasons for it: for the majority of these services actual prices do not exist and some, such as rent and health services paid by persons, have far lower market prices than their corresponding real economic prices. Moreover, a great part of these services are not paid for from the personal incomes of individuals but are financed out of special funds.

The basic scheme of the Yugoslav tables is otherwise fairly similar to the schemes of other countries. Final demand comprises the following five sectors: increase of stocks, gross investment, exports, personal consumption and general consumption (see columns 10–14 of table 1).

Primary input categories are set out as follows:

TABLE 1: AGGREGATED INPUT-OUTPUT

(*In millions*

Industry consuming *Industry producing*	*Manufacturing, mining and quarrying* 1	*Agriculture* 2	*Forestry* 3	*Construction* 4	*Transport and communications* 5	*Trade and catering* 6	*Servicing arts and crafts* 7
1. Manufacturing, mining and quarrying	1,848,873	81,378	4,584	253,527	118,369	37,904	43,704
2. Agriculture	230,180	523,069	3,566	—	78	3,897	44
3. Forestry	79,122	466	550	6,656	220	1,299	370
4. Construction	16,086	1,322	1,235	137,391	26,189	3,113	408
5. Transport and communications	106,351	11,314	2,453	39,900	32,946	12,299	1,253
6. Trade and catering	71,643	14,292	746	20,508	6,407	5,579	10,714
7. Servicing arts and crafts	31,624	9,028	958	8,939	8,561	7,069	1,613
8. Other	39,256	237	130	2,100	1,063	2,849	378
9. TOTAL	2,423,135	641,106	14,222	469,021	193,833	74,009	58,484
10. Depreciation	149,666	42,677	11,458	21,300	54,785	16,112	2,096
11. Personal incomes	402,748	525,599	60,257	173,067	94,313	120,266	38,621
12. Accumulation and funds	1,060,709	203,281	30,673	202,960	134,187	340,735	34,764
13. Production	4,036,258	1,412,663	116,610	866,348	477,118	551,122	133,965
14. Decrease of stocks	11,983	37,598	2,090	—	—	—	—
15. Imports	668,171	146,133	1,122	—	20,247	—	—
16. Available resources	4,716,412	1,596,394	119,822	866,348	497,365	551,122	133,965

From the Federal Institute for Statistics, *Interindustry Relations of the Yugoslav Economy in 1962*, Studies, Analyses and Reviews, 26 (Belgrade, 1966).

	Row No.
Depreciation	(100)
Personal incomes	(101)
Accumulation and funds	(102)

To these, "Decrease of stocks" and "Imports" are added in the table for available resources and uses.

The basic table for 1962 comprises 98 productive sectors and is the most elaborate in the series of tables drawn up for various years. In view of the degree of elaboration of the existing nomenclature of activities which is used in the system of economic statistics as well as in other available statistics, the 98-sector input-output table is considered to be the most detailed that can be drawn up under present conditions. The same number of sectors will be contained in the tables for 1964 which are now in process of being drawn up.

The full table of input-coefficients for 98 productive sectors is reproduced in table 2, together with the corresponding value-added quadrant of the flow table. Columns 99 to 108 of the table are shown in millions of dinars (at producers' prices): column 107 relates to "total available resources" and column 108 to "gross production of domestic industry".

Gross production of each sector, which is the denominator of the input coefficients, is less than total available resources for that sector by the amount equal to "decrease in stock" plus imports (classified according to competitive or counterpart domestic industry).

The productive sectors in the input-output table are specified as groups of definite products and services, and not as groups of organizational, technical or other statistical units. In other words, product is used as the basic unit of classification for the purpose of defining sectors, in accordance with the nomenclature determined in advance. Statistical computation, however, has been worked out with the data for groups of products, of enterprises or of plants. This procedure helps to secure an acceptable precision of computation in a shorter time and with smaller resources than would be required otherwise.

The choice of computation procedure depends upon the homogeneity of a given organizational unit, i.e. the extent to which each unit can safely be treated as though it were producing only the products and services which belong to one single sector of the table. Experience has shown that only the precise, detailed definition of sectors would ensure comparability between the data from economic statistics and those in the input-output table; the chief reason for this is the fact that the volume and structure of the value of the social product are greatly influenced by particular units of classification involved. It is known that the structure as well as the volume of social gross product (by categories of its primary distribution, depreciation, personal incomes and accumulation and funds) turns out rather differently according to whether the unit of classification involved in computation is product, plant or enterprise.

In fact, the official classification of activities had to be modified, not only where it did not yield an acceptable homogeneity of sectors but also where it was not in accordance with the basic assumptions of the input-

TABLE OF THE YUGOSLAV ECONOMY, 1962

of dinars)

Other 8	*Total* 9	*Increase of stocks* 10	*Gross investment* 11	*Exports* 12	*Personal* 13	*General* 14	*Total* 15	*Total (10, 11, 12 and 15)* 16	*Distributed resources (9 and 16)* 17
9,326	2,397,665	178,952	463,623	552,553	960,817	162,802	1,123,619	2,318,747	4,716,412
—	760,834	6,918	—	72,637	731,979	24,026	756,005	835,560	1,596,394
76	88,759	—	681	8,835	20,423	1,124	21,547	31,063	119,822
703	186,447	—	655,773	380	—	23,748	23,748	679,901	866,348
859	207,375	3,501	6,733	109,758	150,851	19,147	169,998	289,990	497,365
894	130,783	6,106	39,485	51,571	306,870	16,307	323,177	420,339	551,122
614	68,406	1,204	2,645	—	50,684	11,026	61,710	65,559	133,965
277	46,290	264	—	1,008	10,190	20,651	30,841	32,113	78,403
12,749	3,886,559	196,945	1,168,940	796,742	2,231,814	278,831	2,510,645	4,673,272	8,559,831
2,106	300,200								
16,090	1,430,961								
37,870	2,045,179								
68,815	7,662,899								
—	51,671								
9,588	845,261								
78,403	8,559,831								

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962

Buying sector ⟶	*Electricity*	*Coal*	*Coke and gas*	*Crude petroleum and natural gas*	*Crude petroleum products*	*Iron ore*	*Ferrous metallurgy*	*Non-ferrous metal ores*	*Alumina and aluminium*	*Other non-ferrous metals*	*Rolling mills of non-ferrous metals*	*Non-metallic minerals*	*Glass*	*Refractory material*
↓ *Selling sector*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1	—	·04298	·00880	·00421	·01126	·02479	·02874	·05449	·10984	·03364	·02003	·02035	·01786	·01213
2	·17572	·00971	·51196	·00089	·00028	·00666	·01168	·00117	·01578	·01559	·00178	·02011	·06325	·03039
3	·00148	·00073	·01436	·00003	—	·00009	·07220	·00066	·03710	·02514	·00014	·00061	·00080	·00490
4	—	—	—	·00963	·40761	—	—	—	—	—	—	—	·01377	—
5	·01693	·01079	·01408	·01121	·01307	·01209	·00758	·01471	·00301	·00899	·00593	·01280	·00888	·03949
6	—	—	—	—	—	—	·04602	—	—	—	—	—	—	—
7	·00740	·01211	·01298	·01827	·00118	·01121	·47902	·01918	·00612	·00412	·00012	·00755	·00423	·01072
8	—	—	—	—	—	—	·00069	·39538	·04725	·41867	—	—	—	·03206
9	·00059	·00056	·00016	—	·00012	—	·00021	·00007	·21662	·00021	·19412	·00118	·00019	·00005
10	·00206	·00095	·00107	—	·00006	·00140	·01467	·00263	·02355	·13902	·29487	·00099	·00122	·00046
11	·00528	·00519	·00148	·00047	·00025	·00219	·00174	·00140	·00141	·00029	—	·00264	·00301	·00268
12	·00019	·00007	·00013	—	·00045	·00018	·00076	·00003	·00345	·00004	·00047	·06143	·03304	·21873
13	·00029	·00016	·00003	·00003	·00002	·00009	·00012	·00013	·00015	·00013	·00033	·00061	·01480	·00030
14	·00060	·00007	·00167	·00199	·00006	·00026	·02099	·00001	·00121	·00730	·00356	·00760	·03125	·05309
15	·00175	·00004	·00003	—	—	—	·00004	·00006	·00005	·00001	—	·00005	·00042	·00005
16	·00042	·00050	·00013	·00028	—	·00035	·00228	·00010	·06531	·00443	·00159	·00014	·00216	·00051
17	·00024	·00129	·00019	·00051	—	·00061	·00445	·00220	·00044	·00153	·00071	·00080	·01227	·00035
18	·00046	·00078	·00009	·00041	—	·00009	·00006	·00015	·00175	·00023	—	·00094	·00014	·00035
19	·00133	·00210	·00091	·00158	—	·00070	·00025	·00066	·00238	·00022	·00002	·00165	·00019	·00025
20	·00035	·00070	·00003	·00013	—	—	·00001	·00021	·00039	·00007	·00002	·00321	·00127	·00005
21	·00861	·01471	·00468	·01197	·01024	·00928	·02593	·02139	·00699	·00289	·00902	·01124	·01071	·00905
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23	·00180	·02637	·00006	·00462	·00418	·01349	·00368	·01265	·00422	·01032	·00408	·00387	·00014	·00501
24	·00117	·00110	·00009	·00595	·00101	—	·00014	·00015	·00340	·00018	·00162	·00019	·00042	·00025
25	·00017	·00420	·00484	—	·00001	·00026	·00127	·00517	·00228	·00009	·00002	·00005	·00019	·00015
26	·00051	·00181	·00009	—	·00001	·00166	·00022	·00268	·00005	·00075	·00048	·00307	·00009	·00152
27	·00108	·00060	·00028	·00009	·00001	·00009	·00030	·00111	·00049	·00033	·00107	·00127	·00019	·00015
28	·00004	—	—	—	—	—	—	—	—	—	—	—	—	—
29	·01597	·00407	·00044	·00215	·00060	·00018	·00039	·00326	·00282	·00049	·00323	·00080	·00094	·00101
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	·01004	·00539	·00066	·00063	·00020	·00736	·00098	·00170	·00558	·00065	·00078	·00113	·00066	·00152
32	·00038	·00003	—	—	—	—	·00002	·00006	—	·00001	·00012	·00009	·00023	—
33	·01673	·00488	·00044	·00098	·00031	·00201	·00166	·00206	·00646	·00174	·00092	.00137	·00169	·00177
34	·00143	·00098	·00597	·00320	·03038	·00026	·00228	·01380	·03137	·00670	·00118	·00874	·06922	·00197
35	·00008	·00004	—	—	—	—	—	·00003	—	·00001	·00005	·00812	—	·00020
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37	·00008	·00009	·00003	·00009	·00001	—	·00007	·00004	·00010	·00004	·00002	·00005	·00009	·00005
38	·00002	·00009	—	—	·00036	·00079	·00021	·00011	—	·00022	·00007	·00774	·00089	·00025
39	·00076	·02502	·00006	·00253	·00033	·01498	·00069	·01616	·00107	·00132	·00126	·00751	·00273	·00040
40	·00094	·00089	·00009	·00032	·00025	·00114	·00013	·00028	·00151	·00011	·00306	·00548	·01222	·00015
41	·00060	·00031	·00006	—	·00056	·00123	·00047	·00011	·00185	·00024	·00026	·00576	·01015	·00420
42	·00239	·00806	·00028	·00253	—	·00359	·00125	·00473	·00083	·00068	·00282	·00623	·00324	·00455
43	·00052	·00136	·00009	—	·00005	·00114	·00067	·00025	·00019	·00100	·00710	·00165	·00249	·00404
44	·00027	·00007	—	—	—	·00009	·00002	—	·00005	·00510	—	·00033	·00103	—
45	·00004	·00004	·00003	—	—	·00018	—	·00004	—	·00001	—	·00061	·00005	—
46	·00010	·00021	—	·00057	·00001	—	·00023	·00046	—	·00035	·00009	·00009	·00089	·00025
47	·00002	·00004	—	—	—	·00009	—	—	—	·00138	—	—	·00014	—
48	·00012	·00015	·00003	·00019	·00021	—	·00006	·00013	·00034	·00009	·00038	·00189	·00056	·00025
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—

H

49	—	—	—											
50												—	—	—
51	·00004	—	—	—	—	—	·00002	·00010	·00005	·00004	·00009	·00028	·00023	·00010
52	·00015	·00056	·00003	·00019	·00003	—	·00006	·00014	·00058	·00005	·00017	·00009	·00005	·00015
53	—	—	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00121	·00618	·00129	·00152	·00024	·00412	·00087	·00692	·00044	·00082	·00031	·00567	·00174	·00228
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	—	—	—	—	—	—	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	—	—	—	—	—	—	·00001	—	—	—	·00002	—	—	—
63	—	—	—	—	—	—	—	—	—	—	—	—	—	—
64	—	—	—	—	—	—	·00008	—	·00053	—	—	—	·00047	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00191	·00148	·00091	·00155	·00010	·00149	·00063	·00044	·00078	·00055	·00116	·00137	·00291	·00192
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	·00008	·00021	·00009	·00013	·00024	·00009	·00004	·00014	—	·00010	·00007	·00005	·00014	·00015
70	—	·00026	—	—	—	—	—	·00004	—	—	—	·00057	—	—
71	—	—	—	—	—	—	—	—	—	—	—	—	—	—
72	—	—	—	—	—	—	—	—	—	—	—	—	—	—
73	—	—	—	—	—	—	—	—	—	—	—	—	—	—
74	·00382	·04841	—	—	—	·00210	·00022	·00587	·00005	·00507	·00346	·00449	·00047	·00177
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00802	·00024	·00286	·00003	·00025	—	·00240	·00006	·00058	·00155	·00171	·00142	·00080	·00025
77	·00008	·01045	·00022	·00687	·00322	·00079	·00071	·00340	—	·00012	—	—	—	—
78	·00186	·00059	·00138	·00095	·00002	·00990	·00122	·00020	·00039	·00009	·00019	·00038	·00056	·00030
79	·02410	·00844	·11698	·00393	·02601	·00359	·03562	·01023	·04652	·03085	·00781	·01582	·03980	·06588
80	·00016	·00015	—	—	·00068	—	·00071	·00004	·00005	·00295	·00016	·00033	—	·00010
81	·00025	·00023	·00057	—	·00359	—	·00063	·00024	—	—	—	—	—	—
82	·00004	—	—	—	—	—	—	—	—	—	—	—	—	—
83	·00227	·00618	·00129	·00041	·00212	·00079	·00465	·00496	·01797	·00226	·00752	·00519	·01212	·00091
84	·00480	·00175	·00091	·00196	·00051	·00140	·00055	·00101	·00092	·00037	·00126	·00236	·00216	·00142
85	·00081	·00037	·00264	·00025	·00093	·00070	·00061	·00010	·00034	·00067	·00097	·00042	·00061	·00076
86	·00028	·00235	·00104	·00180	·00007	·00219	·00018	·00309	·00049	·00134	·00093	·00264	·00150	·00106
87	·00646	·00612	·00506	·00427	·00121	·00648	·00332	·00100	·00189	·00370	·00790	·00685	·00743	·00956
88	·00083	·00035	·02414	·00019	·00871	—	·00429	·00044	·00214	·00471	·00539	·00019	·00216	·00217
89	·00113	·00052	·00374	·00035	·00131	·00096	·00085	·00014	·00044	·00095	·00138	·00057	·00085	·00101
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00836	·00832	·00629	·03499	·00480	·00464	·00462	·00768	·02501	·00201	·00308	·00675	·00479	·00298
92	·01298	·00271	·00047	·00076	·00023	—	·00058	·00117	·00165	·00038	·00017	·00066	·00089	·00020
93	·00071	·00030	·00013	·00006	·00004	·00079	·00028	·00006	·00024	·00002	·00048	·00038	·00047	·00071
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00052	·00022	·00009	·00003	·00003	·00018	·00006	·00001	·00005	·00001	·00010	—	—	·00005
97	·00280	·00112	·00066	·00709	·00039	·00333	·00073	·00034	·00024	·00067	·00045	·00127	·00301	·00182
98	·00072	·00115	·00009	·00009	·00009	·00009	·04250	·00114	·00170	·00087	·01870	·00194	·01471	·00521
99	·36333	·29794	·75724	·15294	·53824	·16211	·83859	·62853	·70841	·75448	·62480	·27966	·42563	·54409
100	·27161	·15010	·04648	·23119	·01409	·10116	·02148	·10139	·03355	·03564	·02605	·07347	·03966	·03317
101	·13199	·24760	·04916	·05921	·01980	·17542	·03934	·09880	·04865	·05311	·05721	·20619	·17590	·07680
102	·23308	·30435	·14712	·55665	·42786	·56131	·10058	·17128	·20938	·15677	·29193	·44067	·35880	·34594
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector → *Selling sector* ↓	*Porcelain and ceramics* *15*	*Other processing of non-metals* *16*	*Stone, sand and lime* *17*	*Bricks and tiles* *18*	*Cement* *19*	*Other building material* *20*	*Metal semi-products* *21*	*Agricultural machines* *22*	*Other machines and equipment* *23*	*Precision instruments* *24*	*Railroad vehicles* *25*	*Road vehicles* *26*	*Metal products not elsewhere classified* *27*	*Shipbuilding* *28*
1	·02483	·03735	·01954	·03749	·07863	·01034	·01399	·00855	·00877	·00900	·01298	·00788	·01114	·00586
2	·05519	·01450	·04264	·08859	·11598	·01040	·00587	·00255	·00268	·00796	·00431	·00289	·00385	·00041
3	·00220	·08674	·02349	·00113	·00513	·00064	·01145	·00430	·00114	—	·00237	·00043	·00221	·00020
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·01066	·02955	·02064	·01271	·00399	·08801	·01048	·00442	·00594	·01018	·00603	·00783	·00593	·00449
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·03061	·00670	·01857	·00963	·03437	·07068	·24135	·13594	·15628	·07869	·15159	·08715	·13892	·13945
8	—	—	—	—	·00088	—	—	—	—	—	—	—	—	—
9	·00537	—	·00016	·00004	·00003	—	·01428	·00174	·00172	·00777	·00208	·00122	·00538	·00193
10	·00554	·00876	·00063	·00095	·00070	·00071	·03547	·00880	·00722	·01480	·00985	·00568	·02136	·00253
11	·01140	·00711	·00078	·00291	·00155	·01663	·00884	·02135	·02263	·03077	·02279	·01034	·04789	·01477
12	·07457	·06307	·00152	·00030	·08231	·00539	·00201	·00038	·00112	·00146	·00004	·00023	·00086	·00020
13	·00033	·02832	·00020	·00043	·00018	·00039	·00043	·00017	·00057	·00999	·00193	·00098	·00121	·00077
14	·02442	·06677	·00422	·00043	·00655	·00116	·00465	·00060	·00145	·00254	·00094	·00026	·00324	·00046
15	·00993	·00096	·00004	·00061	·00010	·00019	·00054	·00013	·00007	·00028	·00033	·00026	·00054	·00033
16	·00399	·03927	·00106	·00052	·00031	·00167	·00587	·00128	·00360	·00123	·00213	·00210	·00207	·00241
17	·00757	·00356	·03354	·00616	—	·03916	·00184	·00064	·00021	·00085	·00019	·00026	·00044	·00024
18	·00081	·00068	·00129	·00447	·00093	·00225	·00026	·00004	·00017	—	·00011	·00001	·00042	·00004
19	·00220	·00274	·00754	·00430	·01057	·10752	·00042	·00026	·00053	·00005	·00025	·00002	·00044	·00035
20	·00016	—	·00121	·00022	·00005	·01117	·00011	·00004	·00019	—	·00014	·00001	·00031	·00006
21	·01685	·01601	·01274	·00885	·00624	·02298	·05416	·08282	·12184	·08981	·10478	·09763	·07281	·06178
22	—	—	—	—	—	—	—	·07758	—	—	—	—	—	—
23	·00407	·00137	·00688	·00382	·00420	·00289	·00806	·05564	·09206	·00160	·02903	·00290	·00754	·23734
24	·00033	·00041	·00035	·00035	·00016	·00045	·00113	·00196	·00317	·02733	·00062	·00062	·00113	·00808
25	·00016	—	·00102	·00148	·00016	—	·00182	—	·00540	—	·11310	·00052	·00023	—
26	·00277	·00027	·00238	·00152	·00041	·00154	·00068	·00825	·00863	·00005	·00189	·26531	·00840	·00286
27	·00130	·00137	·00063	·00273	·00500	·00193	·00172	·00162	·00141	·01159	·00624	·00092	·03190	·01171
28	—	—	·00066	·00022	·00013	—	—	—	·00001	—	—	—	—	·02950
29	—	·00246	·00125	·00286	·00207	·00225	·00295	·00468	·03340	·00957	·00921	·00135	·00323	·01868
30	—	—	—	—	—	—	—	—	—	—	—	—	—	·00222
31	·00065	·00383	·00145	·00100	·00259	·00193	·00123	·00187	·00541	·00660	·00421	·00205	·00250	·01450
32	—	—	·00012	—	·00003	·00006	·00004	·00017	·00005	·00523	—	·00051	·00324	·00443
33	·00261	·00205	·00266	·00204	·00166	·00205	·00350	·00587	·01181	·02158	·00947	·01209	·00722	·02768
34	·01539	·00534	·00082	·00043	·00207	·00783	·00936	·00459	·00375	·01169	·00468	·00539	·01065	·00605
35	·00033	·01396	·00004	—	—	·00257	·00139	·00038	·00035	·00193	·00093	·00165	·00150	·00060
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37	·00016	·00014	·00008	·00004	·00008	·00013	·00019	·00034	·00009	·00019	·00015	·00013	·00018	·00004
38	·00008	·00096	·00004	·00004	·00023	—	·00075	·00094	·00058	·00170	·00005	·00046	·00077	·00021
39	·00431	·00643	·01176	·00074	·00231	·00116	·00730	·00736	·00529	·00452	·01090	·00771	·03689	·01399
40	·00195	·00315	·00102	·00165	·00023	·04198	·00326	·00051	·00143	·00104	·00100	·00205	·00260	·00110
41	·00668	·00424	·00367	·00035	·08024	·00250	·00394	·00034	·00119	·00198	·00008	·00170	·00656	·00011
42	·00269	·00287	·00422	·00525	·00350	·00931	·00363	·00442	·00337	·00730	·03530	·00326	·01125	·02169
43	·01400	·00547	·00035	·00113	·00093	·00315	·00699	·00162	·00219	·00499	·00037	·00054	·00972	·00241
44	—	·00041	·00008	·00022	·00036	·00058	·00003	·00004	·00004	—	·00003	·00001	·00035	·00003
45	·00057	·00068	·00008	·00017	·00008	·00032	·00005	·00009	·00007	—	·00021	·00004	·00077	·00015
46	·00008	·00124	·00008	·00009	·00005	—	·00043	·00009	·00043	·00038	·00070	·00182	·00609	·00080
47	·00073	·00123	·00004	·00004	·00225	—	·00010	—	·00001	—	·00036	·00051	·00082	·00009
48	·00057	·00150	·00008	·00043	·00039	·00815	·00021	·00021	·00034	·00009	·00109	·00082	·00137	·00152
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—

48	·00057	·00150	·00008	·00043	·00039	·00815	·00021	·00021	·00034	·00009	·00109	·00082	·00137	·00152
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	·00016	·00027	·00004	·00013	·00186	·00006	·00011	·00004	·00016	·00033	·00030	·00055	·00067	·00072
52	·00016	·00027	·00012	·00039	·00031	·00019	·00029	·00021	·00031	·00024	·00137	·00061	·00021	·00039
53	—	—	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00252	·00246	·00492	·00334	·00337	·00180	·00217	·01595	·00462	·00264	·00655	·03604	·00333	·00226
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	—	—	—	—	—	—	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	—	—	—	—	—	—	—	—	—	—	—	—	—	—
63	·00016	—	—	—	—	—	—	—	—	—	—	—	—	—
64	·00016	—	—	—	—	·00013	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00456	·00410	·00145	·00221	·00114	·00308	·00223	·00944	·00388	·00867	·00324	·00244	·00334	·00108
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	·00033	·00014	·00012	·00091	·00003	·00019	·00028	·00009	·00020	·00009	·00015	·00007	·00017	·00049
70	—	—	·00051	—	—	—	—	—	—	—	—	—	—	—
71	—	—	—	—	—	—	—	—	—	—	—	—	—	—
72	—	—	—	—	—	—	—	—	—	—	—	—	—	—
73	—	—	—	—	—	—	—	—	—	—	—	—	—	—
74	·00602	·00109	·00266	·00469	·00026	·02337	·00060	·00085	·00043	·00028	·00073	·00008	·00045	·00209
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00765	·01614	·00281	·00555	·00251	·00507	·00207	·00157	·00142	·00146	·01320	·00164	·00115	·00138
77	—	—	—	·00013	—	—	·00005	—	·00002	—	—	—	—	·00037
78	·00090	·00068	·00149	·00143	·00003	·00430	·00145	·00021	·00118	·00137	·00034	·00071	·00200	·01064
79	·03631	·02764	·01634	·02634	·05815	·01932	·01543	·00846	·00786	·01070	·01532	·00530	·01035	·00807
80	—	·00068	·00027	·00013	·00028	·00122	·00012	·00004	·00022	·00005	·00003	·00007	—	·00153
81	—	—	·00008	·00030	—	·00238	·00021	—	·00011	—	—	·00014	·00008	·00003
82	—	—	—	—	—	—	·00004	—	·00006	—	—	—	—	—
83	·00676	·00479	·01087	·00972	·00155	·01650	·00609	·00328	·00360	·00165	·00230	·00452	·00435	·00247
84	·00277	·00315	·00258	·00312	·00176	·00263	·00233	·00183	·00230	·00254	·00105	·00111	·00211	·00131
85	·00073	·00137	·00027	·00048	·00052	·00096	·00104	·00196	·00109	·00132	·00103	·00145	·00141	·00171
86	·00220	·00096	·00348	·00234	·00155	·00058	·00182	·00179	·00267	·00118	·00192	·00110	·00233	·00132
87	·00912	·01519	·00473	·00777	·00373	·01342	·01363	·02527	·01380	·01456	·01111	·01096	·01597	·00611
88	·00236	·00561	—	·00030	·00306	·00212	·00286	·00566	·00332	·00509	·00416	·00848	·00523	·01397
89	·00106	·00192	·00035	·00065	·00070	·00135	·00146	·00281	·00154	·00184	·00145	·00203	·00197	·00241
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00969	·01751	·01739	·01623	·00448	·00892	·00658	·00664	·00970	·00792	·00509	·00603	·00580	·00440
92	·00309	.00219	·00106	·00121	·00104	·00122	·00098	·00081	·00114	·00038	·00073	·00054	·00034	·00007
93	·00024	·00055	·00059	·00100	·00008	·00122	·00048	·00013	·00081	·00057	·00205	·00016	·00041	·00139
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	—	—	·00004	·00009	—	·00013	·00050	·00013	·00084	·00061	·00215	·00017	·00043	·01286
97	·00244	·00342	·00133	·00169	·00096	·00289	·00195	·00140	·00173	·00146	·00181	·00168	·00140	·00186
98	·00033	·00164	·00082	·00130	·00241	·00148	·04536	—	—	—	—	—	—	·00074
99	·44578	·58626	·30385	·29780	·54741	·59456	·58094	·54113	·57964	·44967	·62852	·62344	·53745	·72171
100	·03973	·01792	·06129	·08104	·07977	·02221	·02424	·02590	·02583	·02276	·02112	·02728	·02224	·01594
101	·16509	·07908	·27618	·26335	·08607	·10887	·11749	·13501	·12536	·15093	·11996	·09287	·12453	·08108
102	·34940	·31673	·35869	·35780	·28675	·27436	·27733	·29796	·26918	·37664	·23040	·25642	·31578	·18127
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·0000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector ⋙→	*Electrical machinery and apparatus*	*Electrical home appliances*	*Cables and conductors*	*Radio and telecommunications equipment*	*Other electrical products*	*Basic chemicals*	*Plastic materials and fibres*	*Pharmaceutical products*	*Soap and cosmetics*	*Made-up plastic goods*	*Other chemicals*	*Paper and cellulose*	*Paper products*	*Timber and boards*
↓ *Selling sector*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*
1	·00877	·01049	·01411	·00464	·00862	·04433	·02473	·00563	·00392	·01129	·00657	·05366	·01838	·01355
2	·00177	·00382	·00042	·00157	·00364	·02023	·00214	·00332	·01088	·00276	·00945	·01010	·00187	·00241
3	·00045	·00038	—	·00002	·00377	·03349	—	·00025	·00004	·00045	·00043	·00004	·00009	·00002
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·00537	·00292	·00977	·00165	·00441	·00909	·00338	·00116	·01393	·00288	·02520	·00332	·00171	·00327
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·09652	·11451	·01524	·04213	·04776	·00747	·00287	·00118	·00131	·00570	·00281	·00459	·00202	·00310
8	—	—	—	—	·00667	·00931	—	—	—	—	—	·00418	—	—
9	·00309	·00545	·03159	—	·00533	·00332	—	·00003	—	·00056	·00210	·00044	·00009	·00014
10	·03065	·00715	·20361	·00190	·03783	·01437	·00003	·00050	·00004	·00203	·00706	·00105	·00034	·00049
11	·06047	·07055	—	·04076	·05476	·00404	·00394	·00091	·00044	·00502	·00288	·00247	·00112	·00154
12	·00246	·00135	·00052	·00002	·00214	·06921	·00197	·00023	·00440	—	·00219	·00522	·00003	·00004
13	·00195	·00576	·00016	·01555	·02519	·00088	·00027	·04434	·01606	·00372	·00514	·00106	·00003	·00062
14	·01467	·00448	·00022	·00007	·00115	·00379	·00003	·00008	—	·00045	·00030	·00027	—	·00020
15	·01582	·00267	·00072	·00130	·01191	·00085	·00003	·00008	—	·00073	·00010	·00006	·00009	·00001
16	·00753	·00733	·00081	·00025	·00412	·00706	·00007	·00020	·00044	·00011	·00062	·00039	·00053	·00072
17	·00008	·00003	·00004	·00002	·00010	·02376	·00007	·00008	·00004	·00006	·00034	·00174	·00003	·00024
18	·00004	·00003	·00003	—	·00013	·00018	·00070	·00010	—	·00011	·00012	·00003	—	·00063
19	·00067	·00014	·00007	·00015	·00013	·00033	·00007	·00015	—	·00006	·00019	·00030	·00016	·00085
20	·00004	·00003	·00004	·00012	·00029	·00012	·00057	—	—	·00006	·00006	·00022	·00009	·00002
21	·06662	·07197	·00761	·05823	·05035	·02028	·01898	·01009	·01284	·01495	·03787	·00711	·00966	·00819
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23	·01650	·02035	·00007	·00090	·00393	·00300	·00007	·00070	·00013	·00034	·00077	·00206	·00059	·00242
24	·00515	·00073	·00016	·00165	·00147	·00297	·00017	·00131	·00004	·00006	·00137	·00028	·00140	·00016
25	·00037	—	—	·00005	—	·00020	·00077	—	—	—	·00007	·00013	—	·00035
26	·00089	·00035	·00003	·00015	·00006	·00014	·00003	·00030	·00017	—	·00031	—	·00006	·00101
27	·00482	·03840	·00004	·00973	·00514	·00500	·00040	·00375	·00100	·01964	·00143	·00028	·00062	·00069
28	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	·07081	·06895	·00013	·02768	·00907	·00056	·00017	·00128	·00017	·00164	·00031	·00135	·00137	·00115
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	·04544	·01962	·28240	·09335	·01635	·00161	·00070	·00023	·00009	·00068	·00390	·00144	·00019	·00085
32	·00151	—	—	·12388	·00655	·00009	·00007	·00003	—	·00068	—	—	—	·00001
33	·01576	·03545	·00197	·01368	·02442	·00276	·00307	·00116	·00044	·00135	·00143	·00157	·00100	·00155
34	·00348	·01549	·00381	·01622	·00878	·20178	·15765	·03730	·13722	·02680	·18992	·02461	·00863	·00313
35	·00140	·00382	·05674	·00489	·02146	·00005	·12179	·00050	·00065	·31938	·03922	·00005	·00383	·00334
36	—	—	—	—	—	—	—	·18751	·00287	—	—	—	—	—
37	·00008	·00007	·00003	·00005	·00006	·00023	·00003	·00043	·10049	·00023	·00185	·00003	·00003	·00003
38	·00108	·01430	·00113	·01270	·00405	·00151	·00074	·00848	·00788	·00649	·00418	·00003	·00031	·00003
39	·01060	·01781	·00717	·00612	·00677	·01733	·00117	·00204	·00274	·00434	·04715	·00281	·00850	·01213
40	·00783	·00604	·01007	·00155	·01638	·00112	·11594	·00292	·00218	·00660	·02020	·18075	·53082	·00071
41	·00570	·01434	·00010	·00914	·01089	·02155	·00772	·03245	·07577	·00801	·00966	·00120	·01561	·00046
42	·00856	·00292	·00320	·00305	·00169	·00226	·00074	·00108	·00087	·00333	·00114	·00142	·00106	·02256
43	·00423	·00698	·02275	·02621	·00431	·00386	·00241	·01824	·01301	·00355	·00812	·00170	·00178	·00244
44	·00012	·00149	·00052	—	·00485	·00391	·00087	·00015	·00426	·00017	·01199	·00794	·00209	·00013
45	—	·00014	—	·00002	·00003	·00006	·00100	·00003	·00013	—	·00013	·00513	·00025	·00010
46	·00037	·00031	·00833	·00055	·00169	·00068	·02243	·00204	·00022	·00700	·00229	·00040	·00305	·00004
47	—	·00007	·00006	—	·00006	·00021	—	·00008	—	·00564	—	·00066	·00028	·00002
48	·00008	·00038	·01490	·00002	·00029	·00383	·00468	·00040	·00039	·00525	·00300	·00028	·00053	·00038
49	—	—	—	·00007	—	—	—	—	—	—	—	—	—	—

49	—	—	—	·00007	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	·00010	·00073	·00004	—	·00013	·00005	·00003	·00013	·00009	·00023	·00018	·00624	·00072	·00005
52	·00039	·00007	—	·00005	·00026	·00021	—	·00003	—	·00632	·00012	·00110	·00109	·00031
53	—	—	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00488	·00358	·00039	·00145	·01044	·00105	·00064	·00096	·00135	·00085	·00192	·00071	·00072	·00193
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	—	—	—	—	—	—	—	—	·00392	—	—	—	—	—
59	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	·00129	—	·00641	—	—	·00013	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	—	—	·00006	—	·00013	·00015	·00154	·00126	·08378	·00034	·02014	—	—	—
63	—	—	—	—	·00211	·00576	—	·00634	·00487	—	·00226	·00003	·00022	—
64	·00002	—	—	—	·00003	·00008	·00110	·00214	·00013	—	·00010	·00041	·00243	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·01153	·00378	·00245	·00587	·00425	·00264	·00478	·00948	·01523	·00559	·00416	·00124	·00277	·00140
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	·00049	·00003	·00004	·00070	·00010	·00020	—	·00025	·00035	·00023	·00015	·00004	·00009	·00020
70	—	—	—	—	—	—	—	·00043	·00387	—	·00013	·00021	—	—
71	—	—	—	—	—	—	—	·00088	—	—	—	—	—	—
72	—	—	—	—	—	—	—	·00978	·07990	—	·00223	—	—	—
73	—	—	—	—	—	—	—	—	—	—	—	—	—	—
74	·00014	·00028	·00001	—	·00019	·00265	—	·00003	·00030	·00056	·00174	·12788	·00012	·42591
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00970	·00108	·00020	·00327	·00118	·00224	·00160	·00312	·00152	·00130	·00143	·00303	·00069	·00353
77	—	—	—	—	—	—	—	—	—	—	—	·00006	·00009	·00031
78	·00472	·00035	·00007	·00112	·00073	·00061	·00177	·00060	·00087	·00085	·00102	·00074	·00009	·00073
79	·00919	·00840	·00519	·00517	·00849	·04162	·02988	·00558	·01706	·00711	·02396	·03517	·00956	·03602
80	·00010	—	·00007	·00012	·00003	·00098	·00023	·00025	·00030	·00023	·00024	—	—	·00002
81	·00010	·00017	—	·00002	·00029	·00563	—	—	—	—	·00046	·00004	—	·00054
82	—	—	—	—	—	—	—	—	—	—	—	—	—	—
83	·00348	·00545	·00209	·00157	·00303	·00306	·00381	·00161	·01293	·00497	·00884	·01655	·00495	·04183
84	·00283	·00219	·00052	·00310	·00233	·00159	·00144	·00244	·00231	·00468	·00192	·00106	·00171	·00161
85	·00205	·00083	·00075	·00160	·00112	·00114	·00087	·00123	·00170	·00079	·00173	·00066	·00040	·00038
86	·00148	·00094	·00142	·00055	·00208	·00100	·00057	·00050	·00200	·00056	·00092	·00044	·00037	·00088
87	·02117	·00854	·00493	·01523	·01488	·00616	·00307	·00460	·00936	·00265	·00731	·00715	·00720	·00613
88	·00881	·00375	·00487	·00764	·00278	·00801	·00702	·00996	·01184	·00649	·01344	·00269	·00006	·00039
89	·00289	·00118	·00106	·00225	·00153	·00161	·00120	·00174	·00235	·00107	·00244	·00093	·00056	·00053
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00600	·00434	·00074	·00255	·00536	·00884	·00702	·00445	·00400	·00525	·00472	·00471	·00212	·00644
92	·00244	·00073	·00012	·00045	·00051	·00047	—	·00136	·00013	·00051	·00021	·00155	·00137	·00081
93	·00041	·00045	·00004	·00015	·00035	·00017	·00030	·00030	·00017	·00062	·00034	·00016	·00012	·00028
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00043	·00049	·00004	·00015	·00035	·00011	·00020	·00020	·00009	·00039	·00024	·00010	·00006	·00019
97	·00075	·00115	·00033	·00137	·00086	·00100	·00043	·00370	·00148	·00220	·00254	·00123	·00062	·00078
98	·00114	·00312	·00174	·00007	·00121	·02535	·00007	·00008	·00017	·00085	·00942	·02524	·00053	·00347
99	·61699	·62871	·72578	·57451	·48134	·67045	·57003	·45053	·67713	·52675	·56628	·56977	·65696	·62440
100	·01936	·01962	·01511	·01528	·01475	·07898	·07620	·01124	·01266	·01794	·01787	·04450	·01296	·02314
101	·11549	·09711	·02752	·11689	·12056	·06400	·07928	·06464	·06741	·14073	·08356	·05782	·10087	·12613
102	·24817	·25457	·23159	·29333	·38335	·18656	·27449	·47359	·24280	·31458	·33230	·32790	·22921	·22633
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector ⟶ *Selling sector* ↓	*Final wood products* 43	*Wood chemicals* 44	*Hemp and flax fibre* 45	*Cotton yarn and fabrics* 46	*Woollen yarn and fabrics* 47	*Other yarn and fabrics* 48	*Knitted goods* 49	*Made-up clothing* 50	*Other textile products* 51	*Leather and fur* 52	*Leather footwear* 53	*Made-up leather goods* 54	*Rubber* 55	*Grain milling* 56
1	·01321	·01336	·01232	·02296	·01316	·00848	·00594	·00314	·00661	·00785	·00401	·00312	·01415	·07258
2	·00092	·00924	·00376	·00752	·00760	·01237	·00630	·00090	·00604	·01130	·00120	·00123	·00603	·01000
3	·00011	·01771	—	·00038	·00002	·00016	·00005	·00027	—	·00013	—	·00007	·00020	·00019
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·00341	·02481	·00710	·00197	·00143	·00340	·00138	·00107	·00277	·00228	·00161	·00073	·02834	·01290
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·00723	·01878	·00188	·00273	·00166	·00228	·00102	·00048	·00208	·00086	·00054	·00203	·00625	·00234
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	·00063	·00237	—	·00009	·00005	·00031	·00011	—	·00006	·00002	—	—	·00033	·00005
10	·00047	·00298	·00031	·00066	·00012	·00036	·00006	·00001	·00013	·00019	·00002	—	·00046	·00028
11	·00085	·00664	·00083	·00097	·00063	·00060	·00041	·00010	·00126	·00050	·00051	·00058	·00122	·00215
12	·00005	—	—	·00025	·00033	·00016	·00003	—	·00006	·00105	·00002	·00007	·00608	·00023
13	·00466	·00328	·00031	·00011	·00019	·00031	·00006	·00001	·00019	·00033	·00002	·00094	·00028	·00042
14	·00013	·00015	·00021	·00003	·00010	·00005	·00003	—	·00013	·00015	—	—	·00007	—
15	·00020	—	—	·00006	·00006	·00005	·00005	—	—	·00002	—	—	·00002	—
16	·00299	·00046	·00010	·00019	·00021	·00010	·00005	·00006	·00025	·00036	·00047	·00015	·00007	·00009
17	·00055	·00076	·00063	·00007	·00010	·00010	·00005	·00003	·00006	·00033	·00002	·00007	·00009	·00070
18	·00042	·00008	·00063	·00004	·00008	·00018	·00003	·00001	·00006	·00006	·00002	·00007	·00004	·00033
19	·00159	·00038	·00021	·00023	·00020	·00018	·00012	·00002	·00013	·00029	·00002	—	·00013	·00047
20	·00034	·00031	·00010	·00002	·00015	·00042	·00003	—	—	—	·00002	—	·00002	·00009
21	·03441	·01427	·00981	·00765	·00417	·00654	·00732	·00136	·00661	·00387	·01381	·01334	·00938	·01257
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23	·00169	·00122	·00219	·00383	·00370	·00070	·00269	·00088	·00126	·00073	·00457	·00058	·00658	·00290
24	·00027	·00015	—	·00021	·00021	·00023	·00032	·00026	·00006	·00010	·00006	·00007	·00004	·00019
25	·00007	·00107	—	—	·00001	—	—	—	—	—	—	—	—	—
26	·00071	·00115	·00104	·00013	·00072	·00005	·00008	·00001	—	·00004	·00006	—	·00002	·00107
27	·00689	·00008	·00083	·00199	·00216	·00125	·00188	·00078	·00088	·00088	·00294	·02755	·00148	·00215
28	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	·00124	·00046	·00010	·00005	·00011	·00003	·00042	·00047	·00038	·00029	·00009	—	·00002	·00262
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	·00079	·00038	·00021	·00053	·00060	·00039	·00108	·00011	·00069	·00021	·00022	·00015	·00024	·00065
32	·00001	—	—	·00016	·00017	·00013	·00003	—	—	—	—	—	—	—
33	·00197	·00183	·00167	·00146	·00128	·00130	·00171	·00078	·00094	·00100	·00082	·00189	·00095	·00280
34	·00281	·05412	·00720	·02815	·02149	·01351	·00806	·00023	·00988	·02838	·00126	·00638	·03049	·00056
35	·00198	·00122	·00021	·02386	·04399	·05271	·06499	·01333	·00321	·00008	·00403	·02081	·24622	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37	·00008	·00008	—	·00024	·00099	·00054	·00006	·00003	·00013	·00021	·00024	·00015	·00037	·00009
38	·00181	·00237	—	·00014	·00066	·00018	·00674	·00403	·00289	·00002	·00472	·00131	·00067	·00005
39	·04258	·01786	·00021	·00938	·00716	·00451	·00269	·00009	·00082	·06231	·01323	·00297	·01016	·00122
40	·00505	·01794	·00031	·00294	·00111	·00150	·00143	·00278	·00957	·00036	·00680	·01646	·00145	·00126
41	·00248	·00565	·00010	·00618	·00167	·00215	·00988	·00433	·00384	·00038	·01211	·00109	·00684	·00566
42	·33034	—	·00125	·00112	·00095	·00099	·00053	·00016	·00088	·00086	·00112	·00479	·00048	·00145
43	—	·00450	·00021	·00700	·00223	·00158	·00196	·00078	·00214	·00073	·01203	·00638	·00059	·00182
44	·00032	·00084	—	·00008	·00020	·00016	—	·00001	—	·04864	·00073	·00015	·00156	·00009
45	·00332	—	—	·00095	·00020	·10310	—	—	·00321	·00006	·00021	·00073	·00059	·00042
46	·01057	·00023	·03100	·24492	·01035	·02194	·14585	·24126	·09969	·00033	·03059	·04438	·07030	·00014
47	·00831	—	·00094	·00284	·31123	·00316	·21192	·23813	·11561	—	·00360	·00305	·00332	·00019
48	·01120	·00168	·00094	·00086	·00157	·20452	·04000	·05369	·06671	·00033	·00420	·02364	·00260	·01584
49	—	—	—	·00008	·00025	·00109	·02127	·05189	·00113	—	·00122	·00218	·00764	—

50	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	·00296	—	·00010	·00150	·00028	·00021	·00168	·00529	·02398	·00084	·00094	·00348	·00022	·00023
52	·00220	·00008	·00042	·00129	·00137	·00088	·00041	·00438	·00378	—	·47033	·42825	·00002	·00215
53	—	—	—	—	—	—	—	—	—	—	·00066	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00357	·00092	·00209	·00068	·00075	·00145	·00359	·00105	·00107	·00069	·05120	·00290	·00276	·00280
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	—	·00023	—	—	—	—	—	—	—	·00015	—	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	—	—	—	—	—	—	—	—	—	·00285	—	—	—	—
63	·00011	—	—	—	—	—	—	·00005	—	·00002	·00002	—	·00002	—
64	—	·00031	—	·00246	·00009	·00140	·00005	—	·00057	·00067	·00041	—	·00007	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00228	·00183	·00125	·00151	·00169	·00176	·00393	·00379	·00321	·00119	·00347	·00167	·00326	·00355
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	·00079	·00023	·00010	·00041	·00022	·00044	·00113	·00017	·00113	·00006	·00021	·00036	·00009	·00215
70	·00213	·00038	·40340	·20541	·00440	·07182	—	—	·01743	—	—	—	·00082	—
71	—	—	—	—	—	—	—	—	—	—	—	—	—	—
72	·00024	—	—	·00013	·18464	·00952	—	—	·02914	·49679	·00071	·02045	·00278	—
73	·00004	—	—	—	—	—	—	—	—	—	—	—	—	—
74	·02605	·20916	·00115	·00005	·00008	·00018	·00026	·00019	·00120	·00010	·00030	·00022	·00004	·00145
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00217	·00168	·00365	·00359	·00099	·00283	·00200	·00025	·00189	·00354	·00112	·00247	·00224	·00547
77	·00026	·00252	—	·00015	—	—	—	—	—	—	—	—	—	—
78	·00090	·00008	·00083	·00079	·00039	·00057	·00056	·00028	·00038	·00046	·00069	·00058	·00043	·00168
79	·01396	·03336	·00230	·00560	·00411	·00501	·00397	·00223	·00396	·00862	·00358	·00326	·00666	·00449
80	·00017	—	—	·00002	·00022	·00073	·00014	·00015	·00006	·00038	—	—	·00050	—
81	·00004	·00008	—	—	—	—	·00002	—	—	—	—	—	·00048	—
82	·00005	—	—	—	—	—	·00006	·00004	—	—	—	—	—	—
83	·00758	·02489	·00553	·00196	·00267	·00469	·00189	·00159	·00239	·00779	·00334	·00283	·00569	·00065
84	·00259	·00176	·00136	·00098	·00090	·00135	·00223	·00187	·00214	·00138	·00214	·00268	·00128	·00472
85	·00080	·00076	·00230	·00136	·00157	·00096	·00087	·00076	·00126	·00245	·00028	·00022	·00143	·00107
86	·00116	·00374	·00146	·00051	·00077	·00093	·00086	·00026	·00063	·00050	·00034	·00138	·00050	·00243
87	·01291	·00702	·02797	·00287	·00546	·00690	·00277	·00875	·01718	·01913	·00367	·00290	·00345	·01926
88	·00083	·00351	·00793	·01225	·01288	·00584	·00735	·00275	·00289	·01413	·00084	·00065	·01261	—
89	·00114	·00099	·00324	·00192	·00221	·00135	·00123	·00107	·00170	·00343	·00039	·00029	·00202	·00150
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00506	·00557	·00981	·00804	·00387	·00464	·00313	·00179	·00365	·00490	·00184	·00152	·00412	·02085
92	·00074	·00031	·00083	·00032	·00048	·00021	·00014	·00018	·00050	·00042	·00056	·00029	·00122	·00206
93	·00047	·00015	·00031	·00020	·00014	·00018	·00053	·00027	·00038	·00048	·00034	·00036	·00048	·00089
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00030	·00008	·00010	·00009	·00007	·00008	·00026	·00013	·00019	·00023	·00015	·00015	·00022	·00009
97	·00100	·00061	·00136	·00185	·00119	·00083	·00188	·00047	·00151	·00144	·00082	·00102	·00050	·00313
98	·00155	·00046	·00240	·00348	·01550	·00039	·00063	·00227	·07086	·00048	·00015	·00022	·00113	·00070
99	·60069	·52908	·56654	·64246	·69016	·57693	·58815	·66148	·54342	·74868	·67565	·66522	·52076	·23789
100	·01525	·03092	·01837	·02646	·01638	·02117	·01597	·00555	·01617	·01473	·01263	·00587	·01441	·06553
101	·16405	·10069	·15176	·08118	·07151	·10007	·11419	·09542	·14481	·06794	·11440	·11333	·07145	·21630
102	·22001	·33931	·26333	·24990	·22195	·30184	·28169	·23754	·29559	·16865	·19732	·21558	·39338	·48028
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector → ↓ *Selling sector*	*Bread and pastry* 57	*Livestock slaughter and meat processing* 58	*Fruit and vegetable processing* 59	*Sugar* 60	*Sweets and cocoa products* 61	*Vegetable oils and fats* 62	*Alcohol and beverage* 63	*Other foodstuffs* 64	*Fermented tobacco* 65	*Tobacco manufacture* 66	*Printing and publishing* 67	*Motion picture production* 68	*Miscellaneous manufacturing* 69	*Farming* 70
1	·01185	·00663	·00802	·01918	·00776	·00783	·01270	·02089	·00129	·00112	·00646	·00538	·00732	·00065
2	·02069	·00681	·01299	·02588	·00598	·00710	·01287	·00904	·00142	·00059	·00196	·00316	·00300	·00021
3	·00111	·00024	·00004	·00364	·00196	·00135	·00005	—	—	·00001	·00020	—	·00039	·00004
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·00774	·00601	·00934	·00468	·00201	·00725	·00714	·01219	·00111	·00070	·00258	·00479	·00388	·01271
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·00079	·00038	·00092	·01231	·00082	·00492	·00344	·00426	·00015	·00248	·00061	·00140	·01587	·00076
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	—	·00002	·00016	·00005	·00123	·00037	·00031	·00071	—	·00005	·00104	—	·00300	·00001
10	·00006	·00028	·00020	·00168	·00096	·00070	·00192	·00095	—	·00004	·00259	·00012	·02103	·00007
11	·00076	·00120	·00108	·00433	·00164	·00275	·00447	·00192	·00026	·00037	·00096	·00175	·00721	·00026
12	·00306	·00214	·00229	·00005	·00005	·00089	·00022	·00179	—	—	·00007	—	·00017	—
13	·00032	·00030	·04763	·00018	·00009	·00541	·02312	·00512	·00004	·00003	·00007	·00070	·00777	—
14	·00013	·00002	·00008	·00090	·00005	·00055	·00089	·00053	—	·00001	·00001	—	·00011	—
15	·00006	·00005	·00012	·00138	·00005	·00015	·00002	·00013	·00002	·00001	·00004	—	·00006	—
16	·00003	·00002	·00008	·00035	·00005	·00125	·00022	·00016	·00002	·00009	·00043	·00023	·02924	—
17	·00035	·00013	·00012	·00396	·00214	·00119	·00029	·00213	·00011	·00001	·00005	·00070	·00017	·00023
18	·00022	·00013	·00012	·00016	·00005	·00055	·00012	·00079	·00007	·00001	·00003	—	·00011	·00016
19	·00022	·00017	·00032	·00032	·00014	·00076	·00034	·00494	·00009	·00001	·00003	·00152	·00011	·00026
20	·00003	·00010	·00377	·00014	—	·00034	·00055	·00024	·00002	—	·00003	·00012	—	·00008
21	·00265	·04570	·08087	·00791	·00374	·01395	·00897	·01934	·00227	·00120	·00496	·00585	·01348	·00349
22	—	—	—	—	—	—	—	—	—	—	—	—	—	·00179
23	·00073	·00069	·00020	·00191	·00041	·00110	·00065	·00173	·00013	·00029	·00096	—	·00089	—
24	·00016	·00033	·00008	·00009	·00014	·00024	·00017	·00008	—	·00001	·00016	·00023	·00028	—
25	—	—	—	·00018	—	·00006	—	—	—	—	—	—	—	—
26	·00038	·00114	·00044	·00097	·00018	·00058	·00149	·00134	·00039	·00005	·00008	—	·00039	·00185
27	·00098	·00128	·00682	·00069	·00027	·00098	·00308	·00095	·00059	·00018	·00047	·00164	·01559	·00034
28	—	·00029	—	—	—	·00003	—	—	·00009	—	—	—	—	—
29	·00120	·00060	·00036	·00023	·00009	·00064	·00038	·00047	·00013	·00005	·00077	·00035	·00178	·00008
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	·00022	·00029	·00028	·00037	·00068	·00064	·00029	·00032	·00009	·00020	·00011	·00292	·00078	·00007
32	·00003	·00002	—	—	—	—	—	—	—	·00001	·00016	·00023	—	—
33	·00111	·00069	·00076	·00145	·00119	·00263	·00123	·00121	·00017	·00032	·00093	·00444	·00305	·00033
34	—	—	—	·00468	—	—	—	—	·00825	·00030	—	·00538	·01581	·03370
35	·00038	·00128	·00088	·00002	·00059	·00070	·00096	·00055	·00408	·00045	·00273	—	·03828	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37	·00025	·00037	·00024	·00002	·00046	·00040	·00041	·00087	·00002	·00001	·00019	·00012	·00022	—
38	·00474	·00081	·00188	·00005	·00187	·01064	·00192	·00092	·00024	·00003	·00350	—	·00444	—
39	·00199	·00277	·00746	·00085	·00283	·01162	·01770	·01608	·00055	·00020	·02978	·08408	·01598	·00805
40	·00300	·00450	·00417	·00369	·00908	·00128	·00378	·00552	·00041	·02094	·25771	·00503	·02641	·00017
41	·02136	·00300	·02598	·00975	·08943	·00434	·00861	·01729	·00100	·05301	·00597	·00187	·00977	·00011
42	·00057	·00111	·00096	·00281	·00068	·00052	·00178	·00100	·00068	·00100	·00029	·02093	·03018	·00029
43	·00322	·00800	·02678	·00551	·00639	·00156	·01626	·00518	·00087	·00143	·00041	·00047	·00655	·00053
44	·00003	·00002	·00052	·00005	·00009	·00003	·00036	·00003	·00026	—	·00013	·00035	·00028	—
45	·00003	·00008	·00008	·00005	·00005	·00003	·00010	·00013	·00037	·00008	·00036	·00094	·00055	—
46	·00016	·00077	·00028	·00120	·00009	·00024	·00012	·00139	·00007	·00011	·00301	·00094	·02142	·00004
47	·00006	·00003	·00008	—	—	·00003	·00002	—	—	—	·00001	—	·00383	·00003
48	·00085	·00095	·00088	·00180	·00064	·00229	·00019	·00302	·00668	·00037	·00225	·00327	·02181	·00333
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—

50	—	—	—	—	—	—	—	—	—	—	—	·00281	—	—
51	·00006	·00003	—	·00002	·00005	—	—	—	—	—	·00015	—	·00216	—
52	—	·00009	·00012	·00007	·00009	·00009	·00007	·00045	—	—	·00221	·00012	·01393	·00002
53	—	—	—	—	—	—	—	—	—	—	—	·00023	—	—
54	—	—	—	—	—	—	—	—	—	—	—	·00117	—	—
55	·00161	·00190	·00172	·00214	·00050	·00086	·00274	·00405	·00031	·00028	·00064	·00187	·00499	·00229
56	·02932	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	·00066	·00008	—	·00032	—	—	·00024	—	—	—	—	—	—
58	·03554	·02226	·00473	—	·00671	—	—	·02657	—	—	—	—	—	—
59	·00019	—	·01844	—	·00666	—	·00647	·00197	—	—	—	—	—	—
60	·04230	—	·06889	—	·18565	·00061	·06805	·02728	—	—	—	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	·02979	·01120	·00349	·00025	·01711	·18750	·00024	·10622	—	—	—	—	—	—
63	·00013	—	·00333	·00002	·00675	—	·07719	·00247	—	—	·00005	—	—	—
64	·02720	—	·02201	·00360	·09125	·00012	·00690	·01267	—	·00048	·00019	—	—	—
65	—	—	—	—	—	—	—	—	—	·26692	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00164	·00286	·00277	·00207	·00757	·00190	·00325	·00583	·00164	·00172	·01476	·00421	·00527	·00058
68	—	—	—	—	—	—	—	—	—	—	—	·22044	—	—
69	·00152	·00053	·00128	·00065	·00023	·00009	·00043	·00158	·00017	·00003	·00065	·00234	·00255	—
70	·12824	·00576	·11592	·35106	·02838	·43081	·09451	·12635	·31480	—	—	·00187	·01509	·09709
71	·00199	·00426	·19916	—	·10289	·00021	·03954	·01267	—	—	—	—	—	—
72	·01238	·48521	·01127	—	·00256	·00214	·00046	·20702	—	—	—	·00152	·04555	—
73	—	·03801	—	—	—	—	—	—	—	—	—	—	—	—
74	·00739	·00140	·00108	·00018	·00050	·00049	·00077	·00074	·00033	·00003	·00041	·00538	·01115	·00035
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00164	·00196	·00221	·00095	·00356	·00125	·00305	·00160	·00070	·00015	·00122	·00058	·00166	·00040
77	—	—	—	—	—	—	—	—	—	—	—	—	—	·00018
78	·00152	·00059	·00048	·00018	·00041	·00040	·00087	·00068	·00017	·00001	·00080	·00070	·00139	·00016
79	·00809	·01166	·00998	·02056	·00379	·01266	·00998	·01424	·00111	·00127	·00950	·00936	·00749	·00680
80	·00025	·00045	·00008	—	—	·00073	·00010	·00003	—	—	·00019	—	·00006	·00003
81	—	·00006	—	·00219	·00005	·00018	—	—	·00002	—	·00001	·00023	·00011	·00022
82	—	·00007	—	—	—	—	—	—	—	—	·00009	—	—	·00023
83	·00101	·01022	·01051	·01669	·00210	·00471	·00423	·00426	·00070	·00244	·00581	·01275	·00455	·00126
84	·00288	·00306	·00261	·00101	·00192	·00113	·00229	·00237	·00059	·00042	·01745	·00819	·00399	·00058
85	·00133	·00451	·00152	·00258	·00137	·00303	·00067	·00068	·00011	·00051	·00076	·00082	·00100	·00044
86	·00155	·00138	·00172	·00111	·00055	·00132	·00154	·00263	·00026	·00015	·00061	·00117	·00166	·00513
87	·02401	·04915	·02735	·04269	·01455	·02529	·01099	·01188	·00179	·00495	·01045	·00713	·01470	·00506
88	·00003	·00302	—	·00205	·00552	·01642	·00060	·00029	·00017	·00250	·00184	·00433	·00189	·00164
89	·00190	·00632	·00217	·00364	·00187	·00428	·00094	·00095	·00015	·00073	·00106	·00117	·00139	·00063
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00787	·00401	·00834	·00440	·00443	·00232	·00758	·00544	·00133	·00223	·00537	·00339	·00527	·00942
92	·00079	·00038	·00040	·00007	·00014	·00018	·00024	·00039	·00007	·00004	·00088	·00047	·00050	·00008
93	·00076	·00059	·00080	·00007	·00032	·00083	·00043	·00047	·00044	·00009	·00089	·00187	·00061	·00019
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00009	·00007	·00012	—	·00005	·00009	·00005	·00005	·00004	·00001	·00008	·00012	·00006	·00015
97	·00272	·00265	·00192	·00214	·00119	·00138	·00503	·00399	·00074	·00044	·00189	·00105	·00244	·00015
98	·00044	·00031	·00064	·00023	·00639	·00064	·00029	·00239	—	·00003	·00269	·00316	·00571	—
99	·46771	·77391	·77245	·58411	·64927	·79960	·48666	·73162	·35762	·37121	·41273	·45737	·48638	·20269
100	·02022	·01749	·02101	·05281	·01565	·01009	·03505	·02249	·00891	·00532	·02612	·02503	·01393	...
101	·24207	·08916	·09379	·06096	·09791	·03914	·09109	·08956	·05668	·02116	·20322	·28301	·17417	...
102	·27000	·11944	·11275	·30213	·23717	·15117	·38720	·15633	·57680	·60231	·35792	·23459	32553	...
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector → *Selling sector* ↓	*Fruit-growing and viticulture* 71	*Livestock raising* 72	*Fishing* 73	*Forestry* 74	*Geological survey* 75	*Building* 76	*Civil and hydraulic engineering* 77	*Building arts and crafts* 78	*Railway transport* 79	*Sea-borne transport* 80	*River and lake transport* 81	*Air transport* 82	*Road transport* 83	*Com-munications* 84
1	·00054	·00109	·00291	·00046	·00283	·00192	·00684	·00254	·00268	·00007	·00341	·00325	·00693	·00391
2	·00022	·00014	·00018	·00037	·00167	·00113	·00182	·00078	·08844	·00681	·00845	—	·00043	·00338
3	·00002	·00006	·00018	·00006	·00005	·00009	·00068	·00027	·00012	—	·00007	—	·00004	·00029
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·00237	·00226	·04261	·00715	·00147	·00561	·02577	·00522	·02656	·11774	·10823	·14794	·10336	·00386
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·00038	·00012	·00564	·00187	·00025	·03433	·06779	·02689	·00376	·00185	·00307	—	·00419	·00265
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	·00001	—	·00018	·00002	—	—	—	—	·00027	·00001	·00041	—	·00057	·00002
10	·00001	—	·00091	·00017	·00020	·00036	·00208	·00415	·00096	·00026	·00164	—	·00075	·00044
11	·00020	·00010	·00473	·00053	·00020	·00234	·00636	·01993	·00203	·00364	·00361	—	·00181	·00280
12	—	·00274	—	·00001	—	—	—	—	·00003	—	—	—	·00004	—
13	·00022	—	—	·00010	·00005	·00109	·00131	·00858	·00026	·00101	·00014	·00018	·00034	·00004
14	—	—	—	·00003	—	·00062	·00062	·00305	·00023	·00022	—	—	·00002	—
15	—	—	—	·00009	·00005	·00133	·00161	·03216	·00002	·00032	—	—	·00001	·00044
16	—	—	—	·00008	·00015	·00024	·00024	·00200	·00013	·00029	—	—	·00018	·00006
17	·00006	·00044	·00328	·00075	·00010	·01870	·03307	·00655	·00054	·00019	—	—	·00069	·00002
18	·00003	·00037	·00036	·00072	·00015	·04107	·00550	·00529	·00008	—	·00007	—	·00005	·00008
19	·00005	·00021	·00073	·00081	·00025	·04311	·02907	·01093	·00009	·00065	·00007	—	·00033	·00004
20	·00004	·00007	·00055	·00008	·00005	·01471	·01714	·00799	·00010	—	—	—	—	·00006
21	·00086	·00127	·01111	·00467	·00334	·00389	·01184	·05388	·00588	·00223	·00307	·00018	·01497	·00355
22	·00061	·00084	·00382	·00043	—	—	—	—	—	—	—	—	—	—
23	—	—	—	·00128	·00132	·00257	·02204	·00727	·00064	·00657	·02004	·06521	—	·00040
24	—	—	—	·00014	·00081	·00014	·00189	·00059	·00005	·00043	·00007	—	·00043	·00054
25	—	—	—	·00122	—	·00006	·00077	·00004	·14012	—	—	—	·00985	·00420
26	·00040	·00032	·00291	·00188	·00010	·00138	·00471	·00038	·00001	·00001	·00007	—	·05625	·00157
27	·00011	·00018	·00200	·00108	·00035	·00110	·00331	·01160	·00049	·00048	·00279	·13945	·00074	·00023
28	—	—	·03733	·00006	·00010	·00001	·00052	·00002	—	·06295	·19471	—	·00029	—
29	·00003	·00003	·00291	·00036	·00035	·00064	·00757	·01704	·00065	·00156	·00034	—	·00060	·00278
30	—	—	—	—	—	·00017	—	·00376	—	—	—	—	—	—
31	·00003	·00008	·00255	·00010	·00005	·00204	·01190	·04658	·00046	·00204	·00116	—	·00096	·00800
32	—	—	—	·00001	—	·00003	·00015	·00123	·00003	—	·00007	—	·00001	·00537
33	·00017	·00021	·00401	·00045	·00020	·00256	·00995	·03744	·00078	·00134	·00082	·00036	·00432	·00278
34	·00820	—	—	·00137	·00025	·00050	·00153	·00299	·00095	·00173	·00007	·00036	·00022	·00008
35	—	—	—	·00001	·00010	·00020	·00009	·00402	·00003	—	—	—	·00006	·00002
36	—	·00413	—	—	—	—	—	—	—	—	—	—	—	—
37	—	—	—	·00016	·00015	·00002	·00009	·00007	·00010	·00051	·00007	—	·00007	·00008
38	—	—	—	·00011	·00015	·00003	·00012	·00105	—	·00001	—	—	·00008	·00004
39	—	—	—	·00098	·00096	·00105	·00676	·01427	·00057	·01591	·00075	—	·00121	·00042
40	·00009	·00010	·00036	·00071	·01963	·00076	·00099	·00210	·00077	·00025	·00136	·00018	·00083	·00134
41	·00011	·00006	·00127	·00039	·00577	—	·00001	—	·00016	·00006	·00041	—	·00183	·00073
42	·00036	·00034	·00328	·00324	·00020	·04295	·01057	·01019	·00113	·00274	·00252	—	·00141	·00058
43	·00094	·00034	·00419	·00074	·00035	·03794	·00214	·00873	·00021	·00003	·00027	—	·00022	·00042
44	—	—	—	·00038	—	·00003	·01541	·00014	·00003	·00010	—	—	·00001	·00002
45	—	—	—	·00002	—	·00002	·00006	·00014	·00009	·00057	·00007	—	·00011	·00015
46	·00001	·00001	·00819	·00013	—	·00002	·00025	·00018	·00022	·00197	·00184	—	·00047	·00025
47	·00001	·00001	·00200	·00009	—	·00001	·00003	·00004	·00044	·00006	·00048	—	·00122	·00044
48	·00008	·00147	·00655	·00022	·00010	·00015	·00024	·00080	·00017	·00191	·00048	—	·00013	·00033
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—

50	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	—	—	—	·00009	—	·00003	·00008	·00008	·00020	·00043	—	—	·00015	·00002
52	—	·00001	—	·00014	—	·00001	·00012	·00003	·00004	—	—	—	·00020	·00002
53	—	—	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00054	·00048	·00328	·00392	·00030	·00212	·00669	·00104	·00041	·00032	·00082	·00199	·05220	·00171
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	·00001	—	—	—	—	—	—	—
58	—	·00100	—	—	—	—	—	—	—	—	—	·00018	—	—
59	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	—	·00258	—	—	—	—	—	—	—	—	—	—	—	—
61	—	—	—	—	—	—	—	—	—	—	—	·01553	—	—
62	—	·00368	—	—	—	—	—	—	—	—	—	—	—	—
63	—	—	—	—	—	—	—	—	—	—	—	·00054	—	—
64	—	·02093	—	—	—	—	—	—	—	—	—	·00018	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00018	·00039	·00164	·00150	·00678	·00077	·00158	·00219	·00136	·00323	·00157	·00921	·00237	·00447
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	—	—	—	·00014	·00046	·00008	·00020	·00054	·00019	—	·00014	·00036	·00024	·00027
70	—	·92329	·09632	·00858	—	—	—	—	—	—	·00014	—	·00038	—
71	·28425	—	—	—	—	—	—	—	—	—	—	—	—	—
72	—	—	—	·02200	—	—	—	—	—	—	—	·00036	—	—
73	—	—	—	—	—	—	—	—	—	—	—	—	—	—
74	·00042	·00024	·00146	·00472	·00025	·00837	·01132	·00249	·00019	·00001	·00109	—	·00022	·00267
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00020	·00124	·00055	·00164	·00076	—	—	·00143	—	·00022	·00041	—	·00164	—
77	·00001	·00004	·00073	·00798	—	—	—	·00001	·11275	—	·00150	—	·00011	·00794
78	·00015	·00026	·00109	·00097	·00248	·25677	·04057	·00836	·00290	·00003	·00020	·00018	·00032	·02367
79	·00052	·00594	·00510	·00322	·00501	·01879	·04372	·01221	·03036	·00455	·00866	·00885	·00539	·04951
80	·00001	·00003	·00018	·00010	·00046	·00029	·00125	·00038	·00014	·00003	—	—	·00045	·00211
81	—	·00004	·00018	·00002	—	·00407	·00741	·00005	·00035	—	—	·00325	·00152	—
82	—	·00001	—	·00004	·00025	·00003	·00005	·00010	—	—	—	·17178	·00006	·00152
83	·00076	·00106	·00455	·01526	·00481	·01321	·03342	·00937	·00008	·00148	·00109	·00199	·00391	·01483
84	·00038	·00042	·00346	·00214	·00885	·00133	·00245	·00268	·00102	·00860	·00743	·01752	·00488	—
85	—	·00028	·00036	·00025	·00020	·00042	·00026	·00165	·00018	·26328	·03380	·00145	·00085	·00029
86	·00043	·00505	·00674	·00177	·00035	·01100	·00498	·02363	·00012	·00026	·00020	·00018	·02264	·00104
87	—	·00372	·00637	·00401	·00359	·00721	·00430	·02871	·00295	·00719	·00634	·00470	·01509	·00526
88	·00001	·00072	—	·00027	—	·00023	·00025	·00051	·00016	—	—	·01120	·00008	—
89	—	·00039	·00055	·00034	·00025	·00060	·00037	·00232	·00020	·00056	·00048	·00181	·00120	·00040
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·00174	·00151	·01092	·00677	·00288	·00588	·02269	·00334	·00324	·00066	·00341	·00235	·05733	·00485
92	·00002	·00004	·00055	·00010	·00015	·00042	·00107	·00107	·00044	·00006	—	—	·00039	·00292
93	·00009	·00013	·00109	·00075	·00121	·00035	·00097	·00042	·00053	·00001	·00014	—	·00041	·00119
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00008	·00010	·00073	·00058	·00066	·00019	·00053	·00023	·00025	·00001	·00007	—	·00018	·00054
97	·00030	·00014	·00073	·00088	·00121	·00124	·00154	·00113	·00203	·00081	·00048	·00054	·00157	·00196
98	—	—	—	·00023	·00010	·00031	·00348	·00120	·00083	·00001	·00041	—	·00028	·00081
99	·30623	·99071	·30135	·12196	·08283	·59867	·50213	·46601	·44125	·52830	·42895	·61127	·39008	·18047
100	..	..	·07320	·09826	·01538	·01904	·05270	·01156	·09620	·14160	·09221	·14379	·16346	·06741
101	..	..	·36999	·51674	·34173	·18251	·19645	·23863	·20061	·13537	·18585	·12897	·20604	·22684
102	..	..	·25546	·26304	·56006	·19978	·24872	·28379	·26194	·19474	·29299	·11597	·24041	·52528
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

Buying sector → *Selling sector* ↓	*Trans-shipment and other services* 85	*Retail trade* 86	*Wholesale trade* 87	*External trade* 88	*Storage and other services* 89	*Catering and tourism* 90	*Metal-processing services and repairs* 91	*Electro-technical services and repairs* 92	*Wood-processing services and repairs* 93	*Tailors' services* 94	*Shoemakers' services* 95	*Other handicraft services* 96	*Public utilities* 97	*Scrap and waste* 98
1	·01066	·00723	·00519	·00210	·00806	·02251	·00653	·00415	·00477	·00387	·00287	·00517	·03492	—
2	·00183	·00298	·00196	·00118	·00201	·01427	·00165	·00054	·00021	·00076	·00074	·00497	·00753	—
3	·00501	·00023	·00023	·00005	·00008	·00161	·00068	·00013	·00021	—	—	·00058	·00163	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	·01048	·00660	·01256	·00344	·00890	·00499	·01585	·00361	·00189	·00013	·00074	·00624	·01734	—
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	·00377	·00030	·00080	·00022	·00491	·00037	·05150	·03560	·00498	—	—	·02398	·01664	—
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	·00006	·00002	·00002	—	·00038	·00004	·00245	·00174	—	—	—	·00039	·00014	—
10	·00047	·00002	·00005	—	·00021	·00004	·00534	·01017	·00007	—	—	·00478	·00179	—
11	·00212	·00019	·00036	·00013	·00210	·00019	·02380	·01004	·00168	—	—	·01872	·01112	—
12	—	·00011	·00135	·00005	·00042	·00037	·00004	—	—	—	—	·00039	·00019	—
13	·00012	·00122	·00142	·00107	·00147	·00529	·00123	·00013	·00126	—	—	·02018	·00048	—
14	—	·00002	·00001	·00001	—	·00011	·00048	·00054	—	—	—	—	·00057	—
15	—	·00018	·00017	·00002	·00004	·00309	·00132	·00509	—	—	—	·00088	·00488	—
16	·00012	·00001	·00003	·00002	·00004	·00003	·00122	·00054	·00021	—	—	·00068	·00041	—
17	·00100	·00025	·00033	·00001	·00063	·00019	·00046	·00094	·00014	—	—	·00156	·01935	—
18	·00012	·00038	·00035	—	·00076	·00012	·00012	·00013	·00021	—	—	·00068	·00368	—
19	·00059	·00057	·00033	·00002	·00025	·00024	·00059	·00040	·00042	—	—	·00214	·01849	—
20	·00112	·00011	·00007	·00001	·00004	·00005	·00067	—	—	—	—	·00039	·00787	—
21	·00660	·00237	·00560	·00058	·00504	·00137	·03849	·01205	·01768	·00013	·00287	·00409	·03209	—
22	—	—	—	—	—	—	·03842	—	—	—	—	—	·00007	—
23	·00342	·00043	·00078	·00018	·00138	·00017	·02262	·00402	—	·00013	—	·00058	·00067	—
24	·00029	·00014	·00021	·00004	·00008	·00005	·01268	·01526	—	—	—	·01950	·00172	—
25	·00012	—	·00014	·00004	·00008	—	·00020	·00027	—	—	—	—	·00007	—
26	·00642	·00101	·00378	·00049	·00315	·00025	·07053	·00134	—	—	—	·00088	·00344	—
27	·00347	·00101	·00086	·00032	·00134	·00392	·01568	·00669	·01263	·00031	·00111	·00409	·00624	—
28	·00589	·00003	·00021	·00006	·00013	·00008	·00026	—	—	—	—	—	·00014	—
29	·00241	·00016	·00021	·00001	·00147	·00008	·00413	·02958	·00042	·00013	·00111	·00058	·00232	—
30	—	—	—	—	—	·00029	—	·00602	—	—	—	—	—	—
31	·00212	·00016	·00017	·00004	·00076	·00016	·00406	·07991	·00021	—	—	·00088	·00100	—
32	—	—	—	·00005	—	·00008	·00030	·02195	—	—	—	—	·00005	—
33	·00206	·00084	·00078	·00027	·00239	·00156	·01121	·09262	·00021	·00031	—	·00107	·00244	—
34	·00059	—	—	·00042	·00143	·00048	·00383	·00174	·00042	·00058	·00352	·00809	·00213	—
35	·00006	·00012	·00015	·00005	·00042	·00007	·00068	·00040	·00021	·00058	·00074	·02037	·00022	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37	·00012	·00041	—	·00024	·00017	·00221	·00015	·00013	—	—	·00009	·00039	·00019	—
38	·00006	·00047	·00039	·00008	·00134	·00067	·00017	·00013	·00126	·00031	·00074	·00253	·00019	—
39	·00077	·00060	·00074	·00010	·00558	·00069	·00468	·00080	·01017	—	·00287	·02057	·00163	—
40	·00094	·00451	·00328	·00314	·01188	·00215	·00058	·00040	·00147	·00031	·00074	·01238	·00093	—
41	·00177	·00601	·00505	·00403	·00411	·00189	·00041	·00040	·00021	·00031	·00111	·00663	·00093	—
42	·00165	·00058	·00180	·00272	·00995	·00069	·00497	·00187	·15994	—	—	·01462	·00737	—
43	·00071	·00464	·00733	·00726	·00432	·00399	·00110	·00107	—	·00013	·00315	·00877	·00299	—
44	—	·00008	—	—	·00004	—	·00003	—	·00021	—	—	—	·00005	—
45	·00018	—	—	·00001	·00008	·00009	·00023	—	·00372	·00180	·00037	·00234	·00033	—
46	·00018	·00035	·00007	·00002	·00130	·00118	·00025	·00013	·00084	·06804	·00389	·00819	·00010	—
47	—	—	—	·00002	·00021	·00031	·00003	—	·00351	·18283	—	·00068	·00012	—
48	·00047	·00055	·00347	·00337	·00122	·00031	·00091	·00013	·00561	·01764	·00176	·00712	·00084	—
49	—	—	—	—	—	·00023	—	—	—	—	—	—	—	—

50	—	—	—	—	—	·00420	—	—	—	—	—	—	—	—
51	·00018	—	·00009	·00012	·00017	·00029	·00020	—	—	·00567	—	·00195	·00022	—
52	·00006	·00018	·00004	·00002	·00021	·00003	·00049	—	·00021	·00045	·25726	·00429	·00019	—
53	—	—	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	·00506	·00208	·00455	·00107	·00361	·00093	·00563	·00120	·00189	·00013	·00713	·02915	·00428	—
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	—	·00269	·00093	—	—	—	—	—	—	—	—	—	—	—
59	—	·00143	·00007	·00006	—	—	—	—	—	—	—	—	—	—
60	—	·00080	·00055	·00004	—	—	—	—	—	—	—	—	—	—
61	—	·00030	·00015	—	—	—	—	—	—	—	—	—	—	—
62	—	·00034	·00026	—	—	—	—	—	—	—	—	—	—	—
63	—	·00022	·00023	·00015	—	—	—	—	—	—	—	—	—	—
64	—	·00021	·00016	·00001	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67	·00253	·00461	·00748	·01063	·03219	·00604	·00190	·00187	·00274	·00085	·00102	·00166	·00218	—
68	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69	·00106	·00091	·00087	·00061	·00201	·00218	·00012	·00013	·01887	·00013	·00037	·02934	·00086	—
70	·00183	·00631	·00119	·00068	—	—	—	—	—	—	—	·00390	—	—
71	—	·00537	·00067	·00078	—	—	—	—	—	—	—	—	—	—
72	—	·00359	·00133	·00066	—	—	—	—	—	—	—	·00039	—	—
73	—	·00013	·00001	·00002	—	—	—	—	—	—	—	—	—	—
74	·00053	·00127	·00266	·00036	·00021	·00757	·00067	·00174	·01887	·00031	·00139	·00195	·00182	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76	·00236	·00252	·00281	·00079	·00332	·00511	·00292	·00134	·00063	—	—	·00107	—	—
77	—	—	—	—	—	—	·00004	—	—	—	—	—	·01222	—
78	·00118	·00246	·00206	·00076	·00894	·00644	·00103	·00361	·00330	·00031	—	·00214	·00459	—
79	·00194	·00294	·00483	·00458	·00588	·00682	·00429	·00736	·00295	·00036	·00065	·00331	·00536	—
80	—	·00017	·00035	·00050	·00050	·00019	·00009	—	·00014	—	—	·00010	·00045	—
81	—	·00012	·00023	—	—	—	—	—	—	—	—	—	·00033	—
82	—	·00010	·00019	·00027	·00029	·00009	—	—	—	—	—	—	—	—
83	·00194	·00118	·00229	·00329	·00340	·00124	·00258	·00388	·00210	·00031	·00037	·00224	·00983	—
84	·00512	·01005	·01645	·02576	·03567	·00737	·00270	·00402	·00063	·00054	·00065	·00244	·00364	—
85	·00041	·00039	·00052	·00021	·00067	·00044	·00219	·00201	·00161	·00162	·00167	·00185	·00093	—
86	·00318	·00159	·00313	·00085	·00243	·00185	·04737	·04618	·03416	·03424	·03535	·04133	·00332	—
87	·00736	·00702	·00932	·00379	·01167	·00785	·03843	·03681	·02876	·02871	·02971	·03363	·01674	—
88	—	—	—	—	—	·00008	·00049	·00013	·00021	·00009	—	·00019	—	—
89	·00059	·00054	·00072	·00029	·00092	·00061	·00307	·00294	·00224	·00225	·00231	·00263	·00132	—
90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
91	·01278	·00537	·01176	·00245	·00562	·00348	·01659	·00602	·00084	·00013	·00019	·00214	·01150	—
92	·00218	·00037	·00043	·00018	·00055	·00081	·00152	·00321	·00007	·00004	—	·00010	·00045	—
93	·00713	·00248	·00228	·00110	·00227	·00432	·00065	·00134	·00014	·00009	·00009	·00487	—	—
94	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—
96	·00330	·00341	·00314	·00152	·00311	·00595	·00146	·00294	·00028	·00018	·00019	·00097	·00273	—
97	·00259	·00338	·00290	·00161	·00609	·01258	·00160	·00120	·00014	·00022	·00028	·00097	·00581	—
98	·00012	·00082	·00143	·00005	·00055	·00045	·00133	·00080	·00042	·00013	·00037	·01248	·00081	—
99	·14117	·12026	·14636	·09510	·21844	·16339	·48792	·47945	·35602	·35517	·36739	·42123	·30489	—
100	·05671	·02338	·03125	·01165	·05103	·05346	·02510	·01687	·00168	·00319	·00287	·01102	·05036	—
101	·30571	·23073	·20201	·13331	·22322	·30994	·22687	·22621	·40863	·37452	·37988	·29587	·22336	·25000
102	·49641	·62564	·62037	·75994	·50730	·47321	·26011	·27747	·23367	·26711	·24986	·27189	·42138	·75000
103	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000	1·00000

TABLE 2: INPUT COEFFICIENT TABLE, YUGOSLAVIA 1962 (*continued*)

(*Million dinars at producers' prices*)

Buying sector → *Selling sector* ↓	*Total (1–98)* 99	*Increase in stocks* 100	*Gross investment* 101	*Exports* 102	*Personal consumption* 103	*General consumption* 104	*Total consumption* 105	*Total final use* 106	*Total available resources* 107	*Value of gross production, 1962, millions of dinars at producers' prices* 108
1	81,003	—	—	1,269	15,002	6,954	21,956	23,225	104,228	104,228
2	91,524	—	—	717	12,344	5,620	17,964	18,681	110,205	93,881
3	35,414	595	—	7	607	—	607	1,209	36,623	31,817
4	39,298	—	—	4,489	354	25	379	4,868	44,166	31,580
5	85,774	3,022	—	8,674	10,593	11,371	21,964	33,660	119,434	94,946
6	15,104	203	—	448	—	—	—	651	15,755	11,418
7	349,875	8,985	—	27,239	—	1,010	1,010	37,234	387,109	328,210
8	65,425	512	—	7,544	—	—	—	8,056	73,481	71,238
9	23,762	—	—	1,172	—	—	—	1,172	24,934	20,594
10	68,163	—	—	20,116	—	1,847	1,847	21,963	90,126	81,789
11	39,312	1,189	—	18,956	—	—	—	20,145	59,457	57,852
12	20,129	323	—	3,800	4,094	61	4,155	8,278	28,407	21,179
13	13,304	1,508	—	3,729	4,060	427	4,487	9,724	23,028	21,279
14	15,015	1,403	—	5,052	—	—	—	6,455	21,470	19,778
15	9,190	960	—	644	3,422	58	3,480	5,084	14,274	12,284
16	9,029	995	—	134	—	14	14	1,143	10,172	7,309
17	24,958	—	—	632	—	—	—	632	25,590	25,585
18	24,080	—	—	39	—	—	—	39	24,119	23,049
19	34,411	267	—	4,058	—	—	—	4,325	38,736	38,609
20	13,231	785	—	1,568	—	—	—	2,353	15,584	15,578
21	150,103	10,278	—	20,894	—	2,277	2,277	33,449	183,552	165,877
22	6,444	—	20,504	4,025	—	—	—	24,529	30,973	23,510
23	68,725	17,644	223,860	35,049	—	1,294	1,294	277,847	346,572	163,813
24	6,350	2,434	20,849	1,071	5,805	2,692	8,497	32,851	39,201	21,222
25	42,362	—	22,678	16,009	—	—	—	38,687	81,049	73,094
26	63,890	8,653	77,403	18,241	28,284	6,608	34,892	139,189	203,079	162,562
27	19,853	3,659	11,776	2,028	25,424	34,135	59,559	77,022	96,875	93,105
28	10,902	—	37,360	65,703	103	1,346	1,449	104,512	115,414	106,860
29	26,537	1,789	28,814	9,778	—	—	—	40,381	66,918	50,837
30	1,011	3,177	—	780	27,309	—	27,309	31,266	32,277	28,802
31	47,013	3,809	—	19,919	—	41	41	23,769	70,782	69,013
32	7,109	2,131	17,889	1,340	24,368	4,264	28,632	49,992	57,101	40,064
33	31,661	241	—	1,045	3,165	661	3,826	5,112	36,773	31,321
34	98,106	274	—	11,033	—	—	—	11,307	109,413	66,027
35	49,807	—	—	4,642	603	116	719	5,361	55,168	29,921
36	9,279	4,603	—	2,122	8,953	23,637	32,590	39,315	48,594	39,758
37	3,479	2,043	—	675	17,544	727	18,271	20,989	24,468	22,978
38	6,374	1,721	—	110	10,359	278	10,637	12,468	18,842	17,722
39	54,729	2,602	—	3,701	9,232	7,707	16,939	23,242	77,971	67,725
40	71,545	844	—	7,925	—	2,446	2,446	11,215	82,760	77,206
41	30,877	12	—	13	1,080	966	2,046	2,071	32,948	32,101
42	91,327	5,292	—	31,338	—	—	—	36,630	127,957	127,720
43	41,180	8,753	2,223	29,584	48,325	2,544	50,869	91,429	132,609	132,100
44	8,231	—	—	2,380	3,296	73	3,369	5,749	13,980	13,000
45	5,742	673	—	3,719	—	—	—	4,392	10,134	9,581
46	94,982	20,489	—	19,258	39,141	2,922	42,063	81,810	176,792	170,131
47	80,874	6,162	—	492	33,727	700	34,427	41,081	121,955	101,353
48	29,999	4,015	—	3,546	6,701	122	6,823	14,384	44,383	38,554
49	7,669	6,895	267	4,705	48,589	929	49,518	61,385	69,054	66,492
50	340	9,339	—	9,716	90,406	2,882	93,288	112,343	112,683	109,634
51	3,324	1,339	—	1,635	13,625	110	13,735	16,709	20,033	15,890
52	36,658	6,616	—	4,541	—	302	302	11,459	48,117	47,779
53	**37**	**3,821**	—	**13,053**	**36,104**	449	36,553	53,427	53,464	53,356

54	10	796	—	1,500	11,504	—	11,504	13,800	13,810	13,791
55	30,869	2,011	—	846	16,774	2,280	19,054	21,911	52,780	46,077
56	928	436	—	—	19,314	718	20,032	20,468	21,396	21,396
57	96	1,095	—	48	29,402	1,015	30,417	31,560	31,656	31,652
58	6,208	2,382	—	38,460	70,494	2,282	72,776	113,618	119,826	116.062
59	1,271	1,688	—	6,527	16,025	710	16,735	24,950	26,221	24,940
60	12,728	—	—	1,733	38,841	1,588	40,429	42,162	54,890	43,386
61	173	717	—	66	20,963	—	20,963	21,746	21,919	21,917
62	18,126	—	—	1,210	24,958	951	25,909	27,119	45,245	32,699
63	4,638	645	—	298	37,320	—	37,320	38,263	42,901	41,573
64	14,213	1,294	—	4,623	20,362	498	20,860	26,777	40,990	38,054
65	20,216	—	—	31,366	—	—	—	31,366	51,582	45,803
66	—	527	—	3	75,226	—	75,226	75,756	75,756	75,739
67	19,058	5,097	—	279	31,723	20,571	52,294	57,670	76,728	75,184
68	1,885	655	—	2,249	3,629	453	4,082	6,986	8,871	8,551
69	2,726	1,554	—	2,988	11,663	4,121	15,784	20,326	23,052	18,023
70	577,057	—	—	9,456	295,143	11,269	306,412	315,868	892,925	797,214
71	63,740	6,918	—	11,719	121,540	2,006	123,546	142,183	205,923	184,703
72	115,589	—	—	50,382	312,162	10,751	322,913	373,295	488,884	425,254
73	4,448	—	—	1,080	3,134	—	3,134	4,214	8,662	5,492
74	88,759	—	681	8,835	20,423	1,124	21,547	31,063	119,822	116,610
75	—	—	19,214	273	—	277	277	19,764	19,764	19,764
76	12,665	—	482,575	—	—	4,601	4,601	487,176	499,841	499,841
77	27,949	—	142,654	—	—	10,978	10,978	153,632	181,581	181,581
78	145,833	—	11,330	107	—	7,892	7,892	19,329	165,162	165,162
79	107,605	2,288	2,853	27,099	65,381	6,387	71,768	104,008	211,613	210,391
80	2,113	—	76	61,132	4,398	430	4,828	66,036	68,149	68,149
81	5,318	—	—	8,376	791	188	979	9,355	14,673	14,673
82	1,404	—	—	2,422	2,125	204	2,329	4,751	6,155	5,536
83	45,083	879	1,519	6,718	54,041	5,279	59,320	68,436	113,519	113,519
84	21,203	—	—	222	20,222	6,223	26,445	26,667	47,870	47,870
85	24,649	334	2,285	3,789	3,893	436	4,329	10,737	35,386	16,980
86	31,107	—	5,048	—	163,252	8,592	171,844	176,892	207,999	207,999
87	68,215	5,162	18,411	2,769	61,228	5,952	67,180	93,522	161,737	161,737
88	22,700	475	12,820	37,315	7,917	1,151	9,068	59,678	82,378	82,378
89	8,761	469	3,206	5,317	5,463	612	6,075	15,067	23,828	23,828
90	—	—	—	6,170	69,010	—	69,010	75,180	75,180	75,180
91	53,770	749	939	—	7,769	5,725	13,494	15,182	68,952	68,952
92	5,348	29	430	—	1,356	308	1,664	2,123	7,471	7,471
93	4,265	162	1,183	—	7,763	882	8,645	9,990	14,255	14,255
94	—	201	—	—	21,489	533	22,022	22,223	22,223	22,223
95	—	52	—	—	10,632	122	10,754	10,806	10,806	10,806
96	5,023	11	93	—	1,675	3,456	5,131	5,235	10,258	10,258
97	10,974	—	—	—	10,190	20,651	30,841	30,841	41,815	41,815
98	35,316	264	—	1,008	—	—	—	1,272	36,588	27,000
99	3,886,559	196,945	1,168,940	796,742	2,231,814	278,831	2,510,645	4,673,272	8,559,831	7,662,899
100	300,200									
101	1,430,961									
102	2,045,179									
103	7,662,899									
	51,671	Total decrease in stocks								
	845,261	Total imports								
	8,559,831	Total available resources								

output analysis. The most significant adaptations in the official classification of activities were those needed for the sector of arts and crafts, which was isolated from industrial and building activities and shown separately. The Yugoslav official nomenclature of activities considers arts and crafts as production—a production of all products processed in arts and crafts organizations as a separate activity. In the regular statistical inquiries which are being used for the compilation of the tables therefore a considerable volume of production of certain manufacturing activities and construction, together with other arts and crafts production, has been presented in one common sector "arts and crafts" regardless of the fact that the destinations of these products, as well as the kinds of raw materials from which they are processed, differ widely. In order to secure a better homogeneity of sectors in the compilation of the input-output tables the production of arts and crafts organizations was treated in the same way as the production of counterpart industrial organizations. This treatment brought about a certain incomparability between the data in the input-output table and those of other statistical inquiries for which the official classification was used without any change. Since this definition of sectors was used only for the compilation of the 1962 table, that table is not fully comparable with those for previous years.

The tables do not show a dummy sector "unallocated" although every time in the course of compilation, and particularly in its first phases, there appeared a considerable amount of insufficiently defined or totally unidentified resources which could not be broken down directly by producing industries or by using sectors. Such insufficiently defined categories are found in almost all the fields of economic statistics. In regular statistical inquiries these discrepancies are not considered as being of essential importance, but when all these resources are assembled into a system of methodological and classificatory reconciliation, such as an input-output table, they lead to a further increase in the amount of undefined values. The sector "unallocated" has been completely eliminated from input-output tables so that the users of the tables and the relevant inverse matrices of technical coefficients may feel more at ease. Various procedures, often relying on indirect assessments, have been used for the elimination of these insufficiently defined amounts, which decrease yearly as computation methods improve and the system of statistics is modified.

The tables define the value of production as the sum of the values of products and productive services according to the specified nomenclature of goods, and show it at producers' selling prices. This value therefore comprises depreciation, personal incomes, accumulation and funds, and the value of material (reproduction material consumed for the production purposes as defined).

The flow of distribution of production in input-output tables, such as the flow table underlying the 98-sector coefficient table shown in table 2, involves both domestic and imported products consumed as reproduction material by industries and as final products, by categories of distribution. The value of these products is shown at producers' prices for the consumption of domestic products and at domestic prices at the Yugoslav border for the consumption of imported products. The consumption of domestic agricultural products is also shown at producers' prices which, for the private sector of the economy, have been equal to the purchase prices of agricultural products.

The producers' prices which have been used in the compilation of tables cover the turnover tax and thus depart from the concept more often used in the field of input-output statistics. The consumption of imported products is shown in prices inclusive of customs duties.

Subsidies have been treated as a part of the price realized by producer (unless they are used for the remittance of losses): this means that the value of the subsidy is included in the value of the production of the industry receiving the subsidy. In the case of industries which purchase and consume the products of such an industry the consumption of these products is not computed at actual market prices, which are lower by the amount of subsidy, but at prices inclusive of subsidy. If the consumers of such products are productive industries their "accumulation" is diminished by the amount of subsidy.

The way in which intermediate consumption is presented in input-output tables is itself determined by the definitions of the basic categories of production and distribution involved in the scheme of the input-output tables: the table's definition of the production field determines the industries whose products will be shown in the quadrant of intermediate transactions. The services of all other industries not considered as productive are treated in the autonomous sectors of the input-output table. The field of intermediate consumption consequently excludes such items as insurance costs, interest rates, financial operations costs, *per diem* allowances for business travel, and distributors' commissions, which are otherwise covered by the costs of economic organizations. The differentiation of current and capital transactions in the input-output tables is in full accord with accounting practice. All the purchases which appear on the debit side of the cost account of economic organizations have been considered as current transactions and all those of the investment account as capital ones. In the tables, imports are treated as a part of available resources (rows) and exports as a part of distributed resources (columns). Under exports and imports are shown only transactions with foreign countries relating to material goods and the payments or receipts of productive services rendered or consumed. Other items in the balance of payment which relate to non-productive services or to financial transactions are excluded.

Imports are shown in the tables by counterpart industries which turn out products of the same kind, and not by the industries to which the imported products are destined. This procedure has been used in all the Yugoslav input-output tables so far published, although the compilation of the 1962 tables involved experimental tables showing imports both by counterpart domestic industries and by consuming industries. In those experimental tables the number of the productive sectors is 98, but each row is subdivided into three sections (table 1).

Gross investment is shown as a separate sector of final demand. It is defined so as to cover only material goods and productive services (transportation costs of equipment and the margins of external trade and trade organizations) which are intended as replacements and as increase in fixed assets, as well as investment in non-economic activities. The value of residential construction comes in this sector and not in that of personal or public consumption. Gross investment does not cover investment for the maintenance of fixed assets because practice treats the latter as part of the current costs of economic organizations. Neither does it cover those expenditures which debit investment funds relating to non-productive services, payment for purchases and repayments, personal and other outlays for training of personnel, outlays for purchase of used fixed assets, etc.

Decrease in stocks is shown as a part of available resources and increase as a part of distributed resources. The stocks cover finished and semi-finished products of all producers (manufacturing, agricultural, forestry, and arts and crafts enterprises), products in wholesale and retail trade organizations, and raw materials with the producing organizations or on material reserves. Stocks in households, state administration organs or other social services are excluded, since with these consumers the purchase of goods is identified with their consumption. The exception to this is the stocks of agricultural products in peasant holdings, which may be considerable in amount and change markedly from year to year. Unfinished production in shipyards and building enterprises is not treated as changes in stocks, because the total value of the work of a given year is the sum of the payments made for work to be completed during that year. The value of unfinished production in these enterprises is covered by the corresponding item of gross investment.

Final consumption, as a part of final distribution of social product, is divided into personal and general consumption. Personal consumption consists of domestic and imported material goods and productive services consumed to meet the personal requirements of the population. It also covers the at-home consumption by rural households. Resources for personal consumption are derived from personal incomes, salaries from the budget for economic activities, receipts from social security etc. General consumption consists of material goods and productive services consumed in order to meet the requirements of administration, of national defence, of health, and of educational and other social services which are financed from the budget or from funds. General consumption in the input-output tables, as distinct from the national accounts, excludes subsidies. The structure of general consumption, as well as of other sectors in the table, is shown at producers' prices and covers only material goods and productive services. Budget outlays for subsidies are already comprised in the producers' prices of subsidized products and services in the relevant consuming sectors.

II. SOURCES OF STATISTICAL DATA AND METHODS OF ESTIMATION

As has been seen, the compilation of the input-output tables for 1955, 1958 and 1960 was based primarily on available statistical materials which originated from regular statistical inquiries. For the first time the 1962 table utilized additional data collected especially for its own purposes. This collection was carried out through special questionnaires covering all economic organizations in the social sector of the economy, which made a "Report on reproductive consumption, stocks, purchases and sales in 1962". This report made it possible to decrease considerably the area of input-output flows which have not been covered by regular statistics. All the data problems could not be completely solved with this report however and further extensions and improvements in the system of economic statistics are considered necessary.

The basic characteristic of this report is that it contains only value indicators (excluding natural) and that groups of raw materials, products and industries are defined so as to conform with the sectors of the input-output tables. Although the use of these questionnaires permitted a considerable decrease in processing costs and in the time taken for the construction of the table, further supplementary information is needed for any detailed elaboration of the tables.

The report contains basic information on various items:

(*a*) consumption of raw materials, materials and small inventory and stocks of materials and trade goods purchased from other enterprises;

(*b*) services rendered to the reporting enterprise by other enterprises, specifically: services for repair and maintenance of machines, transport means, construction projects; transportation costs by branches of transport (railway, sea-borne, river and road) shown separately for raw materials and materials spent by enterprises and for finished products and goods sold by enterprises; costs of business travel, communication, forwarding, loading and unloading, and public utility services (water, garbage disposal, rent) etc.;

(*c*) stocks of own products, broken down by finished and unfinished products at the beginning and the end of the year and by industries (statistical units);

(*d*) consumption of own semi-finished products and services by industries (statistical units) in which such products were either used or produced.

Each enterprise filled in separate data for every unit defined in accordance with the classification of industrial activities. Which units were to be separately presented depended upon whether they were considered as primary, secondary or auxiliary in the given enterprise.

Secondary activity units are those which have developed alongside a primary unit in the enterprise but which do not carry out the industry for which the enterprise was founded. They include plants which use the waste and by-products of primary units, or which produce electric energy, packing material or some other product that can be used in the primary units of the enterprise. Auxiliary units work almost exclusively for the needs of the enterprise in which they are incorporated. Commodity production and sales to other enterprises appear in them only occasionally.

All units which by definition fell within primary or secondary activities were considered as separate statistical units and for each of them the enterprise was asked to give all information as if they had been operating as independent enterprises. Units which were considered as auxiliary were included in the primary activity of the enterprise if it had only one primary activity, but in the activity which they predominantly served if it had more than one primary unit (i.e. industries).

To secure adequate uniformity in the presentation of the data for the most important activities, which usually occur within a majority of enterprises, separate units were prepared. Among them, the following should be noted in particular:

(*a*) own-account construction of economic organizations not specialized in construction, except for construction maintenance works of smaller volume;

(*b*) own-account big workshops of economic organizations for repairs and maintenance and production of machines and accessories;

(*c*) units producing packaging material of a higher degree of processing;

(*d*) plants for the internal supply of electric energy; and

(*e*) retail shops and territorially separated warehouses for wholesale purposes, which belong to industrial, agricultural and other producing organizations.

This report provided the principal source of information on intermediate consumption for all economic activities. But not all the necessary information could be obtained for activities in which the share of the private sector in the total production is significant; therefore, other sources from economic statistics had to be used as supplementary information.

The computation of the value of agricultural production, the productive consumption in agriculture and the distribution of agricultural products was based throughout the compilation stages on estimates or normative calculations.

For trade margins and transportation costs, by types of trade and transport and by sectors for which direct data could not be obtained from the enterprises consuming these services, the computation was based on the average figures for individual kinds of commodities from relevant trade and transport enterprises.

The basic data on the value of production and its structure (items of primary inputs by sectors) are obtained for all the sectors by processing the regular annual reports of all economic organizations in the social sector which present an extract of their annual accounts of settlement. These results are also the principal source of data for the computation of national income and social product in Yugoslavia. In the collection and compilation of data from these reports by activities (units) use is made of the above definitions of basic, secondary and auxiliary units as well as of the procedure of separation and special presentation of data for non-primary units of enterprises.

The existing data from the regular statistical inquiries have been used as the basic source of information for the majority of final demand sectors. These, however, are not suitable to the input-output framework as regards the classifications used and particularly as regards prices. The estimation of the composition of gross investment, and personal and public consumption has therefore been based also on data on production, imports, exports and stocks, by groups of products and services.

For each sector of the basic table the form shown below is used to obtain details of domestic consumption:

	Symbol	*Reproduction material*	*Work instruments*	*Consumer goods*	*Total*
Production	+				
Imports	+				
Exports	—				
Stocks-increase	—				
Domestic consumption..					

This procedure has established the control totals of consumption for the basic consumption categories (investment, reproduction material, personal and public consumption) and secured their reconciliation with the total amounts of production, exports, imports and stocks, as shown in other parts of the table. For the sectors producing articles destined mainly or only for one consumption category (such as crude petroleum, fermented tobacco, tobacco preparations or leather footwear) the figures thus obtained are used as final data on consumption. For other sectors the data obtained in this way have been used as the control total according to which the estimates of consumption by various using sectors are made consistent with the system of input-output compilation.

III. USE OF INPUT-OUTPUT TABLES

The whole of the work on the compilation and publication of input-output tables has so far been only in the Federal Institute for Statistics, where the most important work on the Yugoslav economic statistics has been concentrated. The influence of input-output statistics on the existing system of data increased so considerably with the passing of time that today it can be said that in Yugoslavia the input-output statistics, together with the system of national accounts, represent one of the most significant factors determining the nature and extent of data collection for general purposes. The relative slowness of the adaptation of existing data to the requirements of input-output statistics and national accounts is the result of the real difficulties encountered in changing the routine methods of work while maintaining the continuity of existing statistical series.

In addition to the use of input-output statistics for these essentially internal statistical purposes, the tables have also been used in the Federal Institute for Statistics as the source data for separate computations and statistical analyses. Under its programme of work the Institute limited the analytical use of the tables mainly to the standard computations and analyses which permit and simplify the practical application of input-output technique to the computation of various aggregate indexes and "real" values, as well as to the construction of special economic balances which are compiled directly from the data of input-output tables.

Computation of inverse matrices of technical coefficients and other coefficients and structural parameters has been carried out in the Institute for all the input-output tables compiled so far, with the exception of those for 1955. In this connexion a series of standard programmes have been prepared in the electronic centre of the Institute for the inversion at various levels of aggregation, the multiplying of matrices, the automatic aggregation of tables etc.

The weighting systems for aggregate indexes in the fields where price indexes cannot be directly computed (construction, shipbuilding, machine construction) as well as the "real" values of final demand categories (personal and general consumption and investment) and other value aggregates were worked out directly on the basis of the data from the input-output tables and the corresponding individual indexes.

Among the various special economic balances, partial balances for individual economic fields (similar to the production account from the system of national accounts) may be of particular interest. These were worked out in the Institute and were made consistent with the results shown in the system of national accounts of Yugoslavia. It also compiled a separate economic balance, "Computation of the basic structure of production", in which the over-all production was broken down into three categories of basic destination: work instruments, reproduction material, and consumer goods. This balance, worked out for the requirements of economic planning, relied only on the data from input-output tables and used no other additional information.

Outside the Federal Institute for Statistics the input-output tables were used in various fields. In the period directly following the publication of the first input-output tables they were used mostly as means of demonstrating the practical possibilities of the input-output technique, and also as a complex source of information on the structure of the Yugoslav economy for the purpose of various economic analyses not directly connected with the input-output technique. With the development of input-output statistics and by detailed elaboration of the tables with an increased number of sectors, the field of application also has been extended. The subjects of some of the empirical research and analyses using input-output data went indeed beyond the classical partial and aggregate analyses—it might be said that they are an indication of qualitative changes in the approach to the professional problems of economic planning and policy in Yugoslavia. The kinds of analysis which have been worked out on the basis of the data from input-output tables and techniques cannot all be covered in such an article as this, but their systematic review has not yet been undertaken. The present article can deal only with those analyses that will permit the appraisal of the practical significance of input-output statistics and techniques in solving some of the most important problems.

In recent years the Federal Institute for Economic Planning, in collaboration with other economic institutions, has prepared a series of methodological and empirical studies to improve and guide the work of drawing up economic development plans. These studies dealt with various problems relating to the balancing of structural proportions. Among these a special emphasis is given on various methods and models of practical use for the structural balancing of production, consumption and foreign trade as well as for solving the problems of prices which arise in this connexion. The common characteristic of these methods and models is that they use the input-output technique as a basic approach, and the data of the input-output table as a basic source of information for the purpose both of controlling their practical applicability and statistical documentation and of drafting economic development plans. At various phases of these studies a series of parameters and characteristics of the economic structure of Yugoslavia has been computed. Many of them correspond to the results of standard input-output models, such as the import content of individual categories of final demand, cumulative costs of production by activities, or direct and indirect production requirements of individual sectors for given specific final demand. At certain phases of the draft plan the input-output models were employed in many tasks, including the empirical application of a dynamic model as a means of checking the consistency of projections for individual branches of the national economy established by other procedures and also as a separate model used for establishing the total import requirements involved in various alternative draft economic plans.

In connexion with the preparation of the economic reform measures which are being carried out in Yugoslavia, a special position is given to the analyses establishing the plausibility of the new rate of the dinar. The complexity of this problem, particularly under the peculiar conditions of the Yugoslav economic system, demands a serious study of the impact of the new rate upon individual activities. Within this framework the National Bank in 1964 completed a very complex analysis, in which the input-output method was used as the basic approach, of the influence of changes in the existing price parity upon the distribution of accumulation (profit) by individual economic activities. Concrete results were calculated on the basis of the 98-sector input-output table for 1962, where the total transactions were broken down into domestic production and imports.

At the end of 1962 the Institute for the Economics of Industry in Belgrade completed a study entitled "The examination of the structure of industry in Yugoslavia, with methods of linear programming", in which also input-output tables were used as the basic source of information. The objective of this study was to work out a greater number of optimal alternative solutions for the structure of industry as well as optimal trends of industrial development to be effected by particular policy measures and instruments. This was the first study that attempted to apply the linear programming method to the national economy. Though essentially experimental, it provided certain solutions of practical significance.

The study of "production price", which is being conducted in the Yugoslav Institute of Social Sciences in Belgrade, seeks to establish the extent to which the existing system of prices diverges from the system that would be formed on the basis of a uniform accumulation rate (profit) on invested capital. This study also is based on the input-output model. The attempt may turn out to be of particular interest because it is expected that, in addition to the matrices of current transactions, a matrix of capital transactions and depreciation will be compiled for the first time, to establish a statistical basis for analytical computations. The experimental matrix to be drawn up for the requirements of the study itself will be used later as a guide-post for the construction of an official matrix of capital transactions for the Yugoslav economy.

ANNEX

Chronological input-output bibliography of Yugoslav publications

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INTERSECTORAL BALANCES OF PRODUCTION AND DISTRIBUTION FOR A NATIONAL ECONOMY: KEY ASPECTS OF THE PRACTICE IN THE UNION OF SOVIET SOCIALIST REPUBLICS

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This study addresses itself to the general methodological problems of the normative base of intersectoral balances of production and distribution in a national economy. This normative base is provided by a set of direct input coefficients which are calculated on the basis of technological coefficients or norms of requirements of certain materials for the production of others. As illustration, some direct and total input coefficients for the Soviet *ex-ante* intersectoral balance are shown in the annexes.

In order to place the normative base in a proper perspective this study first of all focuses on the general position of the intersectoral balances in the planning of the national economy, on the layout and the model of the balance, and on the calculations of its basic data. Some of this general information is commonly known, but in the author's opinion a summary of this type will be instructive, as it bears directly on the methodological assumptions on the normative base, which are discussed later in the study.

The three annexes to this paper show, respectively, (1) a diagram of the intersectoral balance in kind, (2) direct and total requirements of non-ferrous metals, basic chemicals, electric power and thermal energy and coal for the production of industrial goods, and (3) direct and total expenditures of rolled stock of non-ferrous metals, electric power and coal for the production of industrial goods.

I. GENERAL DESCRIPTION OF THE INTERSECTORAL BALANCE OF PRODUCTION AND DISTRIBUTION OF THE NATIONAL ECONOMY

In a planned economy an intersectoral balance plays an important role in improving the methods of planning the national economy. This balance serves in some sense as an intermediate link between the over-all balance of the national economy and the material balances relating to given specific products.

The over-all balance of the national economy is a set of mutually consistent indexes related to the basic relations and proportions of socialist reproduction. Its main elements are:

(*a*) balance of production, distribution and utilization of social product;

(*b*) balance of production, distribution, and final consumption of national income;

(*c*) balance of labour resources;

(*d*) composite balance of the national economy.

The balance of the national economy shows the relations between material production and final product, and the relations among basic branches of the national economy, as well as the proportions in the distribution of labour resources. The balance does not however show the multiplicity of interrelations within large branches such as industry, agriculture, construction and transportation.

Material balances, on the other hand, describe the available sources and distribution of specific products. These balances are employed in planning to ensure proper proportions in the national economy and adequate supply levels of production or construction. They are particular balances and do not describe fully the interrelations of different branches.

Intersectoral balance makes up the deficiency of the national economy balance and specific material balances. On the one hand it makes specific the data relating to the balance of the national economy and on the other it generalizes and puts into a system the specific material balances.

In 1925 for the first time in the USSR, the balance of production and distribution of output of 20 most important sectors was prepared; this was for the 1923–24 period. This was the first experiment at preparation, reflecting the real processes of reproduction in the economy as a whole and in its sectors. It played an important role in the later development of the method. The work on intersectoral balances was discontinued after 1926 and Soviet economists resumed it once again only at the end of the 1950s. By that time the mathematical model and computing technique had been so developed as to make it possible practically to solve the system of equations of the production and distribution of products in the national economy. The first intersectoral balances for the production and distribution of products in the national economy for 1959, in value terms and in physical units, were prepared in terms of 83 branches, while the balance in physical units was for 157 most important products. The methods of building regional intersectoral balances were also worked out, and several ex-post regional balances have been completed.

The work of the Research Institute of Economy and the main computing centre of the USSR State Planning Committee marked a further important advance on the way to working out experimental intersectoral balance tables for the plan period of 1962 in value and physical terms. The value balance has been prepared for 83 industrial branches, and the balance in kind for 346 types of products. In the working out of these balances the proportions of the economy as a whole and its sectors in the 1962 National Economic Development Plan were analysed, and the basic methodological questions regarding the data processing on computers were solved. Since then the intersectoral balance table in value terms for the plan period up to 1970 has been completed and so have the intersectoral balances in physical units for 1963, 1964, 1965 and 1970. The 1970 value balance incorporates 124 sectors of material production, including 112 industrial branches. The balance in physical units now embraces 438 products, and in the near future the list will be increased to between 800 and 1,000. This work has already proved to be of practical value in preparation of the long-term plan for the development of the national economy of the USSR.

Production planning utilizing an intersectoral balance starts with determination of social product, i.e. a determination of the aggregate of material goods to be produced during the planning period. This aggregate can be defined as the sum of the gross outputs of all branches of material production—industry, agriculture, construction, freight transportation, material supply and distribution, procurement and trade—in so far as it directly contributes to the process of material production. The major share of social product consists of gross industrial product.

The gross social product is divided into two parts, which play different roles in the processes of expanded reproduction. One part is directed into the replacement of labour instruments consumed in the sphere of material production, i.e. is used as inputs in current production. The other part represents the final product which is used for personal consumption and for expenditures in non-productive activities: culture, education, public health, communal services and dwellings, science, administration etc. The final product also includes productive and non-productive accumulations.

The calculation of intersectoral balance in USSR practice begins with determining the volume of final product and its separate elements. Among the things to be determined for the plan period are the over-all rate of growth of the final product and its structure, and the relationship among various funds in the final product, such as the replacement fund for fixed assets, the consumption fund and the accumulation fund. The relationship among the basic elements of these funds is also determined: personal and public consumption; accumulation of fixed and circulating productive capital, of basic non-productive funds and of consumers' stocks and reserves; volume of exports and imports; replacement of basic productive and non-productive funds etc.

The determination of the general rate of growth of the final product is based on calculations regarding the dynamics of labour productivity and the prospects of drawing labour resources into the sphere of material production, calculations of possible production accumulation quota and changes in the efficiency and terms of repayment of production accumulation. Also to be determined are the scale of renewal of production apparatus, tasks for the development of the non-productive sphere of the economy, and requirements for the country's defence capacity. These calculations determine the share of all the remaining elements of final product.

An important element of final product is the consumption fund, the size and structure of which determine the people's living standards. The planning of this fund is the basis for the elaboration of the whole national development plan. In the planning of the consumption fund the *per capita* level of income, the relative prices of products, and changes in the population structure of the country are determined.

The volume and structure of final product, and particularly of the consumption fund, determine the volume and structure of industrial output in those branches of material production whose output is used for final consumption; with the aid of certain parameters the production requirements of all branches of material production are determined. Thus the satisfaction of the material and spiritual requirements of the country's population constitutes the basis of the whole production system.

The determination of the volume of final product and its elements, from which the elaboration of the intersectoral balance actually starts, is an important task; but the determination of the sectoral structure of final product and its separate elements is still more important and complicated. Different sections of the intersectoral balance play different roles in shaping the final product. For instance, the output of the iron and steel industry and other raw material branches, being used mostly as intermediate products, affects the final product to a lesser degree than the output of such branches of industry as food and light engineering, which is generally used for personal and non-productive consumption, and plays an important role in shaping the final product.

The intersectoral flows for all sectors shown in the balance are calculated, with the use of mathematical equations, on the basis of the determined sector structure of the final product and direct input coefficients. The mathematical model of the intersectoral balance is based on a set of equations which reflect the complex system of interrelations of social production. The outputs during the planning period of various sectors of industry, agriculture, construction and transportation are determined on the basis of these equations.

The system of equations includes the following elements: volume of output by each sector in the balance, number of balance sectors, plan coefficient of direct expenditures in the output of one branch for production of one unit of output of other branch, and volume of output of each branch which is used for production of final product. With reference to a value balance, the following notations are employed:

X_i = volume of the output of the supplier where i signifies the number of the supplier's branch;

X_j = volume of the output of the user's branch where j signifies the number of user's branch;

n = number of branches of intersectoral balances;

a_{ij} = plan coefficient of direct expenditures in the output of branch i for production of one unit of output of branch j;

Y_i = volume of output of branch i, being used for final product.

The volume of output of each of the balance sectors may be expressed in the form of the following simple equation employing these notations:

$$X_i = \sum_{j=1}^{n} a_{ij}X_j + Y_i$$

Since the economic-mathematical model of intersectoral balance is expressed by this system of linear equations the conventional methods of linear algebra provide the basis for simulation of intersectoral contacts. Total input coefficients are thus calculated on the basis of direct input coefficients (coefficients of direct expenditures). To obtain the needed volume of output of each sector of the balance, the table of total input coefficients is multiplied by the vector of final product.

The balance assumes that a certain proportionality in the interrelations of different branches is present. This proportionality refers both to the production of specific products and to the value of output of specific branches. In intersectoral balances the value proportions are shown in value terms. and the product proportions in physical units.

II. THE STRUCTURE OF INTERSECTORAL BALANCES IN VALUE TERMS AND PHYSICAL UNITS

An intersectoral balance is divided into four quadrants. The first quadrant shows the circulation of instruments of labour and material services in the process of production, i.e. it reflects the intersectoral relations in the production of social product. This quadrant is in the form of a square table which has the same list of branches both vertically and horizontally. The list embraces all the branches of industry, agriculture, transport, trade, and public eating facilities, procurements, material and technical supply, and other branches of material production.

The second quadrant shows the final product, the material structure of national income, and its distribution into accumulation and consumption, replacement and capital repairs of fixed assets, and the exports-imports balance by branches.

The national income as a summary of value newly created in the plan period—a value which is obtained by summing up elements of net output of all branches of material production—is shown in the third quadrant. This includes wages, profit, turnover tax, and net income of collective farms and co-operatives, as well as depreciation. The share of each branch in the creation of national income is here demonstrated.

The fourth quadrant reflects the final money incomes of the State, enterprises and the population, and the allocation of these incomes.

An important feature of the balance is the balancing of flows: the sum of the totals of quadrants II and IV (north-east and south-east) is equal to the sum quadrant III (south-west). Thus the value and the in-kind flows of national income are equal. This equality is ensured by the equality of total value of output in each row and column, i.e. equality of produced and of distributed output.

The intersectoral balance in physical units is a system of interrelated specific material balances showing resources and distribution of various products. The layout of this balance differs in many respects from that of the value balance. It reflects proportions and interrelations not in the aggregate social product but in that part which is represented by the items included in the balance. Although this balance is a synthesis of material balances it differs substantially from the latter both in its content and in its form of tabulation.

Each of the various material balances shows the balance relationships only for one type of product and without the needed ties with the production and consumption of other products that are expended in its production. These balances do not reveal the interdependence among the indices of reproduction of all the branches of material production or the majority of the most important types of products, which is very important in these days of a high level of division of social labour, specialization and co-operation in production. This shortcoming of material balances is corrected in intersectoral balances of production and distribution for the national economy.

The table of intersectoral balance in physical units consists of three sections. The first shows the supply of each specific product; the second deals with the consumption of one type of product for the production of other types, i.e. intermediate uses; and the third shows the distribution of products for replenishing fixed and circulating assets, for consumption and for exports.

There is a present need for a balance which could combine both monetary flows and flows in physical units. However, the unification of commodity classifications for such a balance will require a substantial disaggregation of sectors in value terms and also the inclusion of products not at present covered in the physical balances.

An intersectoral balance in physical units makes it possible to analyse intersectoral ties in the production of most important products, and to determine progressive structural shifts in production. In addition to value balances those in physical terms make it possible to trace the movement of the social product in kind and to analyse the basic proportions of expanded commodity reproduction (not by branches, as is the case with value balance).

The commodity classification is of great importance in the elaboration of intersectoral balances and in the establishment of more efficient intersectoral and intrasectoral production ties. The national economic importance of certain types of products, and their proportion in both material expenditures for production and the aggregate social product, is taken into account in the preparation of the classification. Because it is impossible to cover the entire range of products an aggregation is necessary of some products according to their designation in the material production, the homogeneity of the structure of expenditures for their production and the technology of their production. The criteria for the selection of branches for the value balance and of products for the physical balance are essentially the same.

The mathematical model of the balance in physical terms consists of a system of equations equal to the number of products included in the balance. The equation for the first product can be written as follows:

$$x_1 = x_{11} + x_{12} + x_{13} + \dots + x_{1n} + y_1,$$

where

$_1$ = production requirement of the first product included in the balance;

x_{11} = expenditure in the first product for production of this same product;

x_{12} = expenditure in the first product for production of the second product;

x_{1n} = expenditure on the first product for production of the nth product;

y_1 = summary requirement of the first product for non-productive consumption, exports, stock, reserves, etc.

Similarly, for the ith product the equation is:

$$x_i = x_{i1} + x_{i2} + x_{i3} + \dots + x_{in} + y_i.$$

After the transformations of the system of equations of separate products the following very simple mathematical model of the intersectoral balance in physical units is obtained:

$$X_i = \sum_{j=1}^{n} a_{ij}X_j + Y_i.$$

A matrix of direct input coefficients and the volume of final consumption provide initial economic information in constructing intersectoral balances in physical units.

Today, however, the number of products in the balance is limited by computer capacities. With further perfection of computing techniques, the coverage will be expanded. The extension of coverage also becomes possible after dividing intersectoral balance into separate blocs encompassing closely interrelated branches. In such blocs it is possible to thoroughly reveal the intrasectoral and intercommodity ties. Such balances may be called intrasectoral (commodity) balances.

III. METHODS OF FORMATION OF DIRECT INPUT COEFFICIENTS IN PHYSICAL UNITS

Unlike the conventional input coefficients ("normatives"), the direct input coefficients in physical units show requirement of specific resources not only in direct productive processes but indirect and auxiliary requirements as well. For instance, the direct input coefficient of electrical power in production of rolled metal shows not only the use of power in heating, rolling, and finishing of the stock but in illuminating buildings, in repairs of equipment, heating of productive premises etc.

On the other hand, these coefficients do not include the use of energy resources in production of other products shown separately in the balance. For instance, the electrical power coefficient referred to above covers only the expenditure in rolling and does not extend to the expenditure in production of pig iron and steel as these products are shown separately in the balance. Input requirements for transportation and capital repair are also excluded.

To deal with joint expenditures in production of several types of products, the distribution of total expenditures into separate coefficients is done according to the methods of distribution employed in the given sector. It is also possible to use another method, based on the mathematical properties of intersectoral balance. If several items are jointly produced from a given raw material the "main" product is singled out and all expenditures are imputed to it. The production of secondary products is regarded as being a result of the production of the main product and consequently it is written off the main product with a minus sign.

Basic and auxiliary materials, fuel, electrical power, semi-finished subcontracted parts, simple tools, and packaging and crating materials are used up in the production of industrial output. The main computer centre of Gosplan developed a technique of determining the input coefficients depending on the role played by these materials in production. This technique starts on the assumption that the largest share of material and energy resources consists of basic materials. The input coefficients for these materials are related to the unit of output. In cases however where the input norm is expressed in terms of the quantity of finished product per unit of the given raw material the necessary input coefficient must be converted to the input-per-output form.

In some industrial branches the input coefficients are related to separate stages of the production process: if these stages correspond to the commodity classification for intersectoral balance they may be regarded as individual coefficients of intersectoral balance.

Subsidiary materials include those used in maintenance connected with the main production process or those added to basic materials to change their outward form and some of its properties. The method of rationing subsidiary materials is related to their ultimate use.

Subsidiary materials may be divided into three groups:

(*a*) Materials used directly in production; the use of these is rationed per unit of finished product;

(*b*) Materials expended in maintenance and operation of equipment: the use of such materials is usually rationed per machine-hour operation of equipment. From process maps showing the requirement in machine hours for the production of a product, one may obtain the normative of expenditures on similar subsidiary materials. Expenditures connected with current repairs of equipment are treated in a similar way.

(*c*) Materials used to repair production premises and structures: usually these are rationed per conventional repair unit or per concrete repair volume. It is possible to find the normative of expenditures on these materials from the summary needs of the enterprise in current repairs and from output data.

Tools are rationed either by the cost of the products to be produced or by machine hours of operation of equipment. In the latter case the normative of tool expenditure may be calculated on the basis of process maps or of the machine hours of equipment operation needed for production purposes.

Technological fuel is consumed in a similar manner to basic materials, and is so rationed. The fuel expenditure for heating buildings and structures is rationed per cubic metre of floor space.

Technological electric power is rationed per unit of output, but when it is expended to operate equipment the ration depends on the capacity of the electric motors and their hours of operation per day. Electricity for lighting is also rationed according to the capacity of lighting facilities and their operation hours per day.

When one enterprise manufactures several types of goods, for which there are corresponding items in the intersectoral balance list, the general productive expenditures are distributed according to the same methods as those adopted to calculate the production costs of an individual industrial branch. Such distribution is possible proportionally to the value of output of each component product, material expenditures, wages (without additional payments for progressive piece-work and premiums), main production workers etc. It is necessary to bear in mind, however, that subsidiary materials, fuel, electric power and so on include those expenditures that are not proportional to the value of output, such as electric power for lighting and fuel for heating. In this connexion, the normatives of such expenditures must be calculated on the basis of current data, due attention being paid to changes in production volume. An individual normative is a summary of analogous material expenditures effected directly both in the process of production (process expenditures) and in the operations of enterprises (productive expenditures as a whole).

The preparation of individual normatives for a plan period should be guided by the techniques of rationing: these are themselves a complex of various calculations and investigations, being based on detailed analysis of primary documentation on construction and technologies, analysis of losses occurring in production processes, and elaboration of corresponding technical and organizational measures for the saving of material and power resources as well as for the introduction of new machines, technology and advanced methods of the organization of production.

If the normatives for the use of material resources in the manufactures of new products have to be calculated the design data must be considered; in their absence the normatives of material expenditures on similar projects may be used, with the necessary adaptations of coefficients.

So far as the products listed in intersectoral balance consist of aggregated items, branch normatives of material expenditures per unit of output have to be calculated as the weighted means of individual normatives relating to individual components of the aggregative product.

In the process of preparing the initial data for intersectoral balance the averaging of individual primary normatives first derives material normatives for the production of a group of similar items included in each branch item of intersectoral balance and then obtains the average normatives of material expenditures for the production of the whole branch.

As has been indicated above, direct input coefficients depend upon the level of engineering, technology and organization of production. The contents and magnitudes of direct input coefficients change with technical progress in industry. To determine the coefficient for the plan period it is therefore necessary to assess the types of change likely to take place in the structure, technology and organization of production and their influence on patterns of expenditures.

Individual technological normatives (coefficients) relating to raw material expenditures, fuel and electric power are used in preparing direct input coefficients in physical units. The calculation of direct input coefficients in physical units can be made in the following schematic form:

$$a_{kl} = \sum_{p=1}^{m} \sum_{q=1}^{n} a_{pq} d_q + \sum_{p=1}^{m} S_{pl}$$

where

a_{kl} = ratio of direct expenditures in kind; for instance, ratio of direct expenditures on all kinds of refractory materials for the production of all kinds of steel;

m = number of products (p) in position (k); for instance, number of certain specific types of refractory materials expended for production of steel, which are included in the item "all kinds of refractory materials";

n = number of products (q) in position (l); for instance, quantity of certain types of steel making up the item "steel";

a_{pq} = individual coefficients of outlays on product (p) for the product (q); for instance, the coefficient of a given type of refractory material for a given type of steel/ton/ton;

d_q = proportion of product (q) in the whole product (l);

S_{pl} = additional requirement of product (p) for the whole production of (l).

TABLE 1: APPROXIMATE CALCULATION OF DIRECT INPUT REQUIREMENTS OF REFRACTORY MATERIALS PER TON OF STEEL PRODUCTION

	a_{pl}	d_q	$a_{pq}d_q$
Outlays on first type of refractory material			
for first type of steel	0·019	0·84	0·01596
for second type of steel	0·006	0·07	0·00042
for third type of steel	0·012	0·09	0·00108
Total outlays on first type of refractory material for three types of steel			0·01746
Outlays on second type of refractory material			
for first type of steel	0·003	0·84	0·00252
for second type of steel	0·005	0·07	0·00035
for third type of steel	0·008	0·09	0·00072
Total outlays on second type of refractory material for three types of steel			0·00359
Additional outlays on refractory material of both types for production of steel as a whole	$\left(\sum_{p=1}^{2} s_{pl}\right)$		0·001
Total direct outlays on refractory material for all types of steel	(a_{kl})		0·02205

An example of the calculation is shown in table 1, which relates to quotas of outlays on two types of refractory materials for three types of steel smelting (open-hearth furnace, converter, electric furnace).

Individual quotas of outlays on material resources are worked out in accordance with the operating instructions concerning the rationing of material expenditures for the main types of products of the iron and steel industry. The additional material outlays for the production as a whole, S , are calculated taking into account the relations existing between basic and subsidiary material outlays. The comparative level of these outlays may be determined by sampling the records of a country's leading enterprises.

Preparation of direct input coefficients per unit of output is thus based on planning normatives of outlays on raw materials, fuel, energy, and other material resources. When planning normatives are not available the preparation of direct input coefficients is done in the following sequence:

(*a*) the actual input coefficient in physical units is determined for the current year from initial statistical data;

(*b*) factors which could influence the magnitude of coefficients are identified;

(*c*) possible changes in the most important factors in the plan period are determined;

(*d*) assessment is made of the influence of changing factors on the size of direct input coefficients in physical units.

Direct input coefficients from an ex-post intersectoral balance or a planning balance for a different period may be employed as the basis for the preparation of current planning coefficients: for instance, the coefficients in the previous planning balances were used in the preparation of the 1970 planning balance coefficients. Statistical records of the consumption of raw materials, fuels and energy, as well as reports on available normatives and production cost records, are employed in the preparation of *ex-post* input coefficients. In some cases it is advisable to sample representative enterprises producing a given commodity.

The size of direct input coefficients is greatly affected by structural shifts in the production of certain types of products: for example, the shifts in the share of steel smelted in oxygen converters and electric and open-hearth furnaces in the total steel output are of great importance to steel outlays for rolling. In order to take into account structural shifts it is expedient to disaggregate these products into various sub-items and then to calculate the aggregate coefficient, taking due account of changes in their share in the total output of the given product. It is also sometimes desirable to divide given material into various types. For instance, in the calculation of the coefficient for steel outlays per ton of rolled stock production, rolled stock is classified by size assortment, and steel by types of smelting. The individual coefficients thus obtained are then aggregated into a single coefficient according to the shares of different types of rolled stock and steel, respectively, in the total production and in the total outlays.

In a number of cases it is useful to investigate the detailed functional relationships between inputs and outputs. In the iron and steel industry, for instance, the outlays on coke are dependent on the amount of oxygen which is used simultaneously in pig-iron smelting. The establishment of such relationships greatly facilitates the calculations of coefficients for the branches of physical intersectoral balances, especially those of the multivariant type.

IV. METHODS OF PREPARING DIRECT INPUT COEFFICIENTS IN VALUE TERMS

In contrast with input coefficients in physical units the value input coefficients incorporate outlays on material resources connected not only directly with the production of given branch but also indirectly through the production of secondary products produced and consumed within the given branch (and consequently not included in the gross output of this branch). For instance, if an iron and steel plant incorporates coke and chemical works in its shop capacity, the value input coefficient includes only that part of the coal outlays in the coke and chemical shop which corresponds to the share of the output of the coke and chemical shop utilized in that plant. Consequently: before the calculation of value coefficients on the basis of coefficients in physical units is begun, it is necessary to add to the latter the material outlays effected through other types of items produced locally. Mathematically this function is expressed in the following form:

$$a_{kl} = a^1{}_{kl} + a_{kv}a_{vl}\,(1-W_v),$$

where

a_{kl} = ratio of outlays on item k to the output of item l;
$a^1{}_{kl}$ = direct input coefficient for item k used for the production of item l;
a_{kv} = ratio of direct expenditures on item k to the output of item v;
a_{vl} = direct input coefficient for item v used for the production of item l;
W_v = proportion of item v received from outside for the production of item l.

In the calculation of direct input coefficients in value terms on the basis of coefficients in physical units, the Scientific Research Institute of Economics utilizes the following formula:

$$a_{ij} = \frac{k_i}{k_j} \sum_{k=1}^{m} \sum_{l=1}^{n} \bar{a}_{kl} \frac{p_k}{p_l} W_k\, d_l,$$

where

a_{ij} = direct input coefficient for the output of branch i used for the production of branch j;
$\bar{a}_{kl}$ = direct physical input coefficient for item k used for production of item l, adjusted for the use of item k effected through secondary products as explained above;
p_k = unit cost of item k;
p_l = unit cost of item l;
W_k = proportion of item k received from outside in the total outlays on item k for the production of item l;
d_l = relative share of item l in the gross output of branch j;
m = number of items included in the material expenditures of branch i;
n = number of items included in the output of branch j;
k_i = ratio of the wholesale cost of the output of branch i to the corresponding final consumption prices;
k_j = ratio of the wholesale cost of the output of branch j to the corresponding final consumption prices.

As this formula shows, the level of direct input coefficients in value terms depends on the size of direct input coefficients in physical units, the relation between the prices of materials and of products, the commodity structure of gross output, and the extent of combination between the branches under discussion.

Under the existing method of preparing intersectoral balances, value input coefficients are derived by the use of average wholesale prices of the branches (p_k and p_l). The average branch prices for the expended items $k(p_k)$ are determined as a weighted average based on the assortment of consumption of items k and the price list for the consumed products.

The average branch prices (p_l) of produced items l are determined similarly as weighted averages based on the planned assortment of various items and the price list for certain types of products included in a given assortment.

Direct input coefficients in value terms are calculated in final consumption prices. In accordance with the formula, therefore, the direct value coefficient at wholesale prices is multiplied by the ratio of wholesale prices to final consumption prices obtained for the supplier branch, and is divided by an analogous ratio obtained for the consumer branch.

The proportion of item k received from outside in the total use of that item for the production of branch j is equal to unity when that whole item is received from outside, i.e. from other enterprises. In a case where whole product k is manufactured at the enterprise where it is consumed, W_k is equal to zero, and consequently the outlays on this product are not included in direct input coefficients in value terms. As for the products which, departing from the factory method, are included in the gross output as "primary" products of the branch, no matter whether they are all consumed within the enterprise or are partly shipped out, W_k is always equal to one.

As to ratio d_l, the numerator—value of the gross output of item l—includes the goods produced and consumed within the same enterprise and hence not included in the gross output. The denominator is the gross output of branch j. When calculating d_l it is necessary to take into account the composition of the gross output of each branch in both base and plan years, adjusted according to current and prospective data.

When direct input coefficients in value terms cannot be obtained directly from appropriate physical coefficients, they are calculated on the basis of statistical data with appropriate amendments for the plan period, following the same sequence of procedure as indicated for the preparation of physical coefficients. Changes in value coefficients depend in fact upon:

(*a*) changes in input coefficients in physical units;

(*b*) changes in average prices in connexion with the changes in the commodity-mix of the output of the branch;

(*c*) changes in ratio W_k;

(*d*) shifts in the commodity-mix of the gross output of branches.

To determine value coefficients for a plan period a considerable amount of basic planning data is therefore necessary. Such data may be available at various stages in the preparation of current plans; they may also be available from the final preparations for long-term plans. In long-term planning however there is an important stage at which an initial preparation of basic economic indices of national economic development and an initial estimation of intersectoral proportions are called for. This stage may still lack many of the basic data which should underlie the estimation of planning coefficients. Different methods of calculating coefficients should be employed at this stage. Calculations of direct input coefficients can be based on *ex-post* balance data at thi nitial stages of preparation of the long-range nationale economic plan. The 1970 intersectoral balance, constructed at the initial stage of preparation of the 1966–70 Five Year Plan, indicated an acceptable level of accuracy of input coefficients based on an *ex-post* balance.

The open static model of intersectoral balance for the national economy is one of the most widely practised of today's planning techniques. This model helps to determine, in the final analysis, the amount of output to be produced by each branch and the level and structure of material expenditures that will ensure the attainment of a scientifically set goal of the people's living standards, expressed in the form of final products. The methods of calculating the final product and creating the basis for normatives, which in turn are the basis of the balance, have been worked out for some years. The static model, however, has some shortcomings. The main one is that industrial capital investments necessary for the expansion of production are determined autonomously and outside the balance model itself. This shortcoming will be corrected by a dynamic model of intersectoral balance now being developed, which embraces, in addition to current material expenditures, capital and labour expenditures in the endogenous system.

In addition to the input coefficients of the instruments of labour for each balance sector, the coefficients must be worked out for stock capacity, investment requirement and labour intensity. These coefficients have, in fact, been calculated for all the branches in the balances for the economy of the USSR in 1963, 1965 and 1970. The system of such coefficients makes it possible to calculate with the aid of computers an intersectoral balance which will ensure the equilibrium of capital and labour resources as well as raw materials, fuel and electric energy.

ANNEX

Selected elements from the 1959 intersectoral balance

(Annex table 1 follows overleaf)

ANNEX TABLE 1: DIAGRAM OF INTERSECTORAL BALANCE IN KIND

List of items (according to accepted nomenclature)	Measurement units	Resources				Output of items (compensation of expenditures)																						End product					Total distribution
																												To replenish the fixed and circulating assets		Consumption = non-productive			
		Production	Imports	Other entries	Resources (total)	Iron ore	Manganese ore	Limestone	Chromite ore	Pig-iron of all types (including blast-furnace ferro-alloys)	Steel	Non-ferrous rolled stock (pipes and forged ingots included; items of higher processing excluded)	Tin-plate	Cold-drawn structural steel	Steel piping	Pig-iron piping (excluding sewerage pipes)	Electric ferro-alloys	Wire nails	Wire, conventional	Steel wire	Cold-rolled steel strip	Coke, 6 per cent humidity	Welding electrodes	All kinds of refractory materials	. . .	Power transformers, etc.	Total	Fixed assets	Circulating assets	Total	Private consumption included	Exports	Total distribution
Part I						Part II																						Part III					
1. Iron ore																																	
2. Manganese ore																																	
3. Limestone																																	
4. Chromite ore																																	
5. Pig-iron of all types (including blast-furnace ferro-alloys)																																	
6. Steel																																	
7. Non-ferrous rolled stock (pipes and forged ingots included; items of higher processing excluded)																																	
8. Tin-plate																																	
9. Cold-drawn structural steel																																	
10. Steel piping																																	
11. Pig-iron piping (excluding sewerage pipes)																																	
12. Electro ferro-alloys																																	
13. Wire nails																																	
14. Wire, conventional																																	
15. Steel wire																																	
16. Steel cable																																	
17. Cold-rolled steel strip																																	
18. Coke, 6 per cent humidity																																	
19. Welding electrodes																																	
20. All kinds of refractory materials																																	
...																																	
26. Power transformers, etc.																																	
...																																	
...																																	

ANNEX TABLE 2: DIRECT AND TOTAL REQUIREMENTS OF NON-FERROUS METALS, BASIC CHEMICALS, ELECTRIC POWER AND THERMAL ENERGY AND COAL FOR THE PRODUCTION OF INDUSTRIAL GOODS

(Calculated according to the 1959 intersectoral balance for 1959 in value terms)

	Expenditure in roubles per 1,000 roubles of product		*Ratio of (3) to (2)*
(1)	*Direct (2)*	*Total (3)*	*(4)*
Expenditures on non-ferrous metals for:			
Metalware for industrial uses	543·4	672·7	1·2
Metal structures	539·7	645·4	1·2
Instruments	289·8	353·2	1·2
Sanitary engineering equipment	279·8	354·2	1·3
Equipment for building materials industry	256·7	353·0	1·4
Power machine-building industry	235·5	306·6	1·3
Bearings	234·5	306·4	1·3
Foundry equipment	196·9	362·4	1·8
Process equipment for food industry	153·9	216·7	1·4
Hoisting and transport equipment	148·0	223·2	1·5
Metal-cutting and woodworking machine tools	140·8	204·8	1·5
Process equipment for timber and paper industries	121·4	196·5	1·6
Equipment for civil engineering and road building works	120·9	217·6	1·8
Electrical engineering industry	120·8	175·5	1·5
Tractors, farm machines and spare parts for them	120·4	176·7	1·5
Forging and pressing equipment	111·1	181·7	1·6
Other metalware	101·4	138·3	1·4
Output of transport engineering	95·7	168·4	1·8
Repairs of all kinds of equipment	91·6	152·3	1·7
Process equipment for printing industry	73·0	103·4	1·4
Automobiles and spare parts	71·5	113·8	1·6
Process equipment for light industry	60·4	97·5	1·6
Instruments for production purposes	42·0	73·8	1·8
Cables	4·4	39·5	9·0
Instruments for cultural and public service purposes	3·6	12·9	3·6
Expenditures on basic chemistry products for:			
Artificial fibres	127·2	140·3	1·1
Aniline-dye industry	83·9	135·3	1·6
Synthetic, organic and other chemical products	71·4	92·3	1·3
Synthetic rubber	54·8	75·0	1·4
Basic chemistry	50·0	60·7	1·2
Products of timber chemistry and wood hydrolysis	31·6	36·7	1·2
Abrasive, micaceous and graphitic carbon goods	29·8	38·2	1·3
Synthetic resins and plastics	16·4	56·6	3·4
Mining and chemical goods industry	15·9	19·9	1·3
Goods of paint and varnish industry	15·4	42·5	2·8
Coke chemistry	11·5	16·2	1·4
Paper industry	10·2	14·6	1·4
Electrical engineering industry	7·6	17·8	2·4
Power machine-building industry	1·2	5·9	4·8
Expenditures on electric power and thermal energy for:			
Oil shale	91·9	107·6	1·2
Abrasive, micaceous and graphitic carbon goods	72·5	95·6	1·3
Artificial fibre	51·7	71·1	1·4
Fundamental chemistry goods	50·5	76·5	1·5
Foundry equipment	49·8	92·9	1·9
Petroleum output goods	47·7	59·1	1·2
Non-ferrous metal ores	44·6	59·4	1·3
Synthetic rubber	44·3	69·3	1·6
Bearings	39·7	59·1	1·5
Paper industry	33·7	47·7	1·4
Metalware for industrial uses	31·4	65·4	2·1
Refractory materials	30·8	51·3	1·7
Building materials	30·6	52·9	1·7
Peat	29·5	38·0	1·3
Power-machine building industry	28·6	50·7	1·8
Equipment for building materials industry	28·6	59·3	2·1
Forging and pressing equipment	25·9	48·2	1·9
Coke chemistry	26·0	59·8	2·3
Oil refinery products	22·3	37·9	1·7
Coal	21·8	35·4	1·6
Pumping and compressor equipment and refrigerators; equipment and apparatus for chemical industry	21·1	51·5	2·4
Metal-cutting and woodworking machine tools	20·2	39·7	2·0
Sanitary-engineering equipment	17·2	42·5	2·5
Repairs to all kinds of equipment	15·8	35·4	2·2
Instruments	15·5	35·4	2·3
Aniline-dye industry	16·4	46·7	2·8
Civil engineering and road-building equipment	16·7	44·1	2·6
Tractors, farm machines and spare parts	16·7	33·9	2·0
Process equipment for printing industry	15·6	30·3	1·9
Glass, porcelain and earthenware industry	15·3	27·8	1·8
Electrical engineering industry	14·7	44·7	3·1
Process equipment for timber and paper industry	14·0	35·3	2·5
Process equipment for light industry	12·1	26·0	2·1
Metal structures	11·1	39·1	3·5
Transport engineering	11·1	33·6	3·0
Instruments for production purposes	10·8	25·7	2·4
Automobiles and spare parts	6·5	26·8	4·1
Synthetic resins and plastics	6·4	37·6	5·9
Hoisting and transport equipment	12·8	35·0	2·7
Cables	9·2	71·1	7·7
Coal expenditure for:			
Coke and chemistry products	716·6	936·1	1·3
Electric power and thermal energy	222·8	275·2	1·2
Non-ferrous metals	81·2	270·1	3·3
Transportation of goods	74·1	103·9	1·4
Mining and chemical goods industry	57·6	115·6	2·0
Goods of gas industry	39·4	56·3	1·4
Paper industry	37·2	82·5	2·2
Building materials	34·4	111·6	3·2
Refractory materials	30·1	146·9	4·9
Glass, porcelain and earthenware industry	27·9	64·9	2·3
Timber chemistry and wood hydrolysis	27·9	58·5	2·1
Non-ferrous metal ores	24·7	93·0	3·8
Abrasive, micaceous and graphitic carbon goods	25·3	88·1	3·5
Foundry equipment	23·9	161·1	6·7
Sanitary engineering equipment	15·0	175·9	11·8
Metalware for industrial purposes	14·9	192·1	12·9
Basic chemical goods	14·9	130·4	8·8

ANNEX TABLE 3: DIRECT AND TOTAL EXPENDITURES OF ROLLED STOCK OF NON-FERROUS METALS, ELECTRIC POWER AND COAL FOR THE PRODUCTION OF INDUSTRIAL GOODS

(Calculated according to the 1959 current year intersectoral balance in physical units)

(1)	Unit of measurement (2)	Direct coefficient (3)	Total coefficient (4)	Ratio of (4) to (3) (5)
Use of non-ferrous rolled stock for:				
Trunk-line electric locomotives	tons/piece	119·7	156·5	1·3
Trunk-line diesel locomotives	tons/piece	95·8	122·5	1·3
Trunk-line passenger cars	tons/piece	36·8	45·3	1·2
Drilling units	tons/set	31·2	85·2	2·7
Trunk-line freight coaches	tons/piece	17·2	20·5	1·2
Excavators	tons/piece	12·1	16·4	1·4
Cutter-loaders	tons/piece	7·4	9·6	1·3
Trolley-buses	tons/piece	5·2	7·6	1·5
Steam boilers (excluding heating)	tons/ton of steam/hour	4·8	9·8	2·0
Automatic loaders	tons/piece	4·5	5·9	1·3
Grain harvesting combines	tons/piece	4·0	6·3	1·6
Scrapers	tons/piece	4·0	9·4	2·4
Forging and pressing machines (excluding hand machines and hand shears)	tons/piece	3·5	4·5	1·3
Buses	tons/piece	2·8	3·8	1·3
Tractors	tons/piece	2·6	3·8	1·5
Lorries	tons/piece	2·3	3·6	1·5
Power transformers	tons/1,000 kW	2·2	3·2	1·5
Bulldozers	tons/piece	1·9	5·9	3·1
Compressors	tons/piece	1·2	2·2	1·8
All kinds of steel piping	tons/ton	1·1	1·3	1·2
Wire nails	tons/ton	1·0	1·2	1·2
Conventional wire	tons/ton	1·0	1·2	1·2
Steel line	tons/ton	1·0	1·2	1·2
Cars	tons/piece	1·0	1·7	1·7
Process equipment and spare parts for cement industry	tons/ton	1·0	1·2	1·2
Oil equipment	tons/ton	1·0	1·3	1·4
Diesels	tons/piece	0·9	1·5	1·8
Metal-cutting machine tools	tons/piece	0·9	2·0	2·3
Metal-cutting instruments	tons/1,000 roubles	0·8	1·1	1·4
Roller bearings (new)	tons/1,000 roubles	0·7	1·4	1·9
High- and low-voltage electrical apparatus	tons/1,000 roubles	0·5	0·9	1·7
Crushing and grinding equipment	tons/1,000 roubles	0·4	0·5	1·2
Textile looms	tons/piece	0·4	0·8	2·3
Woodworking machine tools	tons/piece	0·4	0·6	1·6
Refrigerating units	tons/set	0·2	0·6	2·5
Instrument and means of automation	tons/1,000 roubles	0·2	0·3	1·6
Use of electric power for:				
Electrolytic ferro-alloys	kilowatt hours/ton	4,374	6,259	1·4
Lorries	kilowatt hours/piece	1,750	5,309	3·0
Cars	kilowatt hours/piece	1,679	3,898	2·3
Refractory materials	kilowatt hours/ton	626	681	1·1
Steel	kilowatts/ton	50	283	5·7
Window-panes	kilowatt hours/1,000m^2	438	980	2·2
Coal	kilowatt hours/ton	19·8	23·1	1·2
Trunk-line electric locomotives	1,000 kWh/piece	286·5	552·5	1·9
Trunk-line diesel locomotives	1,000 kWh/piece	103·9	235·9	2·3
Drilling units	1,000 kWh/set	11·2	183·8	16·4
Excavators	1,000 kWh/piece	10·4	26·9	2·6
Diesels	1,000 kWh/piece	8·5	12·8	1·5
Building faience and semi-china	1,000 kWh/1,000 pieces	7·9	10·0	1·3
Trunk-line freight coaches	1,000 kWh/piece	7·4	18·1	2·4
Foundry equipment	1,000 kWh/piece	3·8	6·3	1·7
Metal-cutting lathes	1,000 kWh/piece	3·3	6·8	2·0
Compressors	1,000 kWh/piece	2·1	5·0	2·4
Textiles looms	1,000 kWh/piece	2·0	3·4	1·7
Scrapers	1,000 kWh/piece	1·9	14·7	7·9
Ethyl alcohol, rectified	1,000 kWh/1,000 dal	1·6	2·7	1·7
Metal-cutting instruments	1,000 kWh/1,000 roubles	1·3	2·2	1·7

ANNEX TABLE 3 (*continued*)

 (*1*)	*Unit of measurement* (*2*)	*Direct coefficient* (*3*)	*Total coefficient* (*4*)	*Ratio of (4) to (3)* (*5*)
Use of coal for:				
Coke	kilograms/ton	1,434	1,526	1·1
Electric power	kilograms/1,000 kWh	526	587	1·1
Refractory material	kilograms/ton	86	514	6·0
Cement	kilograms/ton	135	147	1·1
Window-panes	kilograms/1,000 m^2	5,244	6,206	1·2
Pig-iron	kilograms/ton	29	1,412	48·7
Steel	kilograms/ton	42	1,018	24·5
Rolled stock of non-ferrous metals	kilograms/ton	48	1,464	30·7
Electrolytic ferro-alloys	kilograms/ton	69	3,760	54·7
Powdered sugar	kilograms/ton	739	955	1·3
Synthetic fibre	tons/ton	18·1	24·7	1·4
Ethyl alcohol, rectified	tons/1,000 dkl	13·9	16·4	1·2
Building faience and semi-china	tons/1,000 pieces	7·3	13·8	1·9
Foundry equipment	tons/piece	4·8	14·1	2·9
Artificial fibre	tons/ton	4·7	10·2	2·2
Woollen fabrics (ready)	tons/1,000 m^2	1·5	3·2	2·1
Lorries	tons/piece	1·4	10·1	7·2
Rolling equipment	tons/ton	0·5	3·0	5·9

CHARACTERISTICS OF THE USSR INPUT-OUTPUT TABLES

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I. INPUT-OUTPUT TABLES FOR 1959

The first large-scale operational input-output tables for the entire USSR economy for 1959 were completed in 1961. Two other tables, one in current 1959 purchasers' prices and the other in physical units, were prepared at the same time. Both presented flow tables, tables of direct input coefficients, and tables of direct and indirect coefficients (i.e. $(I-A)^{-1}$ type inverse of the technology matrix).[1]

The table in value terms was prepared in the form of four quadrants. The interindustry transaction matrix shows the production and distribution of output of 83 endogenous sectors, 73 of which are industrial; the matrix has no unallocated flows. The table follows the definition of productive activity in the material product system and the sectors shown are only those engaged in "material production", i.e. industry, agriculture, construction, freight transportation, communications serving production, and all trade and distribution activities. All other services—such as financial, medical, passenger transportation, or communications serving population and other non-productive spheres—are excluded from the interindustry transaction matrix and shown as consumers in the final demand quadrant.[2] Construction (represented by one sector, and thus covering maintenance and new construction) is shown only as the purchaser of inputs (columns) with the entire output allocated to final demand; this leaves the construction row of the transaction matrix blank. The flow table was completely integrated with Soviet national income accounts, both in the final demand quadrant (income by use) and in the value added quadrant (income by source). Both competing and non-competing imports are shown in terms of a single row of entries in the value-added quadrant, with imports classified with sectors producing similar or identical products domestically.

The flow table in physical units was prepared for industrial products only (the definition of industry includes mining as well as manufacturing enterprises). It shows the production and distribution of 157 products with flows expressed in appropriate physical units (tons, kilowatt hours, units) except for twelve aggregated groups of products such as small electrical appliances, or spare parts for machinery, which were measured in constant prices. Even with the Soviet definition of gross industrial product, the coverage was far from complete. An entire industry branch, designated in the USSR statistical classification as miscellaneous (printing and publishing, toys, jewellery, plastic products, and some mining of non-metallic minerals), was omitted. Furthermore, according to one source, some 20 per cent of the gross output of ferrous metallurgy, 40 per cent of the gross output of chemicals, and 40 per cent of machine-building and metal-working products have not been included in the table.[3]

The layout of the table in physical units is somewhat different from its counterpart in value terms. It is rectangular, with three quadrants: the first, consisting of two columns and 157 rows, shows stocks at the beginning of the period, and imports; the second, a square 157 × 157 table, shows the interindustry production and distribution of 157 products; and the last is a demand quadrant, consisting of four columns and 157 rows, which divides final demand into general market fund, other uses, exports, and stocks at the end of the period. The format of the table was later criticized for not separately identifying final consumption and investment components of final demand.[4]

The flow and coefficient data necessary for the construction of both 1959 tables could not have been obtained from census or other statistical and planning data, and a specially designed sampling survey was conducted between April and June 1960. The survey covered 11,000 industrial enterprises and construction projects and was of a stratified-random type.[5]

Industry as a whole was divided into groups according to the standard industrial statistical classification (for example, ferrous ores, textiles and petroleum extraction) and selected groups were then further divided into subgroups of small-, medium- and large-scale enterprises (by value of output). Sampling within groups and subgroups was random. On the average, 20 per cent of all the enterprises included in the group or subgroup were sampled; but the coverage was greater for groups of

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[1] M. R. Eidelman, *Vestnik statistiki,* No. 1, 1960, pp. 55–60, and No. 7, 1961, pp. 9–29; *Voprosy ekonomiki,* No. 10, 1961, pp. 61–74. L. Berri, F. Klotsvog and S. Shatalin, *Planovoe khoziaistvo,* No. 2, 1962, pp. 51–62. For an English summary of earlier Soviet experiments with input-output techniques see V. G. Treml, "Economic Interrelations in the Soviet Union", Joint Economic Committee, 88th Congress, *Annual Economic Indicators for the USSR* (Washington, D.C., 1964), pp. 183–213.

[2] Since the table was prepared in terms of purchasers' prices, which include trade and transportation costs, the allocations of these sectors to final demand are, by definition, zero.

[3] L. Berri, F. Klotsvog and S. Shatalin, *Planovoe khoziaistvo,* No. 2, 1962, p. 58.

[4] E. L. Vairadian in *Voprosy statisticheskoi metodologii,* edited by I. G. Malyi (Moscow, 1964), pp. 237–238.

[5] Flow data for agriculture and other non-industrial sectors of the table in value terms were taken directly from census statistics.

multi-product enterprises (such as chemicals) and smaller for groups of enterprises producing homogeneous products such as natural gas. The enterprises being sampled were directed to report in detail the cost structure of each product produced, including secondary and auxiliary products. One questionnaire was provided for the data in value terms, and another for the data in physical units.[6]

The input-output tables are constructed in terms of "pure" sectors or homogeneous products; that is, the secondary, auxiliary, and other non-sectoral products are removed in the process of preparing the table. The method of adjustment employed in the USSR tables is very similar to that used in Japanese input-output studies: products are removed from sectors for which they are secondary and added to sectors for which they are primary. In tables in value terms the input structure (column) is adjusted in proportion to the value of output removed or added. In tables in physical units the enterprises being sampled were asked to identify all costs as related to production of primary and secondary products. These latter tables, following the practice of planning and statistical agencies, show gross turnover of output, including all fabricates and semi-fabricates produced and used up within the same enterprise. Thus for a position in the table designated "sugar" the total output will include granulated sugar produced and subsequently used in the production of lump sugar. If, on the other hand, the semi-fabricate (such as granulated sugar) is shown by a separate position, the necessary adjustments will be made in the cost structure of the sector.

Unfortunately it is difficult to see from the literature how extensive the adjustments for homogeneity of output were in the preparation of the table in physical units. In the table in value terms the adjustments were rather significant, especially for manufacturing enterprises, as can be seen from table 1. One study showed that 88·3 per cent of the gross output of ferrous and non-ferrous metallurgy (as currently reported in statistics on the establishment basis) consist of metallurgy products proper; the remaining 11·7 per cent cover secondary, auxiliary and other products which had to be removed from the sector as non-sectoral. At the same time metallurgy products proper (produced in establishments not classified as metallurgical) were added to the gross output of ferrous and non-ferrous metallurgy, with a resulting net change of +4·8 per cent. Further, as can be seen from the table, the "pure" output of machinery and metalworking turned out to be lower than the gross output reported on the establishment basis, and the pure output of chemicals, after adjustments, to be substantially higher.

TABLE 1: SHARES OF PRIMARY AND SECONDARY OUTPUT IN SELECTED SECTORS AND INDUSTRIES, USSR, 1959

	Percentage of total	
Sector or branch	*Share of primary output in unadjusted gross output*	*Net changes in gross output[a] after adjustments*
Metal-ore mining (all kinds)	85·2	n.a.
Metal-ore mining (ferrous)	n.a.	96·6
Coking coal products	n.a.	141·8
Ferrous metals	85·0	n.a.
Ferrous and non-ferrous metals	88·3	104·8
Coal mining	99·6	n.a.
Petroleum extraction	n.a.	88·9
Oil shales	n.a.	175·4
Electrical power	98·2	n.a.
Fuels (all) and electrical power	n.a.	106·8
Transporting and hoisting machinery	64·9	n.a.
Forging-pressing equipment	65·9	91·9
Transportation machinery	72·2	n.a.
Energy and power machinery	79·8	n.a.
Machine tools	92·3	n.a.
Tools and instruments	n.a.	114·3
Machine building (all)	n.a.	92·0
Chemical industry	n.a.	111·6
Woodworking and paper	n.a.	95·6
Construction materials	91·6	n.a.
Textiles and apparel	n.a.	100·5
Food industry	n.a.	100·5

Sources: M. R. Eidelman, *Vestnik statistiki*, No. 7, 1961, p. 15, and in the same journal, No. 5, 1963, p. 17; A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965), p. 81; and Iu. M. Shvyrkov, *Klassifikatsiia otraslei v narodnokhoziaistvennom plane* (Moscow, 1965), p. 32 and p. 40.

n.a. = not available.

[a] Gross output in wholesale prices net of turnover tax.

After the sample data had been collected and collated and the necessary adjustments for product homogeneity made, the sample flow matrix was recalculated into a matrix of direct material coefficients showing input requirements per unit or per rouble of gross output. Finally, using control national economy totals for the gross output of various sectors and products shown, the interindustry transaction flow table was prepared, and final demand, value-added, and foreign trade data were added from census data.

Product coverage used in the 1959 *ex-post* table and in subsequent planning tables is shown in table 2. With the exception of some sample coefficients (both direct, and direct and indirect) the 1959 input-output table in physical units has not been published. A somewhat truncated version of the interindustry transaction matrix in value terms was published in the 1960 *Statistical Yearbook*.[7]

The 1959 input-output table in value terms was subsequently complemented by the addition of labour

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[6] R. Eidelman, *Vestnik statistiki*, No. 7, 1961, pp. 9–10. A. N Efimov, *Ekonomicheskaia gazeta*, 4 Sept. 1961, pp. 3–4. The instructions issued by the Central Statistical Administration of the USSR and the two questionnaires are available in translation by the U.S. Dept. of Commerce, Joint Publication Research Service, *Forms and Instructions for 1959 Input-Output, USSR* (Washington, D.C., 1962). JPRS 14132.

[7] Ts. S. U. *Narodnoe khoziaistvo SSSR v 1960 godu* (Moscow, 1961), pp. 103–143.

TABLE 2: PRODUCT CLASSIFICATION AND INDUSTRY BREAKDOWN EMPLOYED IN SOVIET INPUT-OUTPUT TABLES

Product or branch	*1959*[a]	*1959*	*1962*	*1963*	*1964–65*	*1970*[a]
Ferrous metallurgy	5	15	17	18	20	6
Non-ferrous metallurgy	2	14	25	25	27	1
Fuel-energy	9	9	10	10	14	8
Chemicals	10	21	30	40	39	11
Paper and woodworking	6	9	13	15	16	5
Construction materials	1	6	15	16	21	13
Machine building	27	60	176	184	213	38
Textiles and apparel	3	13	20	20	24	12
Food products	7	10	13	12	32	14
Miscellaneous industrial products	3	—	4	4	13	4
Total industry	73	157	323	344	408	112
Agriculture	2	—	14	19	20	2
Construction	1	—	1	1	1	5
Transportation and communications	2	—	7	7	7	2
Trade and distribution	3	—	1	1	2	2
Other	2	—	—	—	—	1
TOTAL	83	157	346	376	438	124

Sources: N. I. Kovalev, *Vychislitelnaia tekhnika v planirovanii* (Moscow, 1964), p. 199; and A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965), p. 92.

[a] Tables available in value terms.

data, i.e. by total employment in each of the 83 sectors in man-years, and by a capital capacity vector.[8]

Before an examination of *ex-ante* or planning national input-output tables, and other problems concerning the manipulation of input-output data, at least a brief reference must be made to the extensive exploration of regional and interregional input-output tables in the USSR. Recognizing early the regional differentials in production techniques, prices, transportation costs, and other factors, and the difficulties and distortions introduced by the aggregation of regional data, several groups of scholars devoted their attention to the problems of preparing regional input-output tables. So far 19 such regional tables have been constructed, ranging from a small 14-sector table for the Mordovskaia region to a 500-sector table for the Byelorussian SSR. Several more are in preparation. Both *ex-post* and planning types of input-output tables are being constructed but, with the exception of the 500-sector one for the Byelorussian SSR, all regional tables are in value terms. The first interregional table was recently completed for 1961; it covered 239 products in three Baltic republics and was based on separate tables. This pilot interregional table shows flows measured in producers' prices, in contrast to all other regional tables in value terms, which have been prepared in purchasers' prices. With the exception of the import vector, which is much more detailed, the regional input-output tables are similar to national counterparts in format and in structural and algebraic characteristics.[9]

II. SOME FEATURES OF THE 1959 TABLES IN VALUE TERMS

A comparison of the two 1959 *ex-post* input-output tables shows that the smaller, 83 × 83 table in value terms is closer to the traditional input-output form and is a versatile analytical tool, mainly because of its labour and capital vectors. The larger, 157-product table in physical units is more akin to traditional material balances, except that the individual balances (rows) are completely integrated in a fully balanced table. The table can be used to analyse and, in a planning sense, to ensure the consistency of given gross output levels with individual industry requirements. This is in itself a major step forward in the practice of planning with material balances. However the incomplete coverage, the format of the final demand quadrant, and the absence of any primary resource constraints make it impossible to use the table for a consideration of the feasibility of alternative final demand mixes and for other traditional exercises with input-output models.

Unfortunately the 1959 *ex-post* table in physical units and the subsequent planning tables have never been published in the USSR; nor does the literature seem to offer any significant discussion of the structure of production, or even of the main parameters, as revealed by these studies. We may, however, consider some of the structural data revealed in the 1959 *ex-post* table in value

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[8] Labour data, apparently obtained by the same sampling survey, were adjusted to agree with the adjusted homogeneous-product sectors. The entire flow table in value terms was recalculated in labour terms by multiplying each row of the interindustry transaction matrix and the final demand quadrant by a corresponding labour input coefficient defined as man-years of labour per rouble of gross output. See M. R. Eidelman, *Vestnik statistiki,* No. 10, 1962, pp. 3–17, *Sotsialisticheskii trud,* No. 2, 1963, pp. 12–13; and A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965), pp. 190–203. The interindustry transaction matrix in man-years was published in an abridged format in Ts. S. U. *Narodnoe khoziaistvo SSSR v 1961 godu* (Moscow, 1962), pp. 77–117.

[9] V. V. Kossov (ed.), *Mezhotraslevoi balans proizvodstva i raspredeleniia produktsii ekonomicheskogo raiona* (Moscow, 1964). Iu. R. Leibkind, *Vestnik Akademii Nauk SSSR,* No. 10, 1963, pp. 15–17. V. Kossov and L. Mints, *Vestnik statistiki,* No. 6, 1964, pp. 16–25.

terms, since presumably some basic parameters are similar for tables both in value terms and in physical units.[10]

Two aspects of the structure of production revealed by the 1959 *ex-post* table in value terms are of particular interest: the high concentration of flows and the bloc-triangular structure.

The 83 × 83 interindustry transaction matrix shows 4,260 non-zero entries, thus having the density of approximately 62 per cent. Subsequent studies have revealed however that most direct material input coefficients are small and that some 500 (or 12 per cent of all non-zero entries) account for about 95 per cent of all interindustry transactions, including 97–98 per cent of all purchases of construction and agriculture; about 95 per cent of purchases of the metallurgical, fuel, electrical power, textile, apparel and food industries; and some 80 per cent of purchases of the machine-building, transportation, woodworking and paper industries.[11] The high degree of concentration of flows among a relatively small number of positions in the interindustry transaction matrix is further illustrated in table 3.

TABLE 3: CONCENTRATION OF FLOWS IN SOVIET 1959 INTERINDUSTRY TRANSACTION MATRIX (1959 DATA)

Purchasing sector	*Number of major suppliers*	*Relative share of major suppliers in total purchases (percentage)*[a]
Coal mining	5	87·5
Oil extraction	3	74·7
Electrical power	7	96·2
Electrical appliances	11	82·5
Instruments	5	66·5
Machine tools	6	73·9
Automobiles	8	84·8
Basic chemicals	6	65·8
Resins and plastics	5	89·8
Woodworking	9	85·6
Construction materials	13	89·4
Textiles	8	97·6
Apparel	1	98·5
Sugar	4	94·9
Construction	23	97·4
Agriculture	7	94·9
Animal husbandry	7	97·9

Sources: L. Berri, F. Klotsvog and S. Shatalin, *Planovoe khoziaistvo*, No. 9, 1962, p. 102.

[a] Total cost of material purchases only; i.e. column sum of the interindustry transaction matrix, less costs of transportation, communications, trade and distribution.

It is interesting to note that the concentration of flows revealed and the importance played by a small number of coefficients was deemed sufficient for the preparation of the technology matrix (direct input coefficients) for the 1962 planning tables by the adjustment of only some 500 coefficients, the remaining 3,760 being left as in the 1959 table. The selected key 500 coefficients were adjusted for technological changes, and price and output-mix changes.[12]

Another interesting feature of the 1959 *ex-post* table in value terms is its triangular and bloc-triangular (bloc-diagonal) inner structure which, in all probability, repeats itself in the table in physical units.

The triangularity can be described as follows: the order of the 83 sectors of the interindustry transaction matrix was rearranged in such a way that, as far as possible, each sector would be purchasing less from the preceding sector than it was selling to it; that is, $a_{i-1,\ i} < a_{i,\ i-1}$. This rearrangement of the order in which the 83 sectors are shown in the 1959 table resulted in an almost triangular table in which 92·2 per cent of all interindustry transactions are found on or below the main diagonal of the matrix.[13] The new sector order is very similar to the triangular sector order of other developed economies. At the apex of the matrix are the processed foods, apparel, textile and footwear industries followed by machinery, chemicals, metals, mining, fuels and services.[14]

A further step could be to rearrange the order in which the sectors are listed so as to produce a bloc-triangular interindustry transaction matrix, i.e. a matrix with several distinct blocs (three in the case of the 1959 matrix, omitting the services) having a high degree of inter-

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[10] We must however bear in mind the basic differences of the two tables. In the first place, the technology matrix of the table in physical terms is larger (157 × 157) than the matrix in value terms (83 × 83). Secondly, in contrast with the table in value terms, which offers a complete coverage of all interindustry flows, the table in physical units appears to cover, at best, between 65 and 70 per cent of the interindustry flows.

[11] L. Berri, F. Klotsvog and S. Shatalin, *Planovoe khoziaistvo*, No. 2, 1962, p. 55. A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965), pp. 102–103.

[12] L. Berri, F. Klotsvog and S. Shatalin, *Planovoe khoziaistvo*, No. 9, 1962, pp. 34–43. The importance of this group of key input coefficients is further illustrated by the results of the following sensitivity test. Each coefficient was separately tested to determine the maximum relative change it could undergo before this change would result in a 1-per cent change in the gross output of the given sector chosen as the arbitrary upper limit of tolerance. The test showed that 384 (or 9 per cent) of the total of 4,260 non-zero input coefficients could be varied by 50 per cent before the limit of tolerance would be reached; another group of 199 coefficients (4·7 per cent) could undergo increases up to 100 per cent before inducing a 1-per cent change in gross output. A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965), pp. 156–157.

[13] Iu. R. Leibkind in *Narodnokhoziaistvennye modeli*, edited by A. L. Vainshtein (Moscow, 1963), pp. 162–179.

[14] The structural similarity of the Soviet and other economies can also be seen in the following test. In a study of international comparisons based on input-output data, Chenery and Watanabe classify all commodities into four groups in accordance with two ratios: U, or the ratio of total intermediate purchases of the given industry to gross outlays; and W, or the ratio of total interindustry deliveries of the given industry to gross output. The four groups are identified as final manufacture ($W \leq 0{\cdot}45$; $U \geq 0{\cdot}45$), final primary production ($W \leq 0{\cdot}45$; $U \leq 0{\cdot}45$), intermediate manufacture ($W \geq 0{\cdot}45$; $U \geq 0{\cdot}45$), and intermediate primary production ($W \geq 0{\cdot}45$; $U \leq 0{\cdot}45$). Working with aggregated input-output tables for four countries—Italy, Japan, Norway and the United States—the authors show that all commodities, irrespective of country, fall in the same group. The present author repeated this exercise with a reconstructed 66-product Soviet table for 1959 (Vladimir G. Treml, *The 1959 Soviet Intersectoral Flow Table*, Volumes I and II, RAC Technical Paper 137, Washington, D.C., 1964). With the exception of services and other small discrepancies, all Soviet commodities (when classified in accordance with the value of U and W ratios) fall into one or other of the four appropriate groups.

dependence and rather weak ties: 79·3 per cent of all interindustry transactions being found within the three blocs, and only 20·7 per cent constituting inter-bloc flows. The triangular inner structure would be retained within the blocs, with some 95 to 99 per cent of all intra-bloc transactions lying on or below the main diagonal of the table.

It is interesting to note that the bloc-triangular inner structure of the matrix closely supports a hypothesis recently advanced by Simpson and Tsukui of the Harvard Economic Research Project. Working with five input-output tables for Italy, Japan, Norway, Spain and the United States they showed that each table lends itself to a rearrangement into a bloc-triangular format with a strong intra-bloc interdependence and weak inter-bloc relations. Transactions within blocs are nearly triangular.[15] A comparison of these blocs and those of the Soviet tables reveals a close correspondence between them.

	Simpson-Tsukui blocs	*Soviet blocs*
Bloc A:	Final metal products	Final metal products
	Intermediate metal products	Intermediate metal products
	Basic metals and ores	Basic metals and ores
Bloc B:	Apparel and processed foods	Apparel and processed foods
	Other non-metal products	Agriculture
	Agriculture	
Bloc C:		Other non-metal products
	Electrical power	Electrical power
	Fuels	Fuels

Generally it appears that (in spite of specific features of the 1959 input-output tables for the USSR, such as the treatment of services, the use of purchasers' prices, and the important discrepancies in the commodity classification systems employed) the basic parameters revealed by these tables are similar to comparable structural data derived from input-output tables of other countries, e.g. the 1947 table for the United States.[16]

III. *Ex-ante* INPUT-OUTPUT TABLES

Almost immediately after the completion of the two 1959 *ex-post* tables, attention was turned to the construction of planning input-output tables. As has been seen in table 2 above, the USSR planning and research agencies have completed six tables and are working on the seventh planning input-output table (five of them in physical units). This impressive statistical and computational effort does not however indicate a full incorporation of input-output techniques with the other tools of the planning mechanism. Contrary to the expectations expressed earlier by some proponents of input-output analysis the planning models have not been integrated with the other tools of planning, and input-output techniques have remained in an experimental stage.[17]

Needless to say the introduction of the input-output techniques would greatly increase the flexibility and accuracy of planning. As both home and foreign analysts of the USSR system point out, the planners today (as in the past) begin with gross-output targets extrapolated from previously achieved levels, the consistency of various gross-output levels not being ensured beyond a few key industries and industrial interrelations. National income, and particularly its consumption component, is being determined essentially as a residual, after interindustry demand, export and investment requirements have been satisfied.[18]

Current experiments with planning input-output models (especially those in physical units) have not yet been extended to incorporate primary resource constraints, and the exercises conducted until now seem to have one overriding purpose: the development of a method of constructing a balanced interindustry transaction table with gross output levels and individual allocations that is consistent with a given set of final demand targets.[19]

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[15] David Simpson and Jinkichi Tsukui, "The fundamental structure of input-output tables, an international comparison", in *The Review of Economics and Statistics,* Vol. XLVII, Nov. 1965, pp. 434–446.

[16] The structural similarity of the USSR and the United States economies can be seen in the results of a study recently completed by the author under the auspices of the Research Analysis Corporation, McLean, Va. which is available in mimeographed form under the title "Structural similarities of the US and the Soviet economies, based on comparisons of input-output data" (V. Treml, 1965). The study covered 43 industries comparable in terms of commodity classifications listed in the 1959 USSR and the 1947 United States input-output tables. The rank correlation coefficient for direct labour input coefficients (employment in man-years per one million roubles or dollars of gross output) was calculated as +0·78; and that for ratios of final demand to gross output (Chenery and Watanabe's *W* ratio) was calculated as +0·79. The second group of rank correlation tests was applied to the structure of material purchases of the 43 comparable industries. Relative shares for purchases of metals, fuels and chemicals in total interindustry purchases were calculated and ranked with the following results: purchases of metal +0·90, of fuels +0·85, and of chemicals +0·70. Similarly significant, although somewhat low rank, correlation coefficients were obtained from a comparison of the input-output tables of the USSR for 1959 and those completed in the United States for 1958. For a Soviet study of international comparisons see L. Berri and Iu. Shvyrkov, *Voprosy ekonomiki,* No. 1, 1963, pp. 133–144. The fact that these authors operate with large aggregates somewhat reduces the value of their results.

[17] A. Modin, *Voprosy ekonomiki,* No. 1, 1964, p. 112. V. Belkin, *Voprosy ekonomiki,* No. 6, 1964, p. 112. M. Z. Bor, *Voprosy ekonomiki,* No. 3, 1963, p. 5. Iu. I. Cherniak in *Planirovanie i ekonomiko-matematicheskie metody,* edited by N. P. Fedorenko (Moscow, 1964), pp. 190–191.

[18] One Soviet writer has described the present methods used as follows: "The planning rates of growth and proportions are determined essentially by gross output level projections, without giving due consideration to the needs of final consumption of the society. Gross output levels of steel, fuels and electrical power have been used as the starting point in preparation of the State Plan, and these levels were not balanced with the planning of levels of final consumption, national income, or standards of living. Plans for expansion of various branches are often based on achievements of previous periods without reference to the real requirements." S. Shatalin, *Voprosy ekonomiki,* No. 1, 1965, p. 23. Another authority states that "gross output levels are determined first by calculations of intermediate material requirements, and only then follows the calculation of final product. Consumption by the population is determined as a residual after subtracting capital investment from the final product". V. S. Nemchinov, *Voprosy ekonomiki,* No. 7, 1964, p. 82.

[19] V. S. Nemchinov, *Planovoe khoziaistvo,* No. 6, 1963, pp. 1–9. G. I. Grebtsov et al., *Osnovy sostavleniia mezhotraslevogo balansa* (Moscow, 1962), pp. 187–277.

TABLE 4: NATIONAL INPUT-OUTPUT TABLES FOR THE USSR ECONOMY ALREADY CONSTRUCTED OR IN PREPARATION

	Number of products/sectors				*Percentage coverage of GSP*[a]	*Density of matrix*[b]
Year	*Total*	*Industrial*	*Type*	*Unit of measurement*		
1959	83	73	*Ex-post*	Purchasers' prices	100	61
1959	157	157	*Ex-post*	Physical units	65–70[c]	n.a.[d]
1962	83	73	Planning	Purchasers' prices	100	61
1962	346	323	Planning	Physical units	n.a.	8·4
1963	372	344	Planning	Physical units	80	n.a.
1963	435	407	Planning	Physical units	80	6·9
1964–65	438	408	Planning	Physical units	85	n.a.
1966[e]	n.a.	n.a.	*Ex-post*	Purchasers' prices	n.a.	n.a.
1970	124	112	Planning	Physical units	100	42·6
1970[e]	600	n.a.	Planning	Physical units	n.a.	n.a.

[a] Percentage coverage of Gross Social Product is the total value of material goods and productive services produced in the given year measured in producers' prices, but including turnover tax.

[b] Percentage of non-zero entries in the interindustry transaction matrix.

[c] Gross industrial product only (author's estimate).

[d] Not available.

[e] In preparation.

The planning input-output tables described are thus static, and the capital investment allocations shown are simply categories of final demand and are not related to next-period productive capacities.[20] The available literature on the subject does not offer a detailed description and analysis of planning input-output models, or a comprehensive description of problems encountered in their construction. The following discussion will therefore be limited to a few selected technical problems.

As can be seen from table 4 the number of products included in input-output in physical units was increased from 157 in the 1959 table to 346 in the first such planning table for 1962, and thence continuously to the projected 600 products to be shown in the 1970 table being currently prepared. This trend is dictated by a reluctance to use the common denominator of prices for groups of heterogeneous products on the one hand, and the desire to obtain the maximum possible coverage of Gross Social Product (GSP) on the other. The increased size of the matrix did make it possible to improve the coverage of the GSP—the 1963 table accounts for about 80 per cent (almost the entire agricultural output, and 70 per cent of new and maintenance construction) and the 1964 table shows approximately 85 per cent. This is to be compared with the coverage of some 65–70 per cent in the 1959 *ex-post* table in physical units.[21] It must be added that the expanded product coverage is explained not only by the increase in the number of positions in the table but also by the addition of a row of unallocated inputs measured in value terms. As could be expected the increase in the number of products shown by separate positions led to a decrease in the density of the matrix. The 1962 *ex-ante* 346 × 346 matrix has 8·4 per cent non-zero entries, and this percentage is decreased to 6·9 in the 1963 *ex-ante* 435-product matrix.[22]

The work on a planning input-output table thus starts with the preparation of a matrix of direct material input coefficients. Planning, statistical, and research agencies and organizations in the USSR have had a long experience of collecting, estimating and collating input coefficients (input norms in Soviet terminology) which constitute the basic frame of reference for subsequent allocation, distribution, or target-assigning in economic planning. In addition to elaborating methods of determining these norms the various agencies have also amassed a substantial quantity of empirical data. According to Soviet specialists in this area however the organization and methodology employed in norm-setting leaves much to be desired. At the outset of their explorations of input-output techniques researchers in the USSR reluctantly came to the conclusion that almost no coefficient (or flow) data which are available in the form of census statistics of the Central Statistical Administration of the USSR or in planning documents processed by various planning agencies, are directly usable in the preparation of input-output tables.[23] The framers of input-output tables had therefore to resort to sampling surveys for the construction of the first large-scale 1959 *ex-post* tables, and to an independent estimation of required input coefficients in the subsequent planning of input-output tables.

The available input coefficients (norms) could not be employed because of their general shortcomings: inconsistencies in product and branch classifications, differences in the product definitions used by various agencies, and varying levels of aggregation. But even apart from these general shortcomings the norms

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[20] Some work in dynamic input-output analysis can be found in A. D. Smirnov, *Dinamicheskaia model mezhotraslevogo balansa* (Moscow, 1964) and in A. A. Konüs in *Metody planirovaniia mezhotraslevykh proportsii*, edited by A. Efimov and L. Berri (Moscow, 1965), pp. 54–75.

[21] N. Kovalev, *Voprosy ekonomiki*, No. 5, 1963, pp. 76–87. N. Kovalev, *Vychislitelnaia tekhnika v planirovanii* (Moscow, 1964), p. 198.

[22] N. Kovalev, *Voprosy ekonomiki*, No. 5, 1963, p. 80.

[23] M. R. Eidelman, *Vestnik statistiki*, No. 1, 1960, p. 66. Iu. R. Leibkind, *Vestnik Akademii Nauk SSSR*, No. 10, 1963, p. 17. A. Modin, *Voprosy ekonomiki*, No. 1, 1964, p. 112.

employed by planning agencies were found to be not directly usable within the frame of reference of input-output analysis. All USSR statistical and planning information is related to establishment or administrative divisions and not to the product basis—thus the use of available data would have entailed costly and time-consuming recalculations to remove secondary and auxiliary inputs and outputs.[24] Moreover, the input coefficients employed in input-output tables show input requirements per unit of output based on the entire technological process within the given manufacturing enterprise: to give but one example, fuel requirements include not only fuels used up in direct productive processes such as heat treatment or machining, but also fuels used up in intra-plant transportation, heating of auxiliary quarters, etc. The input coefficients (norms) used by planning agencies, on the other hand, as a rule show only direct input requirements generated in main productive processes, and would not reflect the indirect or secondary requirements of the whole enterprise. In some industrial sectors the use of direct productive process input requirements would understate the total enterprise requirements by as much as 10–15 per cent.[25]

Another thorny problem in the preparation of the matrix of direct input coefficients is posed by aggregation. Even in input-output tables in physical units (which show a large number of fairly narrowly defined products) aggregation is unavoidable. In the 1959 *ex-post* table in physical units such products as rolled ferrous metals, refractory materials, coal, diesels, metal-cutting machine tools, sea and river passenger-cargo ships (to cite but a few examples) are each shown by a single position; while in operational planning and control data these products have a much more detailed breakdown. The crucial problem is the choice of weights to be employed in the aggregation of a given group of coefficients. Until now, the gross outputs of the previous or the current planning period have been used as weights. This of course presupposes an unchanged output mix for the given aggregate position of the table and, furthermore, that the product definitions employed in the input-output table are dictated by considerations of close similarity of input structure. Neither is quite true. This invites substantial aggregation errors.[26] Even if these errors can be dismissed as minor, gross output levels as weights can be employed only as long as a set of gross output levels has been projected by the plan. But, as has been pointed out, the planning input-output models theoretically start off with a matrix of input coefficients lacking a set of gross output levels, and the latter are generated only at the end of the exercise. A recent paper discusses an iterative procedure by which final demand targets could be used in the absence of gross output levels as weights in aggregation.[27]

While this method would constitute an improvement it still does not fully resolve the problem of aggregation, since it presupposes a unique, exogeneously determined set of final demand targets. Ideally the proponents for the application of input-output techniques in planning envisage planning models incorporating resource constraints which would generate alternative feasible sets of final demand, among which the optimal set would then be chosen. Thus the proposed method of using a unique set of final demand targets could not be employed in aggregation either.

Because of these and other difficulties the framers of input-output tables had to resort to an independent estimation of all direct material coefficients needed in the preparation of planning matrices. According to the director of the main computer centre of Gosplan (the agency responsible for the construction of planning input-output tables in physical units)[28] this process has been very involved and time-consuming. In the preparation of the 435 × 435 matrix of input coefficients for 1963 the staff had to draw up 18,000 separate material balance sheets. For the estimation of input reqnirements in agriculture, fuels and lubricants, the staff was working with specially prepared maps for 32 agricultural crops and 42 products.[29]

A brief scanning of the literature on the subject reveals important gaps in analytical techniques and methodology for the estimation of *ex-ante* direct input coefficients.[30] For instance, it seems that much still remains to be explored regarding the problem of substitutability of inputs and what constitutes technological progress in the production of a given commodity.

Relative changes in input requirements appear to be significant. Although the literature available on the subject is not very illuminating, some judgement regarding the order of the magnitude of these changes can be made on the basis of a sample of selected coefficients for different years, as shown in table 5. It must be noted however that all the data presented are from input-output tables in value terms which as a rule are more aggregated than tables in physical units. Since we are dealing with value coefficients the dynamics of the changes are explained not only by changing technology and possible changes in the output mix but also by changes in trade

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[24] G. I. Kiperman, *Klassifikatsiia otraslei narodnogo khoziaistva* (Moscow, 1964), p. 33. Iu. Shvyrkov, *Planovoe khoziaistvo*, No. 5, 1965, p. 17. V. S. Nemchinov, *Planovoe khoziaistvo*, No. 6, 1963, p. 4.

[25] N. Kovalev, *Vychislitel'naia tekhnika v planirovanii* (Moscow, 1964), p. 199. R. Busunov, *Vestnik statistiki*, No. 3, 1964, pp. 26–27.

[26] V. S. Nemchinov, *Ekonomiko-matematicheskie metody i modeli* (Moscow, 1962), p. 276. Iu. Shvyrkov, *Klassifikatsiia otraslei v narodnokhoziaistvennom plane* (Moscow, 1965), pp. 87–111.

[27] L. Dudkin and E. Ershov, *Planovoe khoziaistvo*, No. 5, 1965, pp. 60–64.

[28] Soviet specialists appear to be resigned to the necessity of simultaneously preparing input-output tables in physical units and in value terms. The expressed recommendations of making the two variants at least comparable were not followed and at present even the task of preparing the tables is divided—the main computer centre of Gosplan prepares those in physical units, while the Economic Research Institute does those in value terms.

[29] N. I. Kovalev, *Voprosy ekonomiki*, No. 5, 1963, p. 78 and p. 81. *Vychislitelnaia tekhnika v planirovanii* (Moscow, 1964), pp. 198–206.

[30] A. Efimov and L. Berri (eds.), *Metody planirovaniia mezhotraslevyh proportsii* (Moscow, 1965), pp. 238–349, contains detailed description of methods of estimation and projection of *ex-ante* coefficients.

and transportation changes, shifts in taxes, and changes in relative prices. Input coefficients in physical units would presumably display greater stability over a period of time.

TABLE 5: RELATIVE CHANGES IN INPUT COEFFICIENTS FOR SELECTED PRODUCTS

Input	*Output*	*Percentage/change*	
		1959–62	*1959–70*
Electrical power ...	Ferrous metals	+9·4	+74·0
	Chemicals	+18·6	+260·0
	Textiles and apparel	+3·6	—
	Processed foods	—	+60·0
	Machinery	—	+8·2
	Agriculture	+349·0	—
Coal	Machinery	—20·0	—
Petroleum	Machinery	+5·0	—
Fuels	Machinery	—	—4·9
	Electrical power	—	—28·0
	Apparel and food	—	—20·0
	Ferrous metals	—	—9·0
Ferrous metals	Machinery	—	—30·6
	Ferrous metals	—	—7·2
Non-ferrous metals	Machinery	—	+18·8
	Ferrous metals	—	+30·0
Chemicals	Machinery	—	+20·4
	Construction	—	+41·0
	Agriculture	—	+440·0
	Food	—	+370·0
Transportation	Industry	+2·2	—
	Agriculture	—3·3	—

Sources: L. Berri, F. Klotsvog and S. Shatalin, *Plonovoe khoziaistvo,* No. 9, 1962, pp. 38–39. A. Efimov, *Planovoe khoziaistvo,* No. 5, 1964, pp. 16–20. A. Efimov and L. Berri, (eds.), *Metody planirovaniia mezhotraslevykh proportsii* (Moscow, 1965).

This discussion has dealt with only a few selected problems encountered in the construction and manipulation of *ex-post* and *ex-ante* input-output tables in the USSR: all the problems are not exhausted. For example, no definite solutions seem to have been reached as to what should be the optimal number of commodities or sectors to be shown in planning tables, or as to the related problems of aggregation and disaggregation of data. Before input-output tables in physical units will become a versatile tool of planning, fully integrated with other planning instruments, the problem of the inclusion of primary resource constraints (such as labour and capital capacity) must be resolved. The operationability of input-output tables also depends on the resolution of the problem of collating and co-ordinating detailed statistical and planning documents covering (let us say) some 20,000 products, and input-output tables which would at best show 1,000–2,000 aggregated positions. This again calls for flexible aggregation-disaggregation techniques, and the consolidation and unification of the various statistical commodity classification systems employed in the USSR. A separate but important question now under intensive study in the USSR is the collation of regional and national input-output tables.

Last, but not least, we should refer to some basic theoretical assumptions of input-output analysis, such as linearity and constant returns to scale, or the non-substitutability assumptions. These assumptions would have to be tested in the setting of actual economic planning.

ANNEX

An experiment with the 1959 input-output data for the USSR

The 1960 *Statistical Yearbook* carried a truncated version of the interindustry transaction matrix, with some sectors completely omitted and others aggregated in various ways.[31] With the exception of some relatives and indexes, no data on the value-added or final-demand quadrants were released.

The author of this note found it possible however to reconstruct the entire table: that is, to estimate the omitted flows and various entries in the two quadrants by the use of various input-output and other data scattered through the economic and statistical publications of the USSR and from other sources. The procedure and the results of the reconstructions have already been reported in detail elsewhere,[32] but the reconstructed input-output table of the order of 30 × 38, lately completed, is reproduced here as annex tables 1 and 2. This may serve the purpose not of a re-estimation but essentially of a theoretical experiment serving the interests of comparative analysis. It is hoped that an exhibit of this nature will illustrate the common theme of the papers collected in this publication.

In the reconstructed transaction matrix the flows of production and of distribution are measured in 1959 purchasers' prices (in roubles). The final demand quadrant shows the estimated allocations to private and public consumption, gross investment and losses, and exports. The value-added quadrant shows depreciation, labour income and other elements of net income (accumulation funds, taxes and the like), and imports. The transaction flows relate to domestically produced goods and services; imports are therefore shown as an element of the production costs of column sectors and as such are classified according to their using sectors. The last row shows labour employment measured in thousands of man-years.

Direct input coefficients and those from full input coefficients can easily be calculated from this transaction matrix. To save space only the full input coefficients are reproduced in this annex. The full input coefficient matrix (inverse coefficient matrix) indicates the total (direct and indirect) requirements of product *i* for production of one rouble of final output of project *j*. Labour input coefficients, however, are computed in terms of man-years per 1,000 roubles of final output.

The sector classification employed in this reconstructed table of 38 sectors is shown in annex table 3, the last column of which refers to the sector numbers in the original 73-sector table published in the 1960 *Statistical Yearbook of the USSR*.

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[31] Ts. S. U. *Narodnoe Khoziaistvo SSSR v 1960 godu* (Moscow, 1961), pp. 103–151.

[32] For a detailed description of the Soviet table and of the methods of reconstruction see Vladimir G. Treml, *The 1959 Soviet Intersectoral Flow Table* (two volumes), RAC Technical Paper 137, McLean, Virginia, 1964, and Vladimir G. Treml, "Value-added and final-demand quadrants in the 1959 Soviet input-output table", in John P. Hardt, editor, *Selected Studies in Soviet Economic Trends, Structure, and Institutions,* Research Analysis Corporation, McLean, Virginia, 1966.

ANNEX TABLE 1: RECONSTRUCTED
(Interindustry
(Product in millions of current roubles;

Using sector *Producing sector*	*Ferrous ores* *1*	*Ferrous metals* *2*	*Non-ferrous ores* *3*	*Non-ferrous metals* *4*	*Coking coal* *5*	*Metal products* *6*	*Coal* *7*	*Oil* *8*
1. Ferrous ores	0·9	291·5	0·0	47·3	0·0	28·0	0·0	0·0
2. Ferrous metals	8·6	854·2	15·9	0·0	1·6	406·5	28·8	9·9
3. Non-ferrous ores	0·0	0·0	0·8	798·4	0·0	0·0	0·0	0·0
4. Non-ferrous metals	0·0	552·7	0·0	551·5	0·0	5·8	2·8	1·2
5. Coking coal	6·0	735·0	0·0	154·1	91·3	16·7	0·3	6·8
6. Metal products	3·8	89·8	3·2	22·8	0·8	31·3	13·2	2·5
7. Coal	13·9	525·6	10·8	34·1	968·6	18·0	841·2	0·1
8. Oil	3·1	101·6	22·6	71·7	1·6	14·2	7·9	1,066·5
9. Gas	0·1	2·4	0·5	1·7	0·9	1·4	0·1	1·4
10. Other fuels	0·0	0·2	0·1	0·1	18·2	0·1	0·1	0·2
11. Electrical power	25·1	92·9	12·3	201·5	35·2	30·5	138·8	173·8
12. Electrical and power M&E[a]	1·5	7·0	2·1	2·3	0·6	0·7	6·1	1·1
13. Tools and instruments	3·3	15·5	4·7	5·1	0·5	7·7	27·2	3·2
14. General machinery	9·4	43·9	13·3	14·6	0·5	4·3	57·1	22·3
15. Transportation M&E	0·3	1·6	0·5	0·5	0·0	0·2	0·6	0·0
16. Automobiles	0·8	3·8	1·1	1·3	0·0	1·0	0·5	1·1
17. Agricultural M&E	0·3	1·3	0·4	0·5	0·0	0·1	0·7	1·7
18. Machinery n.e.c.[b]	0·0	0·0	0·0	0·0	0·0	0·0	88·3	28·0
19. Metalworking	1·3	5·8	1·8	1·9	0·2	1·5	10·1	0·7
20. Repair of machinery	21·9	101·7	30·8	33·9	3·3	4·9	2·1	32·3
21. Abrasives	1·2	3·2	1·7	1·1	0·0	1·3	0·3	0·1
22. Mineral and basic chemicals	6·4	39·0	9·1	13·0	15·5	3·3	4·2	41.2
23. Synthetics, paints	2·5	14·7	3·4	4·9	0·5	2·3	1·7	16·1
24. Rubber products	2·5	15·3	3·5	5·1	0·7	1·7	26·9	1·2
25. Lumber and woodworking	14·3	38·6	20·0	12·9	0·9	15·3	396·5	5.1
26. Paper	0·6	1·6	0·9	0·5	0·1	9·8	0·5	0·8
27. Construction materials	2·3	6·3	3·3	2·1	0·2	1·6	11·9	4·4
28. Glass	0·5	1·2	0·6	0·4	0·1	0·2	0·5	0·3
29. Textiles	1·4	8·7	1·9	2·9	0·3	22·8	1·9	1·0
30. Apparel and footwear	8·0	51·5	11·3	17·2	3·6	15·9	132·3	9·0
31. Food	1·0	6·2	1·3	2·1	0·6	0·4	1·7	1·9
32. Industry n.e.c.	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
33. Construction	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
34. Agriculture	0·0	0·6	0·0	0·8	0·0	0·3	2·6	0·1
35. Froestry	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
36. Transportation and communication	80·0	400·0	35·2	140·9	44·3	57·3	1,528·2	1,184·1
37. Trade and distribution	19·0	219·4	27·3	129·6	0·0	30·7	146·2	680·8
38. Products n.e.c.	0·0	88·7	0·0	88·6	0·0	0·0	0·0	0·0
39. Total purchases	240·0	4,321·5	240·4	2,365·4	1,190·1	735·8	3,481·3	3,298·9
40. Depreciation	57·8	296·0	73·0	167·6	45·8	32·4	307·2	300·0
41. Labour income	188·3	1,073·6	238·4	754·2	103·1	200·8	3,035·6	287·7
42. Other net income	76·0	522·1	—44·9	378·3	12·7	7·2	—526·2	2,675·4
43. National income	264·3	1,595·7	193·5	1,132·5	115·8	208·0	2,509·4	2,963·1
44. Imports	0·0	256·8	320·6	164·5	0·0	0·0	83·1	141·0
45. Total outlays	562·1	6,470·0	827·5	3,830·0	1,351·7	976·2	6,381·0	6,703·0
46. Employment	147·7	697·9	130·7	328·9	43·9	100·5	1,253·6	176.5

1959 SOVIET INPUT-OUTPUT TABLE
transactions matrix)
employment in thousands of man-years)

Gas 9	*Other fuels* 10	*Electrical power* 11	*Electrical and power M&E* 12	*Tools and instruments* 13	*General machinery* 14	*Transportation M&E* 15	*Automobiles* 16	*Agricultural M&E* 17	*Machinery n.e.c.* 18	*Metal-working* 19
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
0·6	3·0	3·6	374·0	176·6	650·6	192·8	220·4	292·6	50·0	564·4
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
0·0	0·5	0·9	183·2	484·6	145·8	48·1	146·6	31·6	50·0	83·7
0·1	0·0	0·0	3·0	0·8	21·5	2·5	6·6	9·3	1·9	30·5
0·1	1·6	2·2	19·7	31·7	58·5	14·2	37·3	26·0	13·9	39·4
10·5	6·8	796·9	19·0	7·8	28·6	17·8	14·9	9·0	9·1	14·2
4·1	11·7	245·5	24·3	11·9	46·5	16·0	25·4	14·6	13·0	10·9
0·1	0·3	68·4	0·4	0·5	0·7	0·5	0·6	0·7	0·3	0·4
10·6	20·8	231·7	1·0	0·3	15·0	2·8	0·5	0·4	1·9	2·8
2·0	22·3	4·4	45·5	31·3	76·1	22·4	20·1	40·6	34·3	26·3
0·2	2·0	8·0	191·2	29·6	210·3	228·4	18·0	19·5	278·8	16·3
0·3	4·7	3·2	127·1	129·5	111·0	33·6	37·5	49·8	197·8	12·7
0·4	7·8	0·3	2·3	1·9	198·6	11·9	1·1	3·6	11·6	2·0
0·0	1·5	0·0	0·0	0·4	12·5	91·2	0·0	0·0	7·1	0·0
0·1	0·7	0·5	3·1	8·2	126·2	8·6	315·1	11·4	86·7	3·7
0·0	4·6	0·1	18·5	0·0	87·8	3·6	0·1	217·5	60·4	2·2
1·0	20·4	21·0	25·3	6·6	91·5	47·7	9·5	14·0	136·3	0·0
0·0	0·5	1·1	20·7	2·9	33·8	42·1	14·7	3·7	0·0	46·6
2·0	1·3	59·6	6·5	7·0	12·6	6·1	6·4	2·4	0·0	3·1
0·0	0·1	0·1	47·3	8·4	5·3	3·9	3·2	3·4	0·0	2·2
0·4	2·3	3·9	15·5	6·1	10·3	5·9	6·4	3·1	7·9	6·4
1·2	0·7	1·4	72·4	95·0	41·1	25·8	36·2	17·9	48·6	35·2
0·1	3·0	0·8	21·4	15·3	85·8	16·4	375·8	92·2	38·9	5·0
0·5	13·6	2·9	28·2	32·9	59·1	56·7	26·9	33·7	35·4	15·0
0·0	0·1	0·2	11·5	9·6	3·7	1·0	3·7	1·6	4·6	2·0
0·2	0·8	1·8	5·6	2·4	7·5	14·7	2·6	2·0	0·0	5·0
0·0	0·1	0·4	13·5	12·6	1·8	3·5	13·8	0·7	0·0	4·6
0·1	0·6	1·0	30·5	34·2	9·8	16·0	18·0	14·1	35·0	6·4
0·8	15·3	9·5	13·8	19·4	39·8	16·5	35·2	18·1	0·0	20·0
0·1	0·3	1·5	4·7	3·2	3·8	2·2	2·1	1·1	0·0	1·8
0·0	0·0	0·0	22·8	20·7	38·0	15·1	25·3	18·1	17·6	0·0
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
0·0	0·2	0·0	0·2	0·1	0·3	0·5	0·0	0·0	0·0	0·1
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
0·2	66·5	4·8	58·7	44·0	195·2	17·6	116·6	131·8	23·0	238·1
14·4	1·5	8·3	36·7	63·5	18·8	0·0	51·7	49·2	77·1	102·9
0·0	0·0	0·0	4·8	3·9	17·1	8·5	2·8	16·2	8·0	18·6
50·1	215·6	1,484·0	1,452·4	1,302·9	2,465·0	994·6	1,595·1	1,149·9	1,249·2	1,322·5
17·4	44·5	500·1	95·0	83·7	157·6	68·4	57·1	67·8	166·7	68·7
16·3	260·9	426·6	759·9	669·4	1,260·6	547·1	442·3	426·3	1,436·8	549·6
182·2	29·0	1,165·3	99·7	1,863·4	– 115·5	–75·6	939·6	775·5	2,234·9	948·9
198·5	289·9	1,591·9	859·6	2,532·8	1,145·1	471·5	1,381·9	1,201·8	3,671·7	1,498·5
0·0	0·0	0·0	95·1	133·6	596·9	475·5	49·9	10·5	23·7	5·3
266·0	550·0	3,576·0	2,502·1	4,053·0	4,364·6	2,010·0	3,084·0	2,430·0	5,111·3	2,895·0
14·2	245·3	405·4	473·0	588·3	860·1	353·0	347·0	425·0	1,240·8	677·3

Annex table 1: Reconstructed
(Interindustry
(Product in millions of current roubles;

Using sector / *Producing sector*	*Repair of machinery* *20*	*Abrasives* *21*	*Mineral and basic chemicals* *22*	*Synthetics, paints* *23*	*Rubber products* *24*	*Lumber and wood-working* *25*	*Paper* *26*	*Construction materials* *27*
1. Ferrous ores	0·0	2·0	1·7	0·0	0·0	0·0	0·0	4·7
2. Ferrous metals	343·3	1·7	7·0	18·0	3·7	18·1	5·4	199·6
3. Non-ferrous ores	0·0	2·5	3·0	0·0	0·0	0·0	0·0	22·8
4. Non-ferrous metals	118·7	2·5	10·0	124·7	3·9	3·0	1·9	47·3
5. Coking coal	12·6	1·2	43·2	49·1	0·2	45·2	0·1	13·2
6. Metal products	50·4	0·5	5·5	3·2	7·4	55·4	1·9	42·8
7. Coal	50·3	3·1	25·6	46·4	4·8	28·7	47·1	251·1
8. Oil	59·7	4·4	15·1	124·2	14·4	281·1	13·0	148·5
9. Gas	0·9	0·1	0·6	16·9	0·2	0·4	0·1	12·7
10. Other fuels	1·4	0·0	0·4	1·6	0·2	27·5	9·6	27·8
11. Electrical power	59·2	8·9	66·7	100·3	26·8	47·8	42·7	223·8
12. Electrical and power M&E	58·0	0·2	1·9	3·9	0·5	6·8	1·0	4·9
13. Tools and instruments	88·2	0·6	3·5	3·7	2·8	21·7	2·4	23·5
14. General machinery	20·7	0·1	7·0	6·0	1·7	21·2	6·3	36·4
15. Transportation M&E	65·2	0·0	0·1	0·1	0·0	2·6	0·0	0·1
16. Automobiles	252·0	0·1	1·9	0·7	1·6	67·7	0·5	20·9
17. Agricultural M&E	204·2	0·0	0·3	0·1	0·0	57·4	0·1	7·2
18. Machinery n.e.c.	50·0	0·0	10·8	10·6	4·8	0·0	0·0	92·7
19. Metalworking	43·7	0·4	3·1	11·7	3·9	92·1	3·0	15·6
20. Repair of machinery	0·0	2·8	10·6	33·3	3·2	47·1	3·4	89·5
21. Abrasives	3·1	8·6	0·1	1·1	0·1	5·1	0·1	1·0
22. Mineral and basic chemicals	10·1	3·7	151·6	206·1	4·4	15·0	18·4	4·7
23. Synthetics, paints	64·4	0·3	36·5	975·2	619·0	79·6	3·4	10·9
24. Rubber products	23·8	0·2	2·2	12·9	209·7	61·4	1·3	20·5
25. Lumber and woodworking	107·3	0·5	14·9	80·8	17·1	2,710·3	324·6	122·2
26. Paper	3·9	0·4	7·8	45·7	1·1	5·3	80·1	26·2
27. Construction materials	30·0	0·5	3·5	3·6	0·9	11·3	6·8	1,273·4
28. Glass	6·3	0·1	1·2	27·5	0·2	39·6	0·4	0·9
29. Textiles	27·6	11·8	7·8	57·9	395·1	203·1	8·4	9·8
30. Apparel and footwear	27·4	1·1	20·2	22·5	5·1	154·1	6·1	42·6
31. Food	3·3	2·7	20·2	405·6	7·0	31·0	1·3	7·8
32. Industry n.e.c.	0·0	0·0	5·3	13·4	7·5	0·0	0·0	92·8
33. Construction	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
34. Agriculture	0·2	0·0	0·3	11·5	0·0	32·6	1·1	0·6
35. Forestry	0·0	0·0	0·0	0·0	0·0	142·8	0·0	0·0
36. Transportation and communication	17·0	4·5	514·0	35·1	55·8	1,626·1	72·9	1,726·1
37. Trade and distribution	0·0	0·0	21·7	49·1	17·3	404·4	89·5	338·7
38. Products n.e.c.	7·4	0·0	0·0	55·3	10·7	0·0	78·1	51·5
39. Total purchases	1,810·3	65·5	1,025·3	2,557·8	1,431·1	6,345·5	831·0	5,014·8
40. Depreciation	125·5	3·1	44·1	148·4	13·6	302·0	40·1	316·6
41. Labour income	1,004·2	32·1	195·8	593·7	176·5	3,020·5	200·6	1,794·3
42. Other net income	810·0	22·3	65·8	1,151·6	361·3	1,236·4	181·2	141·2
43. National income	1,814·2	54·4	261·6	1,745·3	537·8	4,256·9	381·8	1,935·5
44. Imports	0·0	1·6	26·0	261·5	17·5	128·6	14·1	37·1
45. Total outlays	3,750·0	124·6	1,357·0	4,713·0	2,000·0	11,033·0	1,267·0	7,304·0
46. Employment	1,236·0	27·7	132·1	431·1	100·0	2,852·8	147·0	1,623·3

1959 Soviet input-output table (*continued*)
transactions matrix)
employment in thousands of man-years)

Glass 28	*Textiles* 29	*Apparel and footwear* 30	*Food* 31	*Industry n.e.c.* 32	*Construction* 33	*Agriculture* 34	*Forestry* 35	*Transportation and communication* 36	*Trade and distribution* 37	*Products n.e.c.* 38
6·2	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
5·0	7·8	2·7	69·1	70·0	1,365·0	5·5	0·0	63·7	57·5	1·8
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
4·0	2·5	2·7	18·4	30·0	21·7	0·3	0·0	23·1	16·2	0·2
0·1	0·5	0·1	0·9	0·0	0·0	0·0	0·0	0·2	0·0	0·0
10·7	9·5	12·9	12·4	0·0	232·6	12·1	0·2	38·0	21·0	2·5
24·5	53·0	17·1	182·5	20·8	49·5	11·7	0·0	803·0	68·6	2·9
20·4	20·4	12·4	194·7	20·9	366·5	1,051·7	5·1	961·6	32·6	3·5
0·9	1·2	0·3	4·4	0·5	9·7	0·0	0·0	0·0	0·0	0·0
13·9	21·3	8·0	15·1	1·9	8·5	0·3	0·0	0·0	0·0	0·0
13·4	112·5	48·6	111·5	60·7	200·6	88·3	0·0	150·2	42·1	2·6
0·9	3·9	2·4	5·6	34·4	127·3	38·8	0·0	4·6	14·8	1·1
1·6	5·9	3·3	10·3	45·5	551·1	11·8	0·0	29·0	9·6	0·1
1·1	40·8	9·6	24·0	23·7	84·0	0·0	0·0	2·5	49·1	0·0
0·0	0·0	0·0	0·4	11·5	6·4	3·5	0·0	152·2	0·0	0·0
0·4	1·5	0·6	4·1	38·4	70·6	19·0	0·0	206·8	0·0	0·7
0·1	0·4	0·0	0·6	27·7	45·4	159·0	3·5	1·5	0·0	0·0
0·0	0·0	0·0	82·0	61·0	228·8	414·9	0·0	69·0	136·7	0·0
11·2	20·8	28·3	57·3	62·8	1,208·9	156·6	3·1	0·0	3·7	0·0
24·5	14·4	5·5	229·2	64·7	0·0	1,028·1	0·0	86·3	0·0	0·0
1·5	0·2	1·5	0·2	0·0	9·5	5·2	0·0	0·0	1·5	0·0
2·1	0·2	11·3	27·7	80·3	17·7	355·6	2·7	9·2	7·5	0·1
11·1	334·7	208·0	43·3	239·7	203·8	55·4	0·0	51·7	12·0	11·8
0·9	28·9	28·0	7·3	121·4	69·3	12·6	0·0	359·9	54·4	2·9
31·4	45·5	74·0	289·3	64·6	2,982·3	113·5	1·1	171·1	205·0	2·0
4·3	6·9	17·3	73·8	95·4	32·6	0·1	0·4	3·1	582·0	163·5
7·0	6·8	3·7	25·3	0·0	5,360·9	16·2	0·9	60·5	0·2	0·1
13·0	0·7	0·9	49·4	0·0	319·3	5·1	0·0	5·9	0·0	0·0
5·8	6,206·7	6,981·9	85·6	9·4	29·9	46·2	0·0	74·1	398·6	23·2
9·1	25·2	2,154·3	108·8	0·0	535·5	99·8	0·2	70·8	89·1	1·1
0·8	20·5	599·6	13,365·8	819·7	85·2	1,582·4	0·0	0·0	11·3	0·0
0·0	25·0	25·0	0·0	0·0	0·0	128·3	0·0	0·0	0·0	0·0
0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
0·3	3,980·3	490·5	16,467·3	207·8	11·2	12,436·5	4·5	19·0	0·0	0·0
0·0	0·0	0·0	0·0	0·0	66·5	0·0	6·2	0·0	0·0	15·8
86·0	284·7	159·6	1,212·3	43·8	38·9	762·2	5·0	49·2	116·5	80·0
88·5	700·3	703·7	3,681·6	722·7	0·0	2,857·6	0·0	0·0	0·0	11·7
10·7	0·0	97·9	80·7	292·0	270·7	6·0	0·0	0·0	0·0	0·0
411·4	11,983·0	11,711·7	36,540·9	3,271·3	14,609·9	21,484·3	32·9	3,466·2	1,930·0	327·6
21·3	110·0	110·0	443·1	125·2	579·0	2,100·0	0·0	1,195·0	434·0	266·0
232·2	923·8	1,410·3	2,531·7	701·3	7,021·9	23,800·0	275·1	4,853·0	3,827·6	1,563·7
204·5	11,454·1	1,987·7	16,893·7	1,383·5	6,989·2	4,815·7	0·0	1,742·0	5,172·3	842·7
436·7	12,377·9	3,398·0	19,425·4	2,084·8	14,011·1	28,615·7	275·1	6,595·0	8,999·9	2,406 4
8·0	1,229·1	2,280·3	1,390·6	49·1	0·0	1,300·0	0·0	0·0	0·0	0·0
877·4	25,700·0	17,500·0	57,800·0	5,530·4	29,200·0	53,500·0	308·0	11,256·2	11,363·9	3,000 0
214·3	1,820·0	1,920·0	2,530·0	600·0	6,208·0	33,100·0	352·0	5,300·0	5,171·0	1,709·0

ANNEX TABLE 1: RECONSTRUCTED 1959 SOVIET INPUT-OUTPUT TABLE (*continued*)

(*Interindustry transactions matrix*)

(*Product in millions of current roubles; employment in thousands of man-years*)

Using sector / *Producing sector*	*Total interindustry use* 39	*Private consumption* 40	*Public consumption* 41	*Gross investment* 42	*Exports* 43	*Total final demand* 44	*Total gross output* 45
1. Ferrous ores	382·3	0·0	0·0	−21·1	200·9	179·8	562·1
2. Ferrous metals	6,099·0	2·1	20·0	−183·4	532·3	371·0	6,470·0
3. Non-ferrous ores	827·5	0·0	0·0	−15·2	15·2	0·0	827·5
4. Non-ferrous metals	2,720·1	2·1	292·3	619·8	195·7	1,109·9	3,830·0
5. Coking coal	1,253·0	0·0	0·0	68·3	30·4	98·7	1,351·7
6. Metal products	931·0	12·8	40·4	−18·0	10·0	45·2	976·2
7. Coal	5,037·6	146·3	542·2	426·1	228·8	1,343·4	6,381·0
8. Oil	5,063·3	103·2	360·7	609·4	566·4	1,639·7	6,703·0
9. Gas	130·3	49·8	36·0	48·2	1·7	135·7	266·0
10. Other fuels	444·3	0·0	60·2	45·5	0·0	105·7	550·0
11. Electrical power	2,442·1	635·5	397·3	101·1	0·0	1,133·9	3,576·0
12. Electrical and power M&E	1,334·7	329·3	57·0	727·6	53·5	1,167·4	2,502·1
13. Tools and instruments	1,589·0	605·1	56·9	1,377·9	424·1	2,464·0	4,053·0
14. General machinery	741·1	234·0	0·2	3,012·8	376·5	3,623·5	4,364·6
15. Transportation M&E	358·5	0·0	35·8	1,525·5	90·2	1,651·5	2,010·0
16. Automobiles	1,261·4	555·7	74·9	1,030·3	161·7	1,822·6	3,084·0
17. Agricultural M&E	907·3	0·0	0·0	1,421·3	101·4	1,522·7	2,430·0
18. Machinery n.e.c.	1,650·9	578·3	166·5	2,700·9	14·7	3,460·4	5,111·3
19. Metalworking	1,915·6	859·1	188·4	−68·1	0·0	979·4	2,895·0
20. Repair of machinery	1,980·5	0·0	19·8	1,749·7	0·0	1,769·5	3,750·0
21. Abrasives	121·6	0·0	0·0	2·5	0·5	3·0	124·6
22. Mineral and basic chemicals	1,128·3	42·4	43·4	31·5	111·4	228·7	1,357·0
23. Synthetics, paints	3,382·4	357·1	402·1	518·5	52·9	1,330·6	4,713·0
24. Rubber products	1,729·2	34·5	132·0	92·7	11·6	270·8	2,000·0
25. Lumber and woodworking	8,166·0	1,271·6	424·9	920·9	249·6	2,867·0	11,033·0
26. Paper	1,202·7	0·0	81·2	−33·2	16·3	64·3	1,267·0
27. Construction materials	6,886·3	122·9	274·6	9·8	10·4	417·7	7,304·0
28. Glass	525·3	333·7	17·6	−2·1	2·9	352·1	877·4
29. Textiles	14,789·5	9,287·0	337·2	1,115·4	170·9	10,910·5	25,700·0
30. Apparel and footwear	3,810·2	10·205·9	439·0	2,988·1	56·8	13,689·8	17,500·0
31. Food	17,000·2	35,575·0	1,214·4	3,138·1	872·3	40,799·8	57,800·0
32. Industry n.e.c.	454·9	4,805·1	610·7	−381·3	41·0	5,075·5	5,530·4
33. Construction	0·0	0·0	0·0	29,200·0	0·0	29,200·0	29,200·0
34. Agriculture	33,669·5	17,096·9	515·7	1,557·9	660·0	19,830·5	53,500·0
35. Forestry	231·3	0·0	0·0	76·7	0·0	76·7	308·0
36. Transportation and communication	11,256·2	0·0	0·0	0·0	0·0	0·0	11,256·2
37. Trade and distribution	11,363·9	0·0	0·0	0·0	0·0	0·0	11,363·9
38. Products n.e.c.	1,218·2	1,929·6	157·9	−309·9	4·2	1,781·8	3,000·0
39. Total purchases	154,005·2	85,175·0	6,999·3	54,084·2	5,264·3	151,522·8	305,528·0
40. Depreciation	8,983·8	2,825·5	2,094·5	0·0	0·0	4,920·0	13,903·8
41. Labour income	66,835·8						
42. Other net income	66,603·2						
43. National income	133,439·0						
44. Imports	9,100·0						
45. Total outlays	305,528·0						
46. Employment	73,983·4						

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[a] M&E = machinery and equipment. [b] n.e.c. = not elsewhere classified.

Annex table 2 follows overleaf.

Annex table 2: Reconstructed

(Full input coefficients,

Producing sector / Using sector	*Ferrous ores* *1*	*Ferrous metals* *2*	*Non-ferrous ores* *3*	*Non-ferrous metals* *4*	*Coking coal* *5*	*Metal products* *6*	*Coal* *7*	*Oil* *8*
1. Ferrous ores	1·00383	0·05524	0·00211	0·01576	0·00110	0·05404	0·00109	0·00060
2. Ferrous metals	0·03809	1·17618	0·03834	0·01994	0·01817	0·51382	0·01835	0·01004
3. Non-ferrous ores	0·00233	0·02567	1·00306	0·24508	0·00151	0·01352	0·00153	0·00094
4. Non-ferrous metals	0·01065	0·12272	0·00956	1·17424	0·00694	0·06435	0·00719	0·00436
5. Coking coal	0·01820	0·15078	0·00651	0·05437	1·07647	0·08634	0·00371	0·00345
6. Metal products	0·01047	0·02095	0·00673	0·01046	0·00549	1·04401	0·00550	0·00247
7. Coal	0·08102	0·26725	0·03978	0·09363	0·93209	0·17756	1·19410	0·03557
8. Oil	0·03718	0·05329	0·04815	0·05511	0·04365	0·05842	0·04315	1·21923
9. Gas	0·00143	0·00160	0·00119	0·00227	0·00197	0·00306	0·00080	0·00107
10. Other fuels	0·00450	0·00551	0·00218	0·00629	0·01949	0·00600	0·00294	0·00292
11. Electrical power	0·05642	0·04403	0·02336	0·07604	0·05829	0·06032	0·03520	0·03869
12. Electrical and power M&E[a]	0·00630	0·00470	0·00550	0·00374	0·00451	0·00442	0·00444	0·00228
13. Tools and instruments	0·01003	0·00765	0·00892	0·00579	0·00767	0·01362	0·00844	0·00280
14. General machinery	0·01990	0·01405	0·01867	0·01119	0·01061	0·01292	0·01241	0·00571
15. Transportation M&E	0·00423	0·00359	0·00264	0·00235	0·00458	0·00345	0·00486	0·00358
16. Automobiles	0·01018	0·00783	0·00736	0·00560	0·00823	0·00804	0·00875	0·00634
17. Agricultural M&E	0·00424	0·00281	0·00382	0·00239	0·00192	0·00247	0·00184	0·00136
18. Machinery n.e.c.[b]	0·00533	0·00767	0·00358	0·00466	0·01777	0·00660	0·02086	0·00979
19. Metalworking	0·00420	0·00307	0·00375	0·00234	0·00314	0·00399	0·00353	0·00084
20. Repair of machinery	0·04372	0·02656	0·04035	0·02369	0·00801	0·02067	0·00525	0·00914
21. Abrasives	0·00264	0·00111	0·00251	0·00115	0·00029	0·00219	0·00032	0·00016
22. Mineral and basic chemicals	0·01567	0·01366	0·01467	0·01031	0·01678	0·01221	0·00311	0·00991
23. Synthetics, paints	0·01740	0·01458	0·01381	0·01061	0·01370	0·01624	0·01388	0·01132
24. Rubber products	0·01583	0·01444	0·01077	0·00948	0·01853	0·01411	0·02016	0·01112
25. Lumber and woodworking	0·05210	0·04562	0·04387	0·03009	0·08900	0·05735	0·10963	0·01653
26. Paper	0·00468	0·00594	0·00442	0·00601	0·00282	0·01668	0·00307	0·00765
27. Construction materials	0·00736	0·00438	0·00629	0·00356	0·00480	0·00535	0·00528	0·00294
28. Glass	0·00157	0·00087	0·00125	0·00072	0·00088	0·00100	0·00090	0·00041
29. Textiles	0·02719	0·02681	0·02237	0·01915	0·02967	0·06330	0·03221	0·01605
30. Apparal and footwear	0·02343	0·02393	0·02038	0·01606	0·03136	0·03451	0·03405	0·00689
31. Food	0·00686	0·00590	0·00582	0·00436	0·00541	0·00659	0·00485	0·00290
32. Industry n.e.c.	0·00079	0·00063	0·00067	0·00047	0·00068	0·00072	0·00069	0·00040
33. Construction	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000
34. Agriculture	0·00970	0·00949	0·00791	0·00688	0·01076	0·01783	0·01143	0·00527
35. Forestry	0·00070	0·00071	0·00059	0·00055	0·00118	0·00081	0·00146	0·00022
36. Transportation and communication	0·19757	0·18492	0·08265	0·10625	0·29615	0·18116	0·32005	0·23684
37. Trade and distribution	0·04872	0·06543	0·04674	0·06201	0·03541	0·07453	0·04208	0·12877
38. Products n.e.c.	0·00188	0·01999	0·00170	0·02830	0·00127	0·01031	0·00133	0·00109
39. Labour input coefficients	0·46716	0·39837	0·32901	0·31829	0·44772	0·41522	0·47426	0·24027

1959 SOVIET INPUT-OUTPUT TABLE

technology matrix $(I-A)^{-1}$

Gas	*Other fuels*	*Electrical power*	*Electrical and power M&E*	*Tool and instruments*	*General machinery*	*Transportation M&E*	*Automobiles*	*Agricultural M&E*	*Machinery n.e.c.*	*Metalworking*
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
0·00041	0·00124	0·00066	0·01183	0·00518	0·01146	0·00853	0·00656	0·00872	0·00206	0·01250
0·00726	0·02088	0·01121	0·20804	0·06357	0·21710	0·15963	0·10979	0·17001	0·03333	0·24574
0·00056	0·00194	0·00103	0·02699	0·03225	0·01649	0·01374	0·01691	0·00876	0·00621	0·01326
0·00261	0·00913	0·00485	0·12695	0·15421	0·07855	0·06506	0·08072	0·04167	0·02958	0·06326
0·00179	0·00396	0·00226	0·03450	0·01576	0·03736	0·02568	0·02149	0·02844	0·00665	0·04548
0·00141	0·00561	0·00293	0·01525	0·01137	0·02152	0·01376	0·01828	0·01685	0·00543	0·02001
0·05527	0·04863	0·27552	0·08242	0·03529	0·08353	0·06550	0·05325	0·06498	0·01900	0·08856
0·02525	0·05156	0·09869	0·04003	0·01935	0·04088	0·03152	0·03414	0·03103	0·01180	0·03156
1·00070	0·00166	0·01957	0·00145	0·00087	0·00129	0·00116	0·00117	0·00124	0·00050	0·00095
0·04247	1·04318	0·06947	0·00430	0·00215	0·00725	0·00437	0·00260	0·00310	0·00165	0·00371
0·01313	0·05097	1·01640	0·04237	0·02311	0·03824	0·02910	0·02460	0·03242	0·01416	0·02608
0·00214	0·00902	0·00501	1·08609	0·00948	0·05908	0·13276	0·00900	0·01181	0·06220	0·00811
0·00283	0·01351	0·00492	0·06071	1·03527	0·03545	0·02883	0·01701	0·02654	0·04577	0·00780
0·00337	0·01701	0·00468	0·00565	0·00319	1·05202	0·01002	0·00360	0·00494	0·00367	0·00492
0·00073	0·00557	0·00210	0·00179	0·00100	0·00522	1·04893	0·00162	0·00186	0·00197	0·00237
0·00214	0·00724	0·00461	0·00584	0·00446	0·03870	0·00919	1·11740	0·00964	0·02082	0·00590
0·00122	0·01135	0·00246	0·01043	0·00094	0·02533	0·00496	0·00126	1·09954	0·01430	0·00198
0·00775	0·04331	0·01480	0·01537	0·00389	0·02745	0·03017	0·00720	0·01010	1·02963	0·00402
0·00054	0·00221	0·00163	0·01097	0·00184	0·01060	0·02505	0·00722	0·00320	0·00128	1·01765
0·00868	0·00627	0·01937	0·01267	0·00746	0·01170	0·01031	0·00914	0·00774	0·00255	0·00923
0·00011	0·00055	0·00025	0·02257	0·00274	0·00305	0·00524	0·00172	0·00220	0·00150	0·00132
0·00292	0·00703	0·00343	0·01526	0·00613	0·00918	0·00942	0·01000	0·00664	0·00459	0·00756
0·00843	0·01282	0·00670	0·05398	0·03707	0·03590	0·03451	0·08366	0·03680	0·02380	0·02402
0·00310	0·01562	0·00736	0·01820	0·00838	0·03698	0·01758	0·15786	0·05430	0·01481	0·01044
0·01288	0·04591	0·03151	0·03801	0·02268	0·03958	0·05648	0·03053	0·03645	0·01744	0·02627
0·00358	0·00187	0·00179	0·01005	0·00575	0·00505	0·00439	0·00598	0·00503	0·00358	0·00551
0·00153	0·00350	0·00250	0·00504	0·00186	0·00436	0·01115	0·00280	0·00275	0·00075	0·00415
0·00019	0·00072	0·00048	0·00688	0·00377	0·00165	0·00332	0·00598	0·00104	0·00085	0·00219
0·00932	0·03058	0·01370	0·04105	0·02406	0·03193	0·03370	0·06797	0·03798	0·01964	0·02155
0·00760	0·03793	0·01426	0·01624	0·01062	0·02059	0·01798	0·02147	0·01647	0·00343	0·01660
0·00226	0·00510	0·00274	0·01403	0·00789	0·01013	0·01005	0·01575	0·00886	0·00466	0·00564
0·00022	0·00091	0·00037	0·01089	0·00571	0·01094	0·00997	0·01047	0·00906	0·00486	0·00050
0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000
0·00321	0·01062	0·00489	0·01541	0·00888	0·01224	0·01262	0·02155	0·01260	0·00630	0·00774
0·00017	0·00061	0·00042	0·00056	0·00034	0·00058	0·00080	0·00044	0·00055	0·00025	0·00041
0·02965	0·16465	0·10353	0·09593	0·04594	0·11641	0·07137	0·09357	0·11127	0·02593	0·14536
0·06073	0·01801	0·02428	0·04605	0·03353	0·03326	0·02587	0·04310	0·04343	0·02556	0·05832
0·00063	0·00145	0·00076	0·01031	0·00678	0·01111	0·01025	0·00751	0·01241	0·00394	0·01233
0·14402	0·62285	0·29603	0·41031	0·26034	0·41889	0·37149	0·29558	0·36399	0·33194	0·43338

Annex table 2: Reconstructed

(Full input coefficients,

Using sector / *Producing sector*	*Repair of machinery* 20	*Abrasives* 21	*Mineral and basic chemicals* 22	*Synthetics, paints* 23	*Rubber products* 24	*Lumber and woodworking* 25	*Paper* 26	*Construction materials* 27
1. Ferrous ores	0·00808	0·01937	0·00305	0·00144	0·00110	0·00123	0·00114	0·00396
2. Ferrous metals	0·14612	0·03128	0·02468	0·01448	0·01337	0·01806	0·01805	0·05690
3. Non-ferrous ores	0·01407	0·02862	0·00660	0·00930	0·00429	0·00150	0·00172	0·00820
4. Non-ferrous metals	0·06696	0·03321	0·01946	0·04379	0·02022	0·00700	0·00784	0·02101
5. Coking coal	0·02657	0·01864	0·04385	0·02059	0·00901	0·00942	0·00559	0·01139
6. Metal products	0·02035	0·00739	0·00882	0·00323	0·00637	0·00939	0·00592	0·01145
7. Coal	0·07043	0·08617	0·12652	0·05462	0·03544	0·03926	0·08267	0·10861
8. Oil	0·04052	0·07075	0·07861	0·05879	0·04035	0·06968	0·04952	0·07599
9. Gas	0·00125	0·00281	0·00225	0·00546	0·00245	0·00052	0·00116	0·00330
10. Other fuels	0·00349	0·00690	0·00648	0·00421	0·00332	0·00497	0·01303	0·00902
11. Electrical power	0·03284	0·09127	0·07431	0·04013	0·03368	0·01592	0·04818	0·05283
12. Electrical and power M&E	0·02288	0·00416	0·00551	0·00294	0·00229	0·00274	0·00322	0·00488
13. Tools and instruments	0·03099	0·00846	0·00763	0·00329	0·00382	0·00512	0·00531	0·00868
14. General machinery	0·00934	0·00430	0·00908	0·00403	0·00359	0·00436	0·00865	0·00956
15. Transportation M&E	0·01950	0·00220	0·00754	0·00150	0·00137	0·00386	0·00271	0·00555
16. Automobiles	0·07869	0·00626	0·01441	0·00383	0·00415	0·01510	0·00775	0·01413
17. Agricultural M&E	0·06141	0·00255	0·00236	0·00176	0·00140	0·00886	0·00339	0·00380
18. Machinery n.e.c.	0·01815	0·00492	0·01706	0·00720	0·00724	0·00429	0·00546	0·02275
19. Metalworking	0·01436	0·00512	0·00442	0·00486	0·00481	0·01243	0·00671	0·00442
20. Repair of machinery	1·00686	0·03142	0·01700	0·01472	0·00973	0·00976	0·00832	0·02158
21. Abrasives	0·00191	1·07448	0·00040	0·00053	0·00034	0·00086	0·00047	0·00050
22. Mineral and basic chemicals	0·00850	0·03939	1·13155	0·06506	0·02678	0·00516	0·02045	0·00460
23. Synthetics, paints	0·03941	0·01401	0·05482	1·27036	0·44714	0·02477	0·01647	0·01740
24. Rubber products	0·02573	0·00876	0·02427	0·00900	1·12362	0·02032	0·01261	0·02128
25. Lumber and woodworking	0·05622	0·02399	0·04679	0·04681	0·03507	1·34047	0·38211	0·05319
26. Paper	0·00432	0·00613	0·01068	0·01755	0·00906	0·00509	1·07791	0·01068
27. Construction materials	0·01149	0·00724	0·00784	0·00278	0·00227	0·00384	0·00922	1·21450
28. Glass	0·00295	0·00140	0·00203	0·00805	0·00312	0·00534	0·00208	0·00088
29. Textiles	0·03322	0·15060	0·04023	0·03565	0·31014	0·05839	0·03976	0·02695
30. Apparal and footwear	0·01737	0·01802	0·02951	0·01309	0·01027	0·02643	0·01821	0·01740
31. Food	0·00844	0·03601	0·03199	0·14803	0·06141	0·01040	0·00701	0·00880
32. Industry n.e.c.	0·00223	0·00082	0·00532	0·00431	0·00630	0·00069	0·00065	0·01609
33. Construction	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000	0·00000
34. Agriculture	0·01127	0·04492	0·02322	0·06733	0·08785	0·02277	0·01460	0·01140
35. Forestry	0·00078	0·00033	0·00063	0·00072	0·00053	0·01771	0·00541	0·00077
36. Transportation and communication	0·07091	0·10748	0·49557	0·07867	0·07824	0·23278	0·16760	0·35048
37. Trade and distribution	0·02572	0·02646	0·04241	0·04395	0·04263	0·06572	0·10376	0·07930
38. Products n.e.c.	0·00755	0·00222	0·00300	0·01800	0·01311	0·00164	0·06753	0·01200
39. Labour input coefficients	0·50775	0·42617	0·47186	0·29741	0·28275	0·56432	0·45713	0·57511

1959 Soviet input-output table (*continued*)

technology matrix$(I-A)^{-1}$

Glass 28	*Textiles 29*	*Apparel and footwear 30*	*Food 31*	*Industry n.e.c. 32*	*Construction 33*	*Agriculture 34*	*Forestry 35*	*Transportation and communication 36*	*Trade and distribution 37*	*Products n.e.c. 38*
0·00909	0·00028	0·00034	0·00048	0·00169	0·00477	0·00049	0·00035	0·00110	0·00063	0·00019
0·02732	0·00449	0·00514	0·00814	0·02980	0·08602	0·00828	0·00591	0·01784	0·01059	0·00293
0·00289	0·00054	0·00064	0·00075	0·00369	0·00474	0·00080	0·00040	0·00191	0·00093	0·00026
0·01339	0·00254	0·00300	0·00348	0·01736	0·01924	0·00369	0·00173	0·00898	0·00440	0·00120
0·00567	0·00126	0·00149	0·00170	0·00660	0·01380	0·00195	0·00147	0·00358	0·00200	0·00072
0·01588	0·00127	0·00198	0·00164	0·00286	0·01401	0·00162	0·00141	0·00555	0·00293	0·00143
0·06412	0·01083	0·01176	0·01543	0·02874	0·04952	0·00976	0·00590	0·10022	0·01768	0·00944
0·05302	0·01340	0·01297	0·02511	0·02301	0·04417	0·03789	0·02505	0·11455	0·01086	0·00802
0·00177	0·00035	0·00037	0·00030	0·00086	0·00139	0·00019	0·00009	0·00063	0·00022	0·00013
0·01915	0·00189	0·00191	0·00109	0·00252	0·00389	0·00064	0·00029	0·00191	0·00128	0·00088
0·02726	0·00914	0·00967	0·00747	0·02177	0·02458	0·00667	0·00277	0·02337	0·00861	0·00464
0·00345	0·00124	0·00125	0·00190	0·00987	0·00760	0·00284	0·00045	0·00383	0·00285	0·00074
0·00508	0·00124	0·00131	0·00186	0·01177	0·02350	0·00229	0·00069	0·00525	0·00231	0·00057
0·00418	0·00288	0·00254	0·00177	0·00688	0·00663	0·00111	0·00041	0·00243	0·00552	0·00065
0·00288	0·00060	0·00063	0·00111	0·00336	0·00217	0·00117	0·00048	0·01532	0·00053	0·00059
0·00706	0·00162	0·00163	0·00301	0·01136	0·00827	0·00382	0·00097	0·02332	0·00160	0·00139
0·00298	0·00156	0·00123	0·00291	0·00780	0·00396	0·00627	0·01298	0·00136	0·00077	0·00033
0·00557	0·00375	0·00351	0·00849	0·01694	0·01407	0·01293	0·00094	0·01020	0·01348	0·00076
0·01485	0·00232	0·00349	0·00344	0·01360	0·04490	0·00469	0·01071	0·00144	0·00119	0·00053
0·03253	0·00699	0·00566	0·01593	0·01803	0·00802	0·02682	0·00119	0·01060	0·00154	0·00095
0·00215	0·00011	0·00021	0·00017	0·00042	0·00087	0·00028	0·00006	0·00023	0·00027	0·00005
0·00603	0·00374	0·00436	0·00546	0·02280	0·00432	0·01107	0·01075	0·00396	0·00259	0·00169
0·02503	0·02478	0·03082	0·00563	0·07189	0·02022	0·00580	0·00207	0·02593	0·00700	0·00737
0·01015	0·00385	0·00534	0·00398	0·03088	0·01145	0·00368	0·00207	0·04278	0·00770	0·00314
0·06889	0·00952	0·01626	0·01981	0·04053	0·15426	0·01147	0·00773	0·03463	0·04650	0·02342
0·01353	0·00388	0·00683	0·00862	0·03220	0·00567	0·00493	0·00194	0·00215	0·05579	0·05918
0·01185	0·00096	0·00107	0·00162	0·00144	0·22417	0·00125	0·00399	0·00775	0·00083	0·00082
1·01573	0·00032	0·00046	0·00141	0·00106	0·01218	0·00039	0·00011	0·00108	0·00030	0·00019
0·03267	1·32555	0·60877	0·01479	0·02659	0·02926	0·01067	0·00275	0·03031	0·05728	0·01433
0·01955	0·00382	1·14380	0·00674	0·00643	0·03010	0·00531	0·00198	0·01253	0·01138	0·00202
0·00634	0·01552	0·06321	1·32147	0·20768	0·01000	0·05304	0·00148	0·00473	0·00365	0·00135
0·00058	0·00215	0·00290	0·00141	1·00122	0·00348	0·00346	0·00028	0·00086	0·00033	0·00011
0·00000	0·00000	0·00000	0·00000	0·00000	1·00000	0·00000	0·00000	0·00000	0·00000	0·00000
0·01092	0·27367	0·18847	0·49405	0·13230	0·01248	1·32524	0·02074	0·01101	0·01370	0·00386
0·00099	0·00013	0·00026	0·00028	0·00084	0·00444	0·00016	1·02065	0·00047	0·00064	0·00570
0·15323	0·02960	0·03416	0·05265	0·05367	0·11644	0·03911	0·03169	1·06385	0·03130	0·03961
0·12001	0·05542	0·08098	0·11701	0·16407	0·03450	0·08149	0·00594	0·02091	1·01152	0·01125
0·01472	0·00093	0·00769	0·00296	0·05731	0·01407	0·00121	0·00050	0·00147	0·00398	1·00386
0·47400	0·32073	0·25272	0·46978	0·39849	0·45876	0·90715	1·21144	0·58145	0·52492	0·62477

[a]M&E = machinery and equipment. [b]n.e.c. = not elsewhere classified.

ANNEX TABLE 3: COMMODITY CLASSIFICATION EMPLOYED IN THE RECONSTRUCTED 38-SECTOR INPUT-OUTPUT TABLE FOR 1959

Reconstructed sector designation	*Description*[a]	*Published USSR table*[b]
1. Ferrous ores	Ferrous ores and non-metallic raw materials for ferrous metallurgy	Part of 1
2. Ferrous metals	Cast iron, steel, ferro-alloys, rolled steel plate and sheet, rails and pipe	Part of 1
3. Non-ferrous ores	Non-ferrous ores	Part of 1
4. Non-ferrous metals	Non-ferrous metals and industrial diamonds	Part of 1
5. Coking coal	Coke and products of coke-chemistry, including tar and coal-based oils	2
6. Metal products	Industrial metal products: nails, wire, bolts, pins, springs, chains, welding electrodes, and other small metal items; refractory materials	3, 4
7. Coal	Anthracite and lignite; coal briquettes	5
8. Oil	Extraction of oil, gas by-products; oil refineries and processing of oil products	6, 7
9. Gas	Extraction of natural gas	8
10. Other fuels	Peat, peat briquettes, oil shales, liquid fuels from coal	9–11
11. Electrical power	Generation of electrical power (thermal and hydro) and of steam as by-product	12
12. Electrical and power machinery and equipment	Steam boilers and equipment, steam and gas turbines, nuclear reactors, steam engines, diesel engines, and other prime movers; electrical machinery; electrical lighting fixtures; electrical household appliances	13, 14
13. Tools and instruments	Cable and wire products; woodcutting and metalworking tools, electrical tools, measuring tools; industrial instruments and gauges, measuring and control apparatus; calculating and data processing equipment, including electronic computers; clocks, watches, optical and photographic equipment, including household types; ball and roller bearings	15, 19–21
14. General machinery	Metal and woodworking tools, lathes, and drills; forging and pressing equipment; casting equipment; mining and metallurgical machinery and equipment; pumps and compressors; machinery and equipment for the woodworking, paper, textile, apparel, food, and printing industries; hoisting and transporting equipment; construction machinery	16–18, 22–30
15. Transportation machinery, equipment and spare parts	Transportation machinery and equipment; shipbuilding and aircraft production	31
16. Automobiles	Passenger automobiles, trucks, and other motor vehicles	32
17. Agricultural machinery, equipment and spare parts	Tractors and other agricultural machinery and equipment	33
18. Machinery not elsewhere classified	Radioelectronics and communication equipment; miscellaneous machinery and equipment	omitted
19. Metalworking	Sanitary engineering equipment; metalware and hardware; metal furniture; metal frames, structures, bridges	35–37
20. Repair of machinery	Repair of all machinery and equipment	38
21. Abrasives	Abrasives and graphite products	39
22. Mineral and basic chemicals	Mineral chemicals: sulphur, calcite, etc.; basic chemicals: ammonia, nitrate fertilizers, inorganic acids and salts	40, 41
23. Synthetics and paints	Aniline dyes, synthetic resins and plastics, synthetic fibres, organic synthetics, synthetic rubber, paint and lacquer; pharmaceuticals and photochemicals	42–46, 48

ANNEX TABLE 3 *(continued)*

Reconstructed sector designation	*Description*[a]	*Published USSR table*[b]
24. Rubber products	Tires, tubes, hoses and other rubber products; asbestos	47
25. Lumber and woodworking	Logging, lumber and woodworking; furniture and other wood products	49–52, 54
26. Paper	Paper and paper products; wood pulp and cellulose	53
27. Construction	Cement, gypsum and other construction materials; brick, ceramic blocks, tiles, insulating materials and concrete	55
28. Glass	Glass and porcelain-faience products	56
29. Textiles	Textiles, hosiery, knitwear and felt goods	57
30. Apparel and footwear	Clothing and apparel, leather goods, footwear and fur products	58, 59
31. Food	Processed foods: fish, meat, milk and dairy products, sugar, flour, bread, processed and canned goods, table salt, alcoholic and non-alcoholic beverages; tobacco and products; candles, soap, perfumes and other cosmetics	60–65
32. Industry not elsewhere classified	Industrial products not elsewhere classified; printing and publishing; musical instruments and toys	omitted
33. Construction	Construction, new and maintenance	66
34. Agriculture	Agriculture, crops and animal husbandry	68–69
35. Forestry	Forestry	70
36. Transportation and communications	Freight transportation, and communications serving production	71
37. Trade and distribution	Retail and wholesale trade, including eating facilities, supply and distribution services, procurement of agricultural products	72
38. Products not elsewhere classified	Metal scrap collection, publishing, non-commercial hunting and fishing, and other activities not elsewhere classified	73

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[a] Based on Central Statistical Administration of the USSR, *Forms and Instructions for 1959 Input-Output,* translated by U.S. Department of Commerce, Office of Technical Services, Washington, D.C., 1962.

[b] Sector numbers refer to those in the published truncated version of the 1959 Soviet input-output table.Ts.S.U., *Narodnoe khoziaistvo SSSR v 1960 godu,* Moscow, 1961, pp. 103–143.

Part Two

APPROACHES TO INTERNATIONAL COMPARISONS

A COMPARATIVE STUDY OF THE INPUT STRUCTURE OF THE CHEMICAL INDUSTRIES IN SEVERAL INDUSTRIALLY DEVELOPED COUNTRIES

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I. COMPARISON BETWEEN THE FEDERAL REPUBLIC OF GERMANY, ITALY AND THE UNITED STATES: YEARS PRIOR TO 1955

The tables and the text are based on the results of a study made in 1958 by Diplom-Volkswirt Heinz Hipler under the auspices of Hans Möller in the Institute for Economics of the Johann Wolfgang Goethe University at Frankfurt-am-Main on behalf of and in collaboration with the Verband der Chemischen Industrie e.V.[1]

The data for Italy and the United States are taken from relevant literature.[2] The earlier German figures derive from the official census of industries made in 1936[3] and relate to the area of the former "Deutsches Reich".

The German figures on the input of materials and energy in 1953, 1954 and 1955 were produced by the Chemieverband and refer to the area of the Federal Republic of Germany.[4] An early portion of this work has already been published;[5] the remainder is in preparation.

Reference years

The statistics of different countries used in this section are not available for identical years. The data for the United States refer to 1919, 1929, 1939 and 1947, the Italian data to 1953, and those for the Federal Republic of Germany to 1936, 1953, 1954 and 1955. Under these circumstances a comparison of the Italian data of 1953 with the German data of 1954 in table 1 seems justifiable. The comparison of the United States chemical industry in 1947 with that of the Federal Republic in 1954 (table 2) can also be justified to a certain extent, since the economic and technical conditions in 1954 in the latter country were still heavily influenced by the Second World War and the subsequent general collapse. Moreover, a study on the technical development of the chemical industry of the United States, which would be very useful, is hampered by large time gaps in the data, which are available only for 1919, 1929 and 1939. Nevertheless, such imperfections must be permitted in a pioneering work such as that first prepared by Leontief (reproduced in table 3). Here the item "undistributed", for instance, amounts to more than 40 per cent of the gross production in 1919 and 1929, which fact necessarily reduces the value of the other identified inputs.

Classification

One of the major difficulties pertaining to international comparison is the differences between countries' statistical methods, especially those in classification. The adjustment of the respective national classifications of the industrial branches into a comparable scheme has so far only partially been solved. The differences in the definition of inputs to the chemical industry were rather troublesome, especially in the comparison between the United States and the Federal Republic of Germany; the Italian classification however differed less from the latter. For that reason the industries have been aggregated into the larger groups shown in tables 1 and 2. The aggregation of the groups was dictated primarily by the nature of the available statistical data of the respective countries rather than by economic or technical considerations.

Special attention was given to the definition of the chemical industry. The original Italian definition used in table 1, *industrie chimiche e delle fibre artificiale,* is generally parallel to the German definition of *chemische Industrie,* which includes *Kohlenwertstoff-Industrie.* In both countries crude coal-tar and crude benzene are considered as chemical products. In view of the general lack of precision with which these comparisons must be made, it has seemed not absolutely necessary to adjust the definitions of either country to make them completely comparable.

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[1] Hereafter referred to as Chemieverband.

[2] Instituto dello Stato, "Le Interdipendenze strutturali del sistema economico nazionale", chap. IV, *Relazione generale sulla Situazione economica del Paese 1954* (Rome); Wassily W. Leontief, *The Structure of the American Economy 1919 to 1939,* 2nd Edition (New York, 1951); Stanford Research Institute, Calif., *Chemical Economic Handbook,* Vol. II and III; W. Duane Evans and Marvin Hoffenberg, "The interindustry relations study for 1947", *The Review of Economics and Statistics,* May 1952; U.S. Department of Commerce, Bureau of the Census, *Census of Manufacturers: 1947 and 1954* (Washington, D.C.).

[3] The "Leisse'sche Erhebung". See *Die Deutsche Industrie, Gesamtergebnisse der amtlichen Produktionsstatistik* (Berlin, 1939). Schriftenreihe des Reichsamts für wehrwirtschaftliche Planung, Heft 1; further reference was made to unpublished details from this and from records of the former Reichsstelle Chemie in Berlin.

[4] The figures on the Federal Republic's input of materials and energy in 1953, 1954 and 1955 derive from *Ergebnisse der Erhebung über Nettoleistung der Industrie 1954* (Federal Statistical Office, Wiesbaden), and from the data in *Kostenstrukturerhebung 1950,* Federal Republic of Germany.

[5] Hans Wittmeyer and Frederick Hauck, "Über den Input der Chemischen Industrie ; aus den Strukturuntersuchungen des Referats Statistik des Verbandes der Chemischen Industrie", in *Chemische Industrie,* Heft 7/1957.

TABLE 1: COMPARISON OF THE INPUT STRUCTURE OF THE CHEMICAL INDUSTRY OF THE FEDERAL REPUBLIC OF GERMANY IN 1954 WITH THAT OF ITALY IN 1953

Federal Republic of Germany (1954)				*Italy (1953)*			
Input category	*Millions of DM*	*Percentage of gross production*		*Percentage of gross production*		*Millions of lire*	*Input category*
Kohlenbergbau	918·1	7·43	7·4	3·3	1·4	9,754	Estrazione di combustibile
					1·9	13,154	Industrie dei derivati del carbone
Mineralölverarbeitung	168·0	1·36	1·4	2·4	2·4	16,821	Industrie dei derivati dei petroli
Fremdstromerzeugung	310·0	2·51	2·7	3·4	3·4	23,492	Energia elettrica, gas e acqua
Wasser und Fremddampf	27·0	0·20					
Sonstiger Bergbau	298·0	2·41	4·0	6·9	6·3	43,526	Estrazione di minerali
Steine und Erden	128·9	1·05			0·6	4,131	Industrie della lavorazione de minerali non metallici
Glas und Feinkeramik	64·5	0·52					
Eisen und Stahl	78·8	0·64	3·2	2·0	2·0	13,803	Industrie metallurgiche
NE-Metalle u. Hüttenvorst.	324·0	2·65					
Maschinenbau	13·0	0·11	2·4	2·7	2·7	18,620	Industrie meccaniche
Elektrotechnik	33·0	0·27					
Feinmechanik u. Optik	29·0	0·24					
Eisen-, Blech-u. Metallwaren	220·0	1·78					
Asbest- und Gummiwaren	17·6	0·14	0·1	0·2	0·2	1,351	Industrie della gomma
Kunststoffverarbeitung	22·0	0·18	0·2	0·1	0·1	515	Industrie manifatturiere varie
Zellstoff- u. Papierind.	255·4	2·07	2·1	2·3	1·0	6,885	Industrie della carta e cartotecnica
					1·3	8,853	Industrie poligrafiche e editoriali
Sägewerke und Holzbearbeitung.	39·6	0·36	0·4	0·1	0·1	885	Industrie del legno e sughero
Textilien	103·0	0·83	0·8	0·1	0·1	984	Industrie tessili Industrie del vestiario
Pflanzliche und tierische Rohstoffe	438·0	3·55	4·4	6·6	1·9	13,374	Agricoltore e foreste
Genussmittelindustrie	108·4	0·88			4·7	32,471	Industrie alimentari e del tabacco
Transport	328·0	2·66	2·7	(2·0)	(2·0)	(14,010)	(Transporti)
Chemie-Input (innerrer Input)	1,972·0	16·0	16·0	2·8	2·8	19,181	Industrie chemiche e della fibre artificale
Abschreibungen	862·0	7·0	7·0	7·6	7·6	53,000	Ammortamenti
Arbeits-, Kapital- und Unternehmereinkommen, sonstige Vorleistungen und Steuern	5,576·1	45·2	45·2	59·4	59·4	411,821	Prodotto netto
Bruttoproduktion	12,335·9	100·0	100·0	100·0	100·0	692,621	Produzione vendibile

TABLE 2: COMPARISON OF THE INPUT STRUCTURE OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY IN 1954 WITH THAT OF THE UNITED STATES OF AMERICA IN 1947

Federal Republic of Germany (1954)				*United States of America (1947)*			
Input category	*Millions of DM*	*Percentage of gross production*		*Percentage of gross production*		*Millions of US dollars*	*Input category*
Kohlenbergbau	918·1	7·4	7·6	1·6	0·6	75·6	Coal-mining
Wasser-und Fremddampf	27·0	0·2			0·8	91·9	Coke and products
					0·2	23·9	Natural, manufactured and mixed gas
Mineralölverarbeitung	168·0	1·4	1·4	2·0	0·2	26·4	Crude petroleum and natural gas
					1·8	211·2	Petroleum products
Fremdstrom	310·0	2·5	2·5	0·6	0·6	77·9	Electric light and power
Sonstiger Bergbau	298·0	2·4	2·4	1·7	1·7	206·0	Mining
Eisen und Stahl	78·8	0·6	0·6	0·5	0·5	56·3	Iron and steel
Eisen-, Blech- u.Metallwaren	220·0	1·8	1·8	1·1	1·1	131·1	Metal products
NE-Metalle	324·0	2·6	2·6	1·2	1·2	149·6	Non-ferrous metals
				0·7	0·5	65·3	Machinery
Maschinenbau	13·0	0·1	0·6		0·0	3·5	Motor vehicles
Elektrotechnik	33·0	0·3			0·0	2·8	Transportation equipment
Feinmechanik und Optik	29·0	0·2			0·1	16·0	Professional and scientific equipment
					0·0	3·3	Electrical goods
Steine und Erden	128·9	1·0	1·6	1·3	0·4	45·7	Stones, sand, clay, abrasives
Glas und Feinkeramik	64·5	0·5			0·6	74·1	Glass
Asbest und Kautschuk	17·6	0·1			0·3	36·4	Rubber products
Sägewerke und Holzbearbeitung	39·6	0·3	0·3	0·4	—	—	Furniture and fixtures
					0·4	49·9	Lumber and wood
Kunststoffverarbeitung	22·0	0·2	0·2	0·2	0·2	24·7	Plastic products
Zellstoff und Papier	255·4	2·1	2·1	3·6	3·2	381·1	Paper and allied products
					0·4	42·5	Printing and publishing
Textilien	103·0	0·8	0·8	0·1	0·1	6·7	Textile mill products
					—	—	Apparel
Pflanzl.u.tier.Rohstoffe	438·0	3·6	4·5	8·7	1·2	140·0	Agriculture
Genussmittelindustrie	108·4	0·9			7·5	898·6	Food and kindred products
					0·0	0·7	Tobacco manufacturing
Transportkosten	328·0	2·7	2·7	2·9	2·9	347·5	Transportation
Chemie (innerer Input)	1,972·0	16·0	16·0	27·7	27·7	3,322·6	Chemicals
Kostensteuern	554·0	4·5	4·5	5·7	5·7	678·9	Government service (taxes)
				40·3	0·0	3·8	Leather and leather products
					0·3	31·6	Miscellaneous manufacturing
					0·2	24·4	Construction
					7·0	838·0	Other industries
Abschreibungen	862·0	7·0	47·7				
Personalkosten	2,586·6	21·0					
Kapital-, Boden-, Gebäudenutzung	185·0	1·5			32·8	3,934·9	Households (capital and labour including depreciation)
Unternehmereinkommen und sonstige Vorleistungen	2,245·5	18·2					
Bruttoproduktion	12,335·9	100·0	100·0	100·0	100·0	12,022·9	Gross purchase (Total)

TABLE 3: INPUT COEFFICIENTS OF THE UNITED STATES CHEMICAL INDUSTRY[a] 1919, 1929, 1939 AND 1947

(*Percentages*)

Input	*1919*	*1929*	*1939*	*1947*
1 Chemicals and allied products	5·7	6·9	17·2	27·6
2 Agriculture	9·1	4·8	3·6	6·8
3 Food and kindred products	2·3	1·5	1·0	5·0
4 Tobacco manufacturing	—	—	—	0·0
5 Energy	—	—	—	3·7
(*a*) Coal-mining	1·3	1·0	1·5	0·6
(*b*) Crude petroleum and natural gas	0·2	0·2	—	0·2
(*c*) Petroleum products	0·2	0·2	1·4	1·5
(*d*) Natural, manufactured and mixed gas	0·3	0·1	1·1	0·2
(*e*) Electric light and power	0·2	1·0	—	0·6
(*f*) Coke and its products	0·1	1·0	—	0·7
6 Mining	—	0·0	—	1·5
7 Iron and steel	—	—	0·8	0·4
8 Metal products	0·3	0·1	—	1·0
9 Non-ferrous metals	1·2	1·5	1·9	1·1
10 Machinery	—	—	0·0	0·5
11 Motor vehicles	—	—	—	0·0
12 Transportation equipment	—	—	—	0·0
13 Equipment: agriculture, construction, mining	—	—	—	—
14 Plumbing and heating equipment	—	—	0·1	—
15 Professional and scientific equipment	—	—	—	0·1
16 Electrical goods	—	—	—	0·0
17 Furniture and fixtures	—	—	0·0	—
18 Lumber and wood	1·4	0·3	—	0·4
19 Stone, sand, clay and abrasives	1·6	2·1	2·6	0·3
20 Glass	—	—	—	0·5
21 Textile-mill products	—	—	0·2	0·0
22 Apparel	—	—	0·0	—
23 Leather and leather products	0·2	0·6	0·1	0·0
24 Paper and allied products	—	—	1·4	2·7
25 Printing and publishing	—	—	—	0·3
26 Plastics products	—	—	—	0·2
27 Rubber products	—	—	0·1	0·3
28 Miscellaneous manufactures	—	—	0·0	0·3
29 Construction	—	0·5	0·4	0·2
30 Transportation	0·3	2·7	4·6	2·8
31 Personal services	—	—	3·7	—
32 Remaining industries	5·3	8·3	19·6	8·6
33 Labour and capital consumption	21·8	25·4	21·0	30·1
34 Government (direct and indirect taxes)	3·1	—	3·7	5·5
35 Undistributed	45·4	41·8	14·0	—
Gross production	100·0	100·0	100·0	100·0
(Millions of US dollars)	(3,404)	(4,050)	(4,914)	(13,936)

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[a] Including vegetable oils, which are not included in the German data.

TABLE 4: DIFFERENCES IN THE DEFINITION OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY AND THE UNITED STATES OF AMERICA

	United States shipments ($US 1,000)		*Material inputs as percentage of shipment*
	1947	*1954*	*1954*
A. Products included by the Federal Republic of Germany but not by the United States of America:			
Ferro-alloys	140,109	262,174	58
Coke-oven by-products	128,617	193,902	70
Candles	18,666	27,426	43
Matches	56,386	61,246	42
Fireworks	15,331	20,537	45
Linoleum	67,208	84,706	44
Roofing felt	274,051	324,078	63
Chemicals for photography	210,994	442,944	35
Lead pencils	45,492	50,986	47
Carbon paper and inked ribbons	49,068	90,990	53
Silicone carbide and aluminium oxide	19,902	34,698	42
TOTAL	1,025,824	1,593,687	54
B. Products included by the United States of America but not by the Federal Republic of Germany:			
Vegetable oils	1,667,911	1,581,487	85
Salt (edible)	46,570	71,636	32
TOTAL	1,714,481	1,653,123	117

Table 4 reveals the considerable differences existing between the United States and the German definitions. The products not included in the former are specified in terms of the value of shipments from the United States in 1947 and 1954, as well as a percentage of the total input of materials to gross production in 1954. As a whole they amount to a considerable value, but taken separately and compared with the total of chemicals they are less important. The inputs are widely spread over various items without any concentration and there would thus not be much danger of misinterpretation. This aspect of the differences in definition can therefore be disregarded in the present comparison.

More serious difficulties arise however in regard to the products included in the United States but not in the German definition. Vegetable oils are particularly important in that they have a markedly different input structure, which concentrates on raw agricultural staples. Vegetable oils are included only in table 3 and have been excluded from tables 2, 5 and 6.[6]

It has also been possible to apply the basic scheme for the global input, as laid down in table 7, to all three countries as far as supplementary data on value-added were available. The latter did not readily lend itself to subdivision, but this was of little importance because the main concern was with the input of materials and energy.

Statistical basis

The second (and often discussed) general problem, that of an institutional *versus* a functional basis for statistical compilation, had already arisen in the available German statistics. The 1936 German census of industries had been constructed on an institutional basis. The chosen unit however was the technical establishment, subdivided as far as possible according to process or product: but even by the mid-1930's these establishments were already heterogeneous and complex.

The study of the Chemieverband on the input structure of the chemical industry is functionally oriented; the product, not the producing institution, is considered as being of prime importance.

The far-reaching disaggregation of the German census of industries in 1936 and the variety of the data collected by the Chemieverband for later years made it possible to prepare pre- and post-war input tables both in institutional and in functional classifications (tables 8 and 9). The functional table (9) is, however, limited to the input of materials and energy.

It is admitted that neither purely institutional nor

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[6] In tables 1, 2 and 6 the original German and Italian denominations of the industrial sectors have not been translated in order not to misinterpret the meaning or to veil the national differences.

TABLE 5: INPUT COEFFICIENTS FOR SUBSECTORS[a]

(*Percentages*)

To: *From:*	*Chemicals Total*	*Inorganic chemicals*	*Organic chemicals*	*Plastic materials*
1. Chemicals and allied products, total	27·7	20·1	29·7	46·5
(*a*) Inorganic chemicals	4·0	6·6	6·4	1·7
(*b*) Organic chemicals	8·6	7·8	15·8	34·3
(*c*) Plastic materials	1·2	—	1·2	0·0
(*d*) Synthetic rubber	0·0	—	0·1	—
(*e*) Synthetic fibres	0·2	—	0·2	—
(*f*) Explosives and fireworks	0·1	1·0	0·1	—
(*g*) Drugs and medicines	2·0	0·9	1·8	—
(*h*) Soap, glycerine and related products	2·1	—	0·5	4·5
(*i*) Paint and allied products	2·0	—	1·1	2·8
(*j*) Gum and wood chemicals	0·6	0·1	0·5	—
(*k*) Fertilizers	0·7	1·6	0·1	—
(*l*) Animal oils	4·1	—	0·1	0·3
(*m*) Miscellaneous chemicals	2·1	2·1	1·8	0·9
2. Energy, total	4·2	9·1	8·2	1·4
(*a*) Coal-mining	0·6	2·2	1·0	0·5
(*b*) Crude petroleum	0·2	0·0	0·5	—
(*c*) Petroleum products	1·8	2·0	2·8	0·2
(*d*) Natural, manufacturing and mixed gas	0·2	0·7	0·6	0·0
(*e*) Electric light and power	0·6	2·2	1·1	0·5
(*f*) Coke and products	0·8	2·0	2·2	0·2
3. Agriculture	1·2	—	1·8	—
4. Food and kindred products	7·5	0·2	4·9	2·6
5. Tobacco manufacturing	0·0	—	—	—
6. Mining	1·7	7·6	0·4	—
7. Iron and steel	0·5	0·2	0·6	0·4
8. Metal products	1·1	0·3	1·1	0·0
9. Non-ferrous metals	1·2	3·7	1·5	0·3
10. Machinery	0·5	0·4	0·4	0·3
11. Motor vehicles	0·0	—	—	—
12. Transportation equipment	0·0	0·1	0·0	—
13. Equipment for agriculture, construction and mining	—	—	—	—
14. Plumbing and heating equipment	—	—	—	—
15. Professional and scientific equipment	0·1	—	—	—
16. Electrical goods	0·0	—	—	—
17. Furniture and fixtures	—	—	—	—
18. Lumber and woods	0·4	0·3	1·0	0·2
19. Stone, sand, clay and abrasives	0·4	1·6	—	0·0
20. Glass	0·6	0·4	0·3	—
21. Textile-mill products	0·1	0·2	0·1	—
22. Apparel	—	—	—	—
23. Leather and leather goods	0·0	—	—	—
24. Paper and allied products	3·2	1·0	1·3	7·1
25. Printing and publishing	0·4	0·1	0·1	0·1
26. Plastic goods	0·2	0·0	0·0	2·0
27. Rubber products	0·3	0·3	0·3	0·2
28. Miscellaneous manufacturing	0·3	0·1	0·1	1·1
29. Construction	0·2	0·2	0·2	0·2
30. Transportation	2·9	5·5	3·3	3·1
31. Personal services	—	—	—	—
32. Other industries	7·0	3·5	1·8	2·5
33. Households (labour and capital)	32·8	38·8	36·1	27·2
34. Government services	5·7	6·5	6·8	4·8
35. Gross production	100·0	100·0	100·0	100·0
(Value in $1,000,000)	12,023	1,094	1,672	592

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[a] Excluding processing of vegetable oils.

OF THE UNITED STATES INDUSTRY, 1947

(*Percentages*)

Synthetic rubber	*Synthetic fibres*	*Explosives and fireworks*	*Drugs and medicines*	*Soap, glycerine and related products*	*Paint and allied products*	*Gum and wood chemicals*	*Fertilizers*	*Animal oils*	*Miscellaneous chemicals*
29·8	17·0	25·8	22·9	38·5	26·9	3·3	30·0	15·8	29·9
0·7	3·6	10·7	1·3	2·9	1·3	1·3	16·8	1·0	4·2
19·7	11·1	2·3	5·4	2·4	6·8	—	0·5	0·8	7·0
—	—	—	—	0·3	5·8	—	—	0·6	1·0
—	—	—	—	0·1	—	—	—	0·2	0·1
—	0·1	—	0·2	0·2	0·1	—	—	0·5	0·4
—	—	0·7	—	0·1	—	—	—	0·2	0·1
—	0·2	—	11·7	0·6	0·2	—	—	0·9	2·3
4·4	0·8	10·9	0·4	2·5	0·4	—	—	1·7	7·0
—	0·5	—	0·1	0·8	10·4	—	—	0·4	1·5
—	—	—	0·1	0·5	0·3	0·8	—	—	1·5
—	—	—	—	0·1	—	—	11·6	0·5	0·1
0·6	—	—	2·0	24·0	0·5	—	0·4	5·3	2·3
4·4	0·7	1·2	1·7	4·0	1·0	1·3	0·6	3·7	2·4
25·2	2·6	2·8	1·0	0·9	3·3	1·3	4·8	0·7	3·7
0·1	1·7	0·5	0·2	0·2	0·2	0·7	0·0	0·3	0·3
—	—	—	—	—	—	—	—	—	1·1
24·0	0·6	0·9	0·4	0·5	2·3	0·1	0·1	0·2	1·4
0·2	0·0	0·3	0·0	0·1	0·1	0·3	0·0	0·1	0·1
0·7	0·3	0·8	0·3	0·2	0·4	0·3	0·6	0·2	0·6
0·2	—	0·3	0·1	0·0	0·3	—	4·0	0·0	0·2
—	—	—	1·2	0·3	0·9	24·5	0·2	2·1	1·1
0·1	0·8	0·3	1·7	10·0	11·8	0·4	0·8	44·3	4·6
—	—	—	—	—	—	—	—	—	0·0
—	—	0·1	0·0	0·0	2·2	—	8·4	—	2·1
0·0	0·3	0·6	0·1	0·7	0·5	0·4	0·1	1·1	0·6
—	0·0	1·3	0·5	1·0	3·3	2·5	0·0	0·1	1·6
—	0·1	0·1	0·1	0·2	4·4	0·1	0·0	0·3	0·2
1·0	0·4	0·3	0·2	0·3	1·3	0·3	—	0·3	0·9
—	0·1	—	0·1	0·1	0·0	—	—	—	—
—	—	0·3	—	0·0	—	—	0·0	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	0·2	—	—	—	0·8
—	—	—	—	—	0·2	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	0·3	3·5	—	0·1	0·0	11·5	—	0·1	0·0
—	—	—	0·0	0·2	1·0	—	0·3	—	0·5
—	—	—	2·8	0·3	0·1	0·1	—	0·1	1·4
—	—	0·9	0·0	0·0	0·0	—	—	0·2	0·0
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	0·2
0·9	12·3	1·9	3·2	4·4	1·3	0·2	4·3	—	3·7
0·0	0·2	0·1	1·1	1·0	0·2	0·1	—	0·0	0·3
—	0·0	0·1	0·2	0·0	0·3	—	—	—	0·1
0·2	0·1	0·3	0·3	0·4	0·3	0·4	0·1	0·5	0·4
—	—	0·3	—	—	0·0	—	2·4	0·1	0·6
0·2	0·8	0·3	0·1	0·1	0·1	0·2	0·4	0·1	0·1
3·2	2·8	2·5	1·5	1·9	2·2	4·0	10·5	1·0	1·9
—	—	—	—	—	—	—	—	—	—
3·6	2·3	4·5	12·4	9·7	3·1	4·4	6·0	14·6	13·0
30·8	48·7	46·5	43·8	25·4	32·0	42·4	26·3	16·3	27·2
5·0	11·2	7·4	6·8	4·5	4·3	4·0	5·4	2·4	5·0
100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
253	727	159	1,270	1,533	1,627	157	523	776	1,640

TABLE 6: PRODUCT MIX OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY AND IN THE UNITED STATES OF AMERICA: 1954

Federal Republic of Germany			*United States of America*			
Chemical product category	*1,000 DM*	*Percentage of total*	*Percentage of total*	*$US1,000*	*Census code*	*Chemical product category*
1. Anorg. Industriechemikalien	1,732,090			1,962,571	2811, 2, 9	Industrial inorganic chemicals
Düngemittel	1,272,968			855,196	2871, 2	Fertilizers
Ferrolegierungen	105,046			11,929	2861051 2862051	Charcoal
				102,833	2895	Carbon black
				195,390	2896	Gases (compressed and liquefied)
					3291, 111	
				34,698	3291, 121	Silicone carbide and other electrometallurgical products
				262,174	3313	
	3,110,104	25·1	19·0	3,424,791		
2. Organische Industriechemikalien	1,760,500			2,720,648	2822, 2829 except 2829411, 611	Industrial organic chemicals
organ. Farbstoffe	600,393					
Gerbstoffe u.-extrakte	68,648			75,810	28414	Glycerine
Synth. Aromen u. Essenzen	10,437			99,222	2861, 2 3, 5 2861051 except 2862051	Gum and wood chemicals except charcoal
				87,426	2821	Cyclic (coal-tar) crudes
				193,902	29323	Coke-oven by-products
	2,439,978	19·7	17·6	3,177,008		
3. Kunststoffe einschl. synth. Kautschuk	1,044,485	8·4	10·3	1,855,654	2823, 2824	Plastic materials and synthetic rubber
4. Chemiefasern	993,698	8·0	6·6	1,202,343	2825	Synthetic fibres
5. Pharmazeutica	1,077,253	8·7	10·8	1,946,672	2831, 3, 4	Drugs and medications
6. Seifen und Waschmittel	701,773			405,031	2841 except 28414	Soap except glycerine
Körperpflegemittel	285,776					
Textil-u. Lederhilfsmittel	200,000			744,481	2893	Toilet preparations
Schuh-, Leder-, Fussbodenpflegemittel				977,899	2842	Cleaning and polishing
	95,765			59,516	2843	Sulphonated oils and treatment agents
	1,283,314	10·4	12·2	2,206,927		
7. Sprengstoffe, Pulver, Zündwaren				183,680	2826	Explosives
				61,246	3983	Matches
				20,537	3985	Pyrotechnics
	168,599	1·4	1·5	265,463		
8. Chemischer Bürobedarf				15,543	2899373, 5, 6	Inks
				50,986	3952	Lead pencils, crayons
	107,099	0·9	0·9	90,990	3955	Carbon paper, inked ribbon
				157,519		
9. Fotochemie	193,713	1·6	2·5	442,944	38615, 6 7, 8	Photographic equipment
10. Saaten- und Pflanzenschutzmittel, Schädlingsbekämpfungsmittel				96,979	28991, 2	Insecticides, weed killers and fungicides
				177,956	2897	
	137,345	1·1	1·5	274,935		
11. Leime und Klebstoffe,	176,667					
Gelatine usw.	27,111					
	203,778	1·6	1·0	180,224	2894	Glue and gelatin
12. Industrielle Öle,					2886	Grease and tallow
Fette, Fettsäuren usw.	147,429	1·2	2·3	408,455	2887	Fatty acids
13. Wachse und Stearinerzeugnisse, Kerzen	100,000	0·8	0·2	27,426	3984	Waxes and candles

TABLE 6 (*continued*)

Federal Republic of Germany			*United States of America*			
Chemical product category	*1,000 DM*	*Percentage of total*	*Percentage of total*	*$US1,000*	*Census code*	*Chemical product category*
14. Mineralfarben	353,402			1,458,297	2851	Paints and varnishes
Druck-, Künstler- u.				370,222	2852	Inorganic colour pigments
Lebensmittelfarben	97,893			45,431	2853	Whiting and fillers
Lacke, Öle-, Leim- u. Wasserfarben	695,481			172,434	2891	Printing ink
	1,146,776	9·2	11·4	2,046,384		
15. Ather, Öle und				47,615	2829411	Flower and perfume materials
Riechstoffe,				5,280	2829611	Flower-oil mixtures
Essenzen und Aromen				25,977	28	Essential oils
	10,000	0·1	0·4	78,872		
16. Chemische Bauten- und Holzschutzmittel, Kitte, Dachpappe usw.	225,544	1·8	1·8	324,078	2952	Roofing felts and coatings
	12,389,115	100·0	100·0	18,020,685		

Note: The value of output relates to gross production in the case of the Federal Republic of Germany; the corresponding figures for the United States relate to gross shipments (including interplant transactions).

purely functional input-output tables can be prepared in practice. It was therefore necessary to adjust the functionally collected input data of the Chemieverband to the official statistics offering institutional data. The institutional unit in the Federal Republic of Germany is enterprise, whereas the United States data are based on establishment.

The structure of internal inputs

The tables for both countries contain transactions within the chemical industry. In data for the Federal Republic, only transactions between different enterprises are collected, whereas in the United States data, flows between various establishments of the same enterprise are also recorded. This methodological difference accounts for the fact that the internal input in the latter country (27 per cent) is nearly twice as high as that in the former one.

In the comparison between the Federal Republic and Italy there occurs a similar phenomenon, despite the application of the same methodological base. The Italian internal input amounts to 2·8 per cent which is only a sixth of the other figure. Since in both countries the enterprise has been the institutional unit and methodological differences are almost non-existent this must be attributed to the real structural difference between the chemical industries of these countries. One of the causes for this phenomenon might be the relatively high degree of vertical integration in the Italian chemical industry.

Variation of input coefficients

Another striking observation is the relative constancy of the input coefficients for the Federal Republic as compared with the considerable variations in the United States ones. The extent to which these can be attributed to statistical imperfections, above all to the incompleteness of the United States tables in the early years and to their time gaps, is no part of this study, but it is generally true that a broader aggregation of input sectors tends to diminish changes in coefficients.

Changes in the interindustry relations of important industries, when viewed in the light of economic evolution, occur rather gradually. Substitution between materials occurs, if at all, within the major categories (which will be defined in the next section), and rarely goes beyond the confines of these categories. The dynamic characteristic of the chemical industry is, in general, therefore not perceptible through these aggregated input data.[7]

Structure of production

The purpose of table 6 is to give an idea of the composition of the chemical products of the Federal Republic of Germany and of the United States in 1954. For this

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[7] See Hans Wittmeyer, "Zur Frage der Gültigkeit von Naturgesetzen in der Wirtschaft", in Allgemeines Statistisches Archiv, Band 44, Heft 2, 1960. Also see section IV of this paper.

TABLE 7: GLOBAL INPUT CLASSIFICATION SCHEME FOR THE CHEMICAL INDUSTRY

Proprietor's income	Net value-added	Gross value-added[a]	Gross production
Interests and rents for capital, buildings, machinery, estate			
Wages and salaries			
Taxes paid other than income taxes			
Depreciations			
Other services (non-material charges, distribution, advertising etc.)			
Intra-industry inputs	Material inputs		
Inter-industry inputs (raw and auxiliary material, commission work etc.)			

[a] Gross value added in this context is the census concept rather than the national account concept in the sense that it includes not only factor services but non-factor services as well.

TABLE 8: INPUT COEFFICIENTS OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY 1936 AND 1953–55—INPUT CLASSIFIED BY INDUSTRY

(*Percentage*)

Input (classified by industry)	*1936*	*1953*	*1954*	*1955*
1. Coal-mining	8·1	7·8	7·4	7·5
2. Other mining	2·3	2·2	2·4	2·8
3. Steam	0·2	0·2	0·2	0·2
4. Electricity (public)	2·1	2·4	2·5	2·5
5. Stone, sand and gravel	1·1	1·0	1·0	1·0
6. Iron and steel	1·4	0·7	0·6	1·0
7. Non-ferrous metals	1·8	2·4	2·6	2·8
8. Mineral oil refining	1·2	1·1	1·4	1·6
9. Rubber and asbestos	0·2	0·2	0·1	0·1
10. Pulp, paper and boards	2·0	2·2	2·1	2·1
11. Lumber and wood	0·5	0·3	0·3	0·3
12. Metal manufactures	1·9	1·7	1·8	1·7
13. Glass and pottery	0·3	0·5	0·5	0·5
14. Textiles	1·1	0·8	0·8	0·8
15. Plastic products	0·2	0·2	0·2	0·2
16. Vegetable and animal crude materials	4·4	3·7	3·6	3·4
17. Food and beverages	1·3	1·0	0·9	0·8
18. Machinery, including electrical and precision instruments	0·2	0·6	0·6	0·6
19. Transportation	1·9	2·6	2·7	2·6
External input, total	32·2	31·6	31·8	32·5
20. Internal input (chemicals)	11·4	—	16·0[a]	—
Input (materials and energy), total	43·6	—	47·8	—
21. Taxes (trade, turnover etc.)	56·4	—	4·5[a]	—
22. Depreciation			7·0[a]	
23. Compensation of employees			21·0[a]	
24. Interests and rents for capital, estate and buildings			1·5[a]	
25. Proprietors' income				
26. Other services			18·2[a]	
Gross production	100·0	100·0	100·0	100·0
(Value in millions of DM)	(4,253·1)	(10,889·8)	(12,335·9)	(14,017·9)

[a] Computed or estimated according to *Kostenstrukturerhebung*, 1950.

TABLE 9: MATERIAL AND ENERGY CONSUMPTION OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY—1936, 1953–55; INPUTS CLASSIFIED BY PRODUCT

(*Percentage*)

Input (classified by product)	*1936*	*1953*	*1954*	*1955*
1. Coal and related fuel, including coke	3·8	3·7	3·6	3·6
2. Gas	1·5	1·2	1·2	1·3
3. Crude coal-tar	2·1	1·5	1·2	1·3
4. Crude benzol	0·7	1·4	1·4	1·3
5. Petroleum, crude and refined (refinery gas, liquefied gas)	—	0·0	0·3	0·3
6. Fuel oil	0·1	0·1	0·2	0·4
7. Benzene, test and special grade	0·2	0·3	0·3	0·3
8. Bitumen	0·5	0·2	0·2	0·1
9. Gasolines, lubricants	0·2	0·4	0·3	0·3
10. Electricity (public)	2·1	2·4	2·5	2·5
11. Water and steam service	0·2	0·2	0·2	0·2
12. Rock salt	0·5	0·3	0·3	0·3
13. Potash salts	0·8	0·3	0·3	0·4
14. Pyrites	0·4	0·9	0·9	1·2
15. Phosphate rock	0·5	0·4	0·4	0·5
16. Barytes	0·1	0·1	0·1	0·1
17. Fluorspar	0·0	0·1	0·1	0·1
18. Quicklime, calcium carbonate and limestone	0·5	0·4	0·4	0·4
19. Clay	0·0	0·0	0·0	0·0
20. Quartz sand and powder	0·0	0·0	0·0	0·0
21. Kieselguhr	0·0	0·0	0·0	0·0
22. Gypsum and anhydrite	0·1	0·0	0·0	0·0
23. Acid and fire-proof stones	0·2	0·1	0·1	0·1
24. Non-ferrous metals	0·9	1·4	1·4	1·6
25. Non-ferrous metal ores, metallurgical primary products	0·9	1·0	1·2	1·2
26. Rubber and asbestos	0·2	0·2	0·1	0·1
27. Pulp, paper and board	2·0	2·2	2·1	2·1
28. Wood and related products	0·5	0·3	0·3	0·3
29. Metal manufactures	1·9	1·7	1·8	1·7
30. Glass and pottery	0·3	0·5	0·5	0·5
31. Jute (yarn, staple and fabrics)	0·1	0·1	0·1	0·1
32. Other textile raw material	0·1	0·1	0·1	0·1
33. Jute and other textiles for packaging clothes	0·9	0·6	0·6	0·6
34. Plastics products	0·2	0·2	0·2	0·2
35. Oils and fats	2·0	2·3	2·3	2·1
36. Other vegetable and animal crude materials such as hides and skins, glands, drugs, waxes, gums and resins, natural essential oils	2·4	1·4	1·3	1·3
37. Crude and white spirits	0·9	0·6	0·6	0·5
38. Sugar and starch	0·2	0·2	0·2	0·2
39. Machinery, including electrical, precision and optical instruments	0·2	0·6	0·6	0·6
40. Transportation	1·9	2·6	2·7	2·6
TOTAL (1–40)	30·1	30·0	30·1	30·5

TABLE 10: INPUT COEFFICIENTS FOR MAJOR MATERIAL GROUPS AND ENERGY

(*Percentage*)

Major input group	*Federal Republic of Germany 1954*	*Italy*	*United States 1947*
Vegetable and animal raw materials, food and allied products	4·4	6·6	8·7
Textiles	0·8	0·2	0·1
Pulp, paper and allied products	2·1	2·9	3·6
Coal	7·6	3·3	1·6
Petrol/natural gas	1·4	2·4	2·0
Purchased electricity	2·5	3·4	0·6
Total energy	11·5	9·1	4·2

purpose the value of shipments of important product groups and their percentage composition are compared. No essential differences in the production structure of both countries can be noticed. The greatest difference (of about 6 per cent) appears in the first group, which is composed primarily of inorganic chemicals and fertilizers, and can be attributed to the higher per hectare fertilizer consumption.

Conclusions from the above investigations

The summary input comparison of the three countries given in table 10 shows some similarities between Italian and United States industries.

Despite the statistical imperfections mentioned earlier this table permits an analysis of the chemical structure of the three countries.

The fact that the input of total energy in each European country is more than twice as large as that in the United States is due to the considerably lower prices for energy in the latter. The similarity of the production structure of the Federal Republic of Germany and of the United States obviously tends to reduce such differences in energy consumption. Furthermore the price difference conceals the relative extent of the substitution of petroleum and natural gas for coal: this process was already rather advanced in the United States in 1947 while it began in the two European countries only in 1953–54 (see section IV).

In the United States the input of vegetable and animal raw materials is nearly double that of the Federal Republic. This relationship cannot be attributed solely to price differences. Probably the consumption in the United States and in Italy was considerably higher. This is connected with the high input of coal in the Federal Republic of Germany. Despite the high price of energy, coal was the only basic material for synthetics which, compared with derivatives of natural raw materials, played a more important part there than in the other two countries.

There seem to be no reasonable economic explanations for the differences in the input of textiles and of pulp and paper products. They may be influenced by differences in the aggregation of these industries.

These observations concerning the economic and technical structure of the chemical industries of the countries compared here are not satisfactory. At this stage they are too vague to indicate any facts more specific than already well-known general trends. The statistical material used in this section is no doubt far from adequate.

II. AN EXAMINATION OF THE INPUT-OUTPUT DATA FOR THE FIVE MEMBER COUNTRIES OF THE EUROPEAN ECONOMIC COMMUNITY

Uniform classifications

The work of the Statistical Office of the European Communities (SOEC) for the establishment of uniform input-output tables merits a particular welcome. The great progress in international input-output statistics brought about by this work of the SOEC lies in the achievement of a uniform definition and standardized classification of the national data of the individual member countries. The statistical methods however have often preserved national peculiarities.

The classification follows the Nomenclature of the Industries Established in the European Communities (NICE) developed by the SOEC for institutional statistics. The input of materials is defined strictly according to the product list of the Statistics and Tariff Classifications for Foreign Trades and has therefore a pronounced functional character. The higher numbered categories of intermediate input (such as transport, commerce and other services) and primary factor input follow the scheme of compilation of gross national product. They are institutionally oriented.

In the first version of the SOEC tables, dated October 1964, intermediate inputs are divided into 85 categories, while in the second version (December 1965) they are divided first into 65 and then into 35 categories. The fifteen categories of primary input remain unchanged, however.

The correspondence between the 85 categories of intermediate input in the first version and the 65 and 35 categories in the second version is shown in table 11.

The classification of intermediate input into 35 categories has resulted in consistent chemical data for all the countries considered. Chemicals in this classification are put in category 18, which can be subdivided as follows for the purposes of this study:

18 (a)	Plastics products (products of the plastics processing industries)
18 (b)	Synthetic materials and artificial fibres (products of the plastics, synthetic rubber and artificial fibre producing industries)

TABLE 11: NOMENCLATURES FOR THE INPUT-OUTPUT TABLES PREPARED BY THE STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES (SECOND VERSION, DECEMBER, 1965)

		Corresponding Sector No. in	
35-Sector alignment	*Sector title*	*65-Sector alignment*	*85-Sector alignment*
1.	Agricultural products (including wine), forestry and fishery products	1, 2	1, 2
2.	Coal and related fuels	3	3
3.	Coal products (coke, gas)	4	4
4.	Iron and non-ferrous ores	5, 6	5, 6
5.	Crude and refined petroleum (including distribution), natural gas	7, 32	7, 44
6.	Minerals, non-metallic mineral products (cement, glass etc.)	8, 9, 33, 34	8, 9, 45, 46
7.	Meat (including canning), dairy products, vegetable and animal fats and oils	10, 14, 18	10, 14, 18
8.	Miscellaneous food products	11, 12, 13, 15, 16	11, 12, 13, 15, 16
9.	Beverages	17	17
10.	Tobacco	19	19
11.	Yarn, fabrics, knit fabrics	20, 21	20 (21, 22), 23
12.	Clothing, textiles, carpets, furs	22	24, 25
13.	Leather, footwear and leather products, other than clothing	23, 27	26, 34 (35, 36)
14.	Wood, wood and cork products (including furniture and bedding)	24	27 (28, 29)
15.	Pulp, paperboard and allied products	25	30 (31, 32)
16.	Printing, publishing and related activities	26	33
17.	Rubber and asbestos products	28	37
18.	Chemical products, artificial fibres, plastics and synthetic products	29, 30, 31	38, 39, 40, 41 (42, 43)
19.	Iron and steel products (ECSC)	35	47 (48, 49, 50)
20.	Iron and steel products outside ECSC; metal furniture and products other than machinery	36, 39	51 (52, 53), 56
21.	Non-ferrous metals and related products	37	54
22.	Foundry products	38	55
23.	Non-electric machinery, railroad cars, aircraft	40, 41, 44, 48	57, 58, 61, 65
24.	Electrical machinery, apparatus and equipment	42	59

TABLE 11 (*continued*)

		Corresponding Sector No. in	
35-Sector alignment	*Sector title*	*65-Sector alignment*	*85-Sector alignment*
25.	Naval construction, motor vehicles and engines, bicycles	43, 45, 46, 47	60, 62, 63, 64
26.	Precision and optical instruments, miscellaneous industrial products, recovered products	49, 50, 52	66, 67, 71
27.	Buildings and civil engineering	51	68 (69, 70)
28.	Electrical energy, gas, water services (including distribution)	53, 54	72, 73
29.	Transportation and ancillary trades	55, 56, 57, 58, 59	74, 75, 76, 77, 78
30.	Commerce	60	79
31.	Communications	61	80
32.	Finance and insurance	62	81
33.	Other services	63	82
34.	Housing services	64	83
35.	Government services	65	85
36.	Intermediate input (output) TOTAL (1 to 35)	66	86

18 (c) Other chemicals
(corresponding to the products as defined by the Special Committee for Chemical Products of the OECD, except plastics and synthetic rubber).

These subcategories will be studied here in three different combinations: 18 (a + b + c), 18 (b + c) and 18 (c). Other SOEC categories of the 35-sector alignment subdivided or re-aggregated in this study are: Nos. 5, 6, 7–9 and 28. The results for the first three are shown in table 12. The subdivision of No. 28 is considered later.

For the Federal Republic of Germany the SOEC has established tables for 35 categories only. This means that chemicals appear as a whole in category 18. In order to eliminate plastics processing (18 (a)), which is generally not considered as part of the chemical industry, the present author has disaggregated the subcategory 18 (b + c) from Chemieverband data and adjusted it to the SOEC scheme. Consistent input data for Belgium, France, Italy and the Netherlands have been computed by adding the figures from categories 30 and 31 of the 65-category classification of the SOEC.

Because of the intensive interlacing of the synthetic materials and man-made fibres industry with other chemical industries in the Federal Republic of Germany it was not possible to isolate 18 (c) for the purpose of comparison with other countries where consistent data are available as category 31 of the 65-category SOEC classification.

TABLE 12: COMPARISON OF THE CLASSIFICATION IN THIS STUDY WITH THOSE OF SOEC

Classification number in this study	*SOEC classification number*		
	35-Sector	*65-Sector*	*85-Sector*
18 (a+b+c)	18	29+30+31	38+39+40+41+42+43
18 (b+c)		30+31	39+40+41+42+43
18 (c)		31	40+41+42+43
5(a)	5	7	7
5(b)		44	32
6(a)	6	8+9+33	8+9+45
6(b)		34	46
7–9(a)	7+8+9	18	18
7–9(b)		12	12
7–9(c)		10, 11, 13–17	10, 11, 13–17

Table 13 is derived from the SOEC data for category 18 as a whole; in the last three rows the value terms are converted into United States dollars by means of exchange rate tables prepared by the United Nations. The intermediate input categories have been rearranged in different order, however, so as to reflect the functional characteristics of different input materials. As in SOEC publications the intra-industry inputs are shown in brackets and are not included in the totals. Input coefficients as well as value of production in terms of United States dollars for 18 (b + c) and for 18 (c) are given in tables 14 and 15 respectively. In these tables the input categories 5, 6, 7-9 and 18 are subdivided as explained above.

Formation of aggregates

In tables 13, 14 and 15 various input categories are grouped from the technical-economic point of view. The first group, "energy", incorporates categories 2 + 3 (coalmining products), 5 (petroleum and natural gas and their derivatives produced by the mineral oil industry), and 28 (electricity and other secondary energies purchased or produced in the same establishment). This group includes the cost of energy production and distribution. The dual role played by the materials of this energy group in the chemical industry is worth noting: they not only are consumed as fuel or as a source for light and heat but also serve as raw material for organic synthesis.

The second group, "organic primary materials", aggregates categories 1 (agricultural, forestry and fishery products, including wine), 7 + 8 + 9 (vegetable and animal fats and oils, sugar, and food and beverages), 14 (wood, and wood and cork products, including furniture and related products), and 15 (pulp, paper and board and allied products).

TABLE 13: INPUT COEFFICIENTS OF ALL CHEMICAL INDUSTRY 18 (a+b+c) FOR THE FIVE EEC COUNTRIES, 1959

(In percentage of gross value of production)

SOEC code	*Input*	*Belgium*	*Germany, Federal Republic of*	*France*	*Italy*	*Netherlands*
28	Electricity, gas, compressed air, steam and water	6·0	6·7	3·4	5·3	2·2
2	Coal and related fuels	1·0	2·3	0·7	0·2	1·8
3	Coal products (cokes and gas)	1·0	0·9	1·3	1·2	3·9
5	Petroleum, natural gas and petroleum refining	1·6	2·6	2·0	5·2	6·3
	Energy, total	9·6	12·5	7·4	11·9	14·1
1	Agriculture, forestry and fishing	0·4	1·1	0·8	1·0	0·7
7–9	Vegetable and animal oils, food and beverages	2·9	2·7	2·9	5·1	5·9
10	Tobacco products	—	—	—	[a]	—
14	Wood and wood products	0·5	0·4	0·2	0·3	0·5
15	Pulp, paper and allied products	2·5	2·2	3·4	2·5	3·7
	Organic primary materials, total	6·3	6·4	7·4	8·9	10·9
4	Metal ores	0·1	0·9	0·4	0·2	0·4
6	Non-metallic mineral ores and products	5·3	4·4	3·7	3·5	1·0
21	Non-ferrous metals and products	2·6	1·7	0·9	1·6	0·5
19	Iron and steel products, ECSC	[a]	—	—	—	0·7
	Inorganic primary materials, total	8·0	7·1	5·0	5·3	2·6
20	Iron and steel, except ECSC, and metal products	1·8	2·3	1·6	0·4	1·5
22	Foundry products	0·9	—	0·1	—	—
23	Non-electrical machinery, railroad cars and aircraft	0·8	1·0	0·1	—	0·2
24	Electrical machinery	0·5	0·2	[a]	—	0·2
25	Ships, motor vehicles, engines and bicycles	0·1	0·5	0·2	1·4	0·2
26	Precision instruments	0·1	0·2	0·3	[a]	0·5
	Repair and maintenance materials, total	4·3	4·2	2·3	1·8	2·6
11	Textiles	0·7	1·0	0·2	0·3	0·4
12	Clothing	—	0·2	0·2	[a]	—
13	Leather products	—	[a]	—	[a]	[a]
17	Rubber and asbestos products	[a]	0·4	0·5	0·3	0·1
	Secondary materials (*a*), total	0·7	1·6	0·9	0·5	0·5
16	Printing and publishing	1·7	1·1	0·6	1·2	1·3
	Secondary materials (*b*), total	1·7	1·1	0·6	1·2	1·3
18	Imported chemical materials	19·8	6·3	15·5	16·7	25·9
	External material inputs, total	50·4	39·2	39·1	46·3	57·9
	(Internal input)[b]	(12·9)	(18·8)	(14·1)	(56·0)	(12·4)
27	Construction	0·8	0·3	0·6	0·2	0·7
29	Transportation	2·3	3·3	3·1	4·1	0·4
30	Trade	1·3	5·6	2·0	1·4	1·3
31	Communications	0·9	1·1	0·5	1·4	0·3
32	Finance and insurance	0·6	1·3	1·0	1·8	1·2
33	Other services	1·5	1·4	3·7	1·9	1·6
34	Rental	—	—	—	—	—
35	Government services	—	1·1	[a]	—	—
	Construction and services, total	7·5	14·1	10·8	10·8	5·5
36	Intermediate input, total (1 to 35)	57·9	53·3	50·0	57·2	63·4

TABLE 13 (*continued*)

SOEC code	*Input*	*Belgium*	*Germany, Federal Republic of*	*France*	*Italy*	*Netherlands*
37	Compensation of employees	22·0	18·2	20·0	13·2	13·7
38	Employers' contributions for social insurance	2·5	2·1	4·2	5·2	2·5
39	Depreciation	7·9	6·1	5·0	8·0	5·6
40	Other income	6·3	15·4	10·1	12·1	11·9
41	Indirect taxes on sold products, less subsidies	3·3	4·9	10·7	4·3	2·9
43	Gross value added at factor cost (37 to 40)	38·7	41·8	39·3	38·5	33·7
44	Gross value at market prices (41 and 43)	42·1	46·7	50·0	42·8	36·6
46	Gross production at ex-factory prices (36 and 44)[c]	498·4	4,612·7	3,324·7	2,202·1	680·9
49	Imports at ex-customs prices[c]	295·8	515·7	382·1	304·9	335·3
50	Total availability[c] (46 and 49)	794·2	5,128·4	3,706·8	2,507·0	1,016·2

[a] Negligible (less than 0·05 per cent).

[b] Domestic products only; not included in 36 or in 46.

[c] In millions of US dollars.

TABLE 14: INPUT COEFFICIENTS OF THE CHEMICAL SUB-SECTOR 18 (b+c), EXCLUDING PLASTICS, FOR THE FIVE EEC COUNTRIES, 1959

(*In percentage of gross value of production*)

SOEC code (subdivision)	*Input*	*Belgium*	*Germany, Federal Republic of*	*France*	*Italy*	*Netherlands*
28 (a)	Electrical energy	4·1	5·8	2·4	3·8	2·0
(b)	Gas, compressed air, steam and water services	2·2	0·9	1·2	2·0	0·2
2	Coal and related fuels	1·0	0·8	0·8	0·2	1·9
3	Coal products (cokes and gas)	0·9	4·0	1·5	1·3	4·1
5 (a)	Petroleum and natural gas	—	0·1	—	—	—
(b)	Petroleum refining	1·7	2·1	2·0	5·6	6·6
	Energy, total	9·9	13·7	7·9	12·9	14·8
1	Agriculture, forestry and fishing	0·4	1·2	0·9	1·0	0·8
7–9 (a)	Vegetable and animal fats and oils	1·6	1·1	1·9	1·9	3·1
(b)	Sugar	0·4	0·1	0·2	0·6	0·3
(c)	Miscellaneous food and beverages	1·0	1·3	1·2	3·1	2·9
10	Tobacco products	—	—	—	[a]	—
14	Wood and wood products	0·1	0·2	0·2	0·2	0·4
15	Pulp, paper	2·5	2·1	3·8	2·6	3·9
	Organic primary materials, total	6·0	6·0	8·2	9·4	11·4
4	Metal ores	0·1	1·0	0·4	0·3	0·4
6 (a)	Non-metallic mineral ores and products other than glass	5·0	3·9	3·3	2·5	0·4
21	Non-ferrous metals and products	2·8	1·7	1·0	1·8	0·6
19	Iron and steel products (ECSC)	[a]	0·1	—	—	0·7
	Inorganic primary materials, total	7·9	6·7	4·7	4·6	2·0

TABLE 14: INPUT COEFFICIENTS OF THE CHEMICAL SUB-SECTOR 18 (b+c), EXCLUDING PLASTICS, FOR THE FIVE EEC COUNTRIES, 1959 *(continued)*

(In percentage of gross value of production)

SOEC code (subdivision)	*Input*	*Belgium*	*Germany, Federal Republic of*	*France*	*Italy*	*Netherlands*
20	Iron and steel except ECSC, metal products	1·9	2·2	1·8	0·3	1·5
22	Foundry products	1·0	—	0·1	—	—
23	Non-electrical machinery, railroad cars and aircraft	0·8	0·9	0·1	—	0·2
24	Electrical machinery	0·5	0·2	[a]	—	0·2
25	Ships, motor vehicles, engines and bicycles	0·1	0·5	0·2	1·5	0·2
26	Precision instruments	0·1	0·1	0·4	[a]	0·6
	Repair and maintenance materials, total	4·4	3·9	2·6	1·8	2·7
11	Textiles	0·7	0·7	0·2	0·1	0·3
12	Clothing	—	0·1	0·2	[a]	—
13	Leather products	—	[a]	—	[a]	0·1
17	Rubber and asbestos products	0·1	0·4	0·4	0·2	0·1
	Secondary materials (a), total	0·8	1·2	0·8	0·3	0·5
6 (b)	Glass and glass products	0·5	0·6	0·6	1·2	0·7
16	Printing and publishing	1·6	1·0	0·7	1·2	1·4
	Secondary materials (b), total	2·1	1·6	1·3	2·4	2·1
18 (a)	Plastic products	1·8	0·3	1·1	0·8	0·8
18	Imported chemical materials	17·2	6·4	12·0	12·4	23·5
	External materials inputs, total	50·1	39·8	38·6	44·6	57·8
	(Internal input)[b]	(11·9)	(17·3)	(11·3)	(56·5)	(10·6)
27	Construction	0·8	0·3	0·7	0·3	0·6
29	Transportation	2·3	3·3	3·4	4·3	0·4
30	Trade	1·3	5·4	2·1	1·5	1·3
31	Communications	1·3	1·1	0·5	1·5	0·3
32	Finance and insurance	0·6	1·3	1·0	1·9	1·3
33	Other services	1·6	1·4	3·4	2·1	1·7
34	Rental	—	—	—	—	—
35	Government services	—	1·2	[a]	—	—
	Construction and services, total	7·9	14·0	11·1	11·6	5·6
36	Intermediate input, total (1 to 35)	58·0	53·8	49·7	56·2	63·4
37	Compensation of employees	21·9	18·7	20·2	13·7	13·5
38	Employers' contributions for social insurance	2·5	2·0	4·2	5·3	2·5
39	Depreciation	8·0	5·8	5·2	8·2	5·5
40	Other income	6·4	14·8	10·2	12·3	12·1
41	Indirect taxes on sold products, less subsidies	3·2	4·9	10·5	4·3	3·0
43	Gross value added at factor cost (37 to 40)	38·8	41·3	39·8	39·5	33·6
44	Gross value added at market prices (41 and 43)	42·0	46·2	50·3	43·8	36·6
46	Gross production at ex-factory prices (36 and 44)[c]	476·0	4,313·2	2,980·0	2,017·1	645·6
49	Imports at ex-custom prices[c]	281·2	456·3	380·3	301·0	318·8
50	Total availability[c] (46 and 49)	757·2	4,769·5	3,360·3	2,318·2	964·4

[a] Negligible (less than 0·05 per cent).

[b] Domestic products only; not included in 36 or in 46.

[c] In millions of US dollars.

TABLE 15: INPUT COEFFICIENTS OF THE CHEMICAL SUBSECTOR 18 (c), EXCLUDING PLASTICS, SYNTHETIC MATERIALS AND ARTIFICIAL FIBRES, FOR FOUR EEC COUNTRIES, 1959

(In percentage of gross value of production)

SOEC code (subdivision)	*Input*	*Belgium*	*France*	*Italy*	*Netherlands*
28 (a)	Electrical energy	4·2	2·6	4·0	2·1
(b)	Gas, compressed air, steam and water services	2·3	1·4	1·4	0·3
2	Coal and related fuels	1·1	0·8	0·2	2·0
3	Coal products (cokes and gas)	0·9	1·7	1·6	4·7
5 (a)	Petroleum and natural gas	—	—	—	—
(b)	Petroleum refining	2·0	2·1	6·2	7·6
	Energy, total	10·5	8·6	13·4	16·7
1	Agriculture, forestry and fishing	0·4	1·0	1·2	0·9
7–9 (a)	Vegetable and animal fats and oils	1·9	2·3	2·3	3·1
(b)	Sugar	0·5	0·2	0·6	0·3
(c)	Miscellaneous food and beverages	1·0	1·4	3·7	3·5
10	Tobacco products	—	—	[a]	—
14	Wood, wood and cork products	0·1	0·3	0·2	0·6
15	Pulp, paper and allied products	1·3	3·2	1·3	2·6
	Organic primary materials, total	5·2	8·4	9·3	11·0
4	Metal ores	0·1	0·5	0·3	0·5
6 (a)	Non-metallic mineral ores and products other than glass	5·7	3·9	3·0	0·5
21	Non-ferrous metals and products	3·1	1·2	2·2	0·7
19	Iron and steel products (ECSC)	0·1	—	—	0·8
	Inorganic primary materials, total	9·0	5·6	5·5	2·5
20	Iron and steel except ECSC and metal products	2·1	2·1	0·3	1·7
22	Foundry products	1·1	0·1	—	—
23	Non-electrical machinery, railroad cars and aircraft	0·8	0·1	—	0·2
24	Electrical machinery, apparatus and equipment	0·5	[a]	—	0·2
25	Ships, motor vehicles, engines and bicycles	0·1	0·2	1·6	0·2
26	Precision instruments	—	0·5	[a]	0·5
	Repair and maintenance materials, total	4·6	3·0	1·9	2·8
11	Textiles	0·8	0·2	0·1	0·3
12	Clothing	—	0·3	[a]	—
13	Leather products	—	—	[a]	0·1
17	Rubber and asbestos products	[a]	0·4	0·2	0·1
	Secondary materials (a), total	0·8	0·9	0·3	0·5
16 (b)	Glass and glass products	0·5	0·7	1·5	0·8
16	Printing and publishing	1·6	0·8	1·3	1·4
	Secondary materials (b), total	2·1	1·5	2·8	2·2
18 (a)	Plastic products	2·0	1·3	0·9	1·0
(b)	Synthetic materials and artificial fibres	1·2	1·5	0·7	1·6
	Imported chemical materials	13·7	5·9	9·6	19·3
	External materials inputs, total	49·1	36·7	44·5	57·6
	(Internal input)[b]	(10·1)	(7·0)	(62·9)	(8·6)

TABLE 15: INPUT COEFFICIENTS OF THE CHEMICAL SUBSECTOR 18 (c), EXCLUDING PLASTICS, SYNTHETIC MATERIALS AND ARTIFICIAL FIBRES, FOR FOUR EEC COUNTRIES, 1959 *(continued)*

(In percentage of gross value of production)

SOEC code (subdivision)	*Input*	*Belgium*	*France*	*Italy*	*Netherlands*
27	Construction	0·9	0·7	0·2	0·7
29	Transportation	2·5	3·6	4·7	0·5
30	Trade	1·4	2·0	1·5	1·3
31	Communications	1·4	0·6	1·7	0·3
32	Finance and insurance	0·6	1·0	2·0	1·3
33	Other services	1·8	3·8	2·3	1·9
34	Rental	—	—	—	—
35	Government services	—	[a]	—	—
	Construction and services, total	8·6	11·7	12·4	6·0
36	Intermediate input, total (1 to 35)	57·7	48·4	56·9	63·6
37	Compensation of employees	22·3	21·4	13·9	12·1
38	Employers' contributions for social insurance	2·5	4·4	5·5	3·7
39	Depreciation	7·8	4·9	8·0	4·8
40	Other income	6·4	10·1	11·1	12·5
41	Indirect taxes on sold products, less subsidies	3·3	10·8	4·6	3·3
43	Gross value added at factor cost (37 to 40)	39·0	40·8	38·5	33·1
44	Gross value added at market prices (41 and 43)	42·3	51·6	43·1	36·4
46	Gross production at ex-factory prices[c]	419·2	2,524·6	1,653·2	532·8
49	Imports at ex-customs prices (36 and 44)[c]	222·2	280·0	243·8	257·5
50	Total availability[c]	641·4	2,804·6	1,897·0	790·3

[a] Negligible (less than 0·05 per cent).

[b] Domestic products only; not included in 36 or in 46.

[c] In millions of US dollars.

The group "inorganic primary materials" consists of categories 4 (iron and non-ferrous ores), 6 (a) (minerals and non-metallic mineral products, other than glass), 21 (non-ferrous metals and products), and 19 (iron and steel manufacturing products in so far as they are controlled by the European Coal and Steel Community (ECSC)).

These three groups contain not only the raw material for the production of chemicals but also products serving other purposes in it.

The fourth group, "repair and maintenance materials", aggregates categories 20 (iron and steel products, except ECSC, metal furniture and metal products (except machinery), 22 (foundry products), 23 (non-electrical machinery, railroad cars and aircraft), 24 (electrical machinery, apparatus and equipment), 25 (naval construction, motor vehicles and engines, and bicycles), and 26 (precision, optical and related industrial products, and recovery products). This group mainly represents durable goods, as far as they are used in production. Investments are not tabulated here.

The group "secondary materials (a)", the fifth group, aggregates categories 11 (yarn, fabrics, knit and woven goods), 12 (clothing, other textile goods, carpets and furs), 13 (leather, footwear and other leather products except clothing), and 17 (rubber and asbestos products) This group represents auxiliary materials used mainly in technical operations such as filtration, filling, transportation, or as working clothes.

The next group, "secondary materials (b)", aggregates categories 6(b) (glass and glass products), and 16 (printing and publishing), and represents packaging and advertising costs.

Chemical materials, shown as external inputs to chemical industries in tables 13 and 14, relate only to imported chemicals and chemicals produced outside the particular chemical sector or sub-sector considered. Thus for the whole sector 18 (a + b + c), for example, only imported chemicals are shown as chemical inputs (table 13); when sub-sector (b + c) is considered (as in table 14) only the products of chemical sub-sector (a) and imported chemicals are shown as external inputs.

It must be emphasized that the aggregation of material and energy inputs in the above groups follows only a rough criterion. Just as the energy and raw material aggregates incorporate products serving other production purposes, so there will be some overlap with regard to the uses of secondary materials as well.

The input aggregates involved in the tabulated coefficients include both domestic products and imports; this does not apply to "internal" inputs which arise solely from domestic production.

Relations to the tables in section I

The Federal Republic of Germany and Italy have already been discussed in the preceding section. Although the methods and definitions involved in the tables shown there differ from those presented in this section, an attempt has been made to find relationships between 1953/54 (dealt with in section I) and 1959 (dealt with in this present section). This comparison again confirms the fact that the Italian input of animal and vegetable raw materials is considerably higher than the corresponding German input, while that of coal is higher in the Federal Republic than in Italy. The comparison may in one way or another provide an indication of the economic-technical differences between the two countries; but the veil of statistical and methodological differences, as well as differences in the structure of production and prices, does not permit far-reaching conclusions to be drawn regarding technological characteristics of the chemical industries of these countries.

Intercountry comparison

The comparison of the five member countries of the EEC in 1959 only partly confirms expectations. It could be foreseen, for instance, that the input of coal and coal products would be highest in the Federal Republic of Germany, followed by France and then by Italy. What could not be foreseen, however, was that it would be so high in the Netherlands and so low in Belgium. It might be possible to find an explanation of the fact that the input of refined petroleum products in Italy and the Netherlands is more than twice the consumption in France and the Federal Republic. On the whole, however, it must be admitted that the tables give no satisfactory information, despite the standardized classification of the SOEC system.

The aggregation of inputs into the above-mentioned categories brings out a marked similarity of input structure among the countries for all 18 (a + b + c), 18 (b + c) and 18 (c). The steadily increasing percentage of the energy input from 18 (a + b + c) to 18 (c) is due to the concentration in the latter of products consuming high energies.

A similar increase in the percentage of inorganic primary materials from 18 (a + b + c) to 18 (c) can be explained simply by the fact that 18 (c) is composed mostly of inorganic chemicals. Although these rates are considerably higher in 18 (c) than in 18 (a + b + c) in Belgium and France they are nearly unchanged in Italy and the Netherlands. The figures for sub-category 18 (b + c) compared with those for 18 (a + b + c) are lower in all the countries, though in most cases only slightly. This is because some of the inorganic primary materials serve not only as raw materials but also as auxiliary materials in sectors other than inorganic chemicals.

The percentage of the input of organic primary materials decreases in Belgium and the Federal Republic of Germany from 18 (a + b + c) to 18 (c). This is normal, since sub-categories 18 (a) and 18 (b) are primarily organic. In France, however, the figures increase markedly and steadily; in Italy and the Netherlands the increase is moderate and unsteady.

The input of secondary products 18 (b) is highest in all countries in sub-category 18 (c), in which products consuming a great deal of advertising and packaging materials are evidently concentrated. For secondary materials 18 (a) and repair and maintenance materials, such clear relations cannot be expected, nor can they be detected in our input coefficient tables.

No doubt the aggregation of related input categories has improved the stability of input coefficients in many respects. Nevertheless, many questions still remain unanswered. For example, the importance of the inorganic material inputs is even greater than that of the organic inputs in Belgium and the Federal Republic of Germany. The situation is reversed in France, Italy and the Netherlands. This apparently contradicts the expectation that the use of coal for organic synthesis should be encouraged in view of the importance of coal-mining in the economies of Belgium and the Federal Republic of Germany, while in France and Italy climatic conditions favour the non-synthetic type of chemical industries.

Energy input

The coefficient of energy input differs significantly between countries. It should be borne in mind that all these coefficients are based on data in value terms. They depend on a variety of factors, among which four may be mentioned.

(*a*) A large proportion of coal, petroleum and natural gas serves as raw material and should be classified first in the group of organic primary materials. This portion of the raw material depends on the structure of the chemical industries and can therefore differ considerably from one country to another.

(*b*) The prices of various energy-producing materials differ among countries.

(*c*) The cost of energy depends partly on whether the secondary energy (electricity, gas, steam) is produced by the establishment itself or purchased from other enterprises.

(*d*) The evaluation of various kinds of energy is in no way uniform from country to country or from enterprise to enterprise. In the case of self-produced power it often depends on the individual evaluation scheme for internal services of the respective enterprise. When energy is purchased from other enterprises more favourable prices and agreements can be reached for large-scale consumers than for those with a medium or small consumption.

Last but no less important, corporate tax systems and other institutional factors affect the coefficients in value terms.

Internal input

The importance of the internal inputs decreases steadily and markedly from 18 (a + b + c) to 18 (c) in Belgium, France, the Federal Republic of Germany and the Netherlands, in all of which the internal input is less than half of the external input. Italy presents an anomalous case in this respect. Real structural differences apart, this has a great deal to do with the underlying method of statistical compilation. Table 1 in fact, where the Italian data for 1953 are examined in comparison with the German data for 1954, shows an entirely different picture.

Industry-mix

Input coefficients for a sector are affected not only by the choice of input categories but also by the way in which various consuming industries are grouped. In table 16 the relative importance of different chemical sub-sectors of category 18 (a, b, and c) is indicated in terms of various concepts (total availability, gross production, intermediate input, interindustry input, internal input and external input). The comparison shows that the relative contribution of sub-categories 18 (b + c) and 18 (c) to the total chemical category 18 (a + b + c) is rather similar among different countries, almost irrespective of the type of criterion used for measurement purposes.

The findings in this section could be summed up as follows:

The standardization of classifications, definitions and partly of compilation methods worked out by the SOEC has permitted a marked improvement in the possibility of international comparison.

The rearrangements of input categories have resulted in some accentuation of general patterns for purposes of comparison. The progressive aggregation of input categories and their comparison within the chemical industry as a whole, as well as its sub-sectors, has revealed certain peculiarities and similarities of the production structure. The information provided by the SOEC tables is still too vague however to provide an operational clue for the programming of chemical industries.

III. The Chemieverband's data on the input structure of the chemical industry in the Federal Republic of Germany, 1956, 1959 and 1961

The definition of the chemical industry corresponds to category 18 (b + c). The missing sub-category 18 (a) is not very important since it is not very closely connected with the chemical industry thus defined. Furthermore, the SOEC sub-category 18 (a) consists solely of the processing of primary plastics, which are first produced in 18 (b). In the case of the Federal Republic of Germany, less than half of the plastics produced in 18 (b) is delivered to 18 (a).

Sources

The tables and reports in this section are based on the investigations which have been undertaken over many years by the Chemieverband. The work of this organization concentrates on problems of particular interest to its members and its statistical methods are adjusted to such problems. Apart from the *Leisse'sche Erhebung* of 1936 for the old "Deutsches Reich" no further data on chemical inputs were available. The Chemieverband data cover the Federal Republic of Germany, including West Berlin.

TABLE 16: RELATIVE CONTRIBUTION OF SUB-CATEGORIES TO THE TOTAL CHEMICAL INDUSTRY: THE FIVE EEC COUNTRIES IN 1959

(In percentage of total category 18 (a + b + c))

	Belgium		*France*		*Federal Republic of Germany*	*Italy*		*Netherlands*	
	(b + c)	*(c)*	*(b + c)*	*(c)*	*(b + c)*	*(b + c)*	*(c)*	*(b + c)*	*(c)*
Total availability	95·3	80·8	90·7	75·7	93·0	92·5	75·7	94·9	77·8
Gross production at ex-factory prices	95·5	84·1	89·6	75·9	93·5	91·6	75·1	94·8	78·3
Intermediate input	95·6	83·7	89·2	73·5	94·5	90·0	74·8	94·9	78·5
Interindustry input (including internal input)	93·4	78·5	84·1	62·3	92·1	90·6	78·9	92·3	73·8
Internal input	87·9	65·6	72·0	37·6	86·0	92·5	84·4	81·6	54·6
External input	95·9	82·0	88·5	71·2	95·0	88·3	72·2	94·6	77·9

a = Plastic Products
b = Synthetic materials and artificial fibres.
c = Other chemicals.

Methods employed by the Chemieverband

The work of the Chemieverband has been based on the statistics of production of the Federal Statistical Office, Wiesbaden, which collects information on industrial production in both quantity and value terms. For a number of important basic products, supplementary data are published on the internally consumed products of establishments. Although the institutional unit of official statistics is the local establishment the work of the Chemieverband is based on the enterprise.

As a first step the quantities of major raw material requirements were computed by applying the qualitative and quantitative relations ordinarily known to chemists, such as structural formula and technical process, stoichiometry and the factor of efficiency. The quantities were then evaluated by means of individual or average f.o.b. prices. In order to check and complete quantities, prices and values use was made not only of official statistics on related industries but also of information from numerous offices, institutes and suppliers. Estimates of other minor miscellaneous material inputs were made in co-operation with the experts of chemical firms and their suppliers. Available official and professional data were very useful in establishing the quantities of energy inputs. The evaluation of energy presented a special problem, which had to be solved gradually in collaboration with experts.

Auxiliary materials were evaluated by means of the statistics of supplier industries—unfortunately, often unavailable—and in co-operation with the relevant offices, organizations and experts. The data were also partly estimated on the basis of general statistics.

One of the special problems encountered during the study was how to deal with the supply of durable goods to the chemical industry. From the supplier industries only the total values of shipments could be obtained. The breakdown of goods into those for investment and those for current production was very difficult and could be estimated only approximately.

These estimates from various sources were finally put together like a mosaic. The results obtained were checked and corroborated by data on investments, distribution and other costs. Later, a special inquiry was made into organic synthesis, as an additional source of information. This will be discussed in the next section.

Advantages and disadvantages of these methods

This working method has the disadvantages of requiring much time and special knowledge and entailing assembly difficulties and a certain expense. Another disadvantage, at least at the beginning, was that values could be obtained only for the chemical industry as a whole. The intra-industry input-output relations for chemicals had to be established later, following a step-by-step procedure. This method of estimation, when applied exclusively to the input of materials and energy, was not considered too disadvantageous. Information about the remaining input materials could be obtained from other sources (data on investments, distribution costs etc.).

These disadvantages are largely counterbalanced by four advantages.

(*a*) Special inquiries, which often cause embarrassment to enterprises, are not necessary. Moreover, special inquiries have the disadvantages that enterprise accounting is not adapted to the classification of interindustry transactions and that numerous errors often occur in the statements of firms.

(*b*) The data thus obtained are quite flexible. It was possible to adjust the data originally based on the German chemical definition to the SOEC definition.

(*c*) Information not only as to values but also as to the quantities of material inputs can be obtained easily by this method. The results for raw materials and energy are quite reliable; checking and correction can be done in a flexible manner; differences in prices and purchasing power present no problem; the technological facts and relations implied in estimates are clearer and the result can be better used.

(*d*) The method of the Chemieverband is no less advantageous in breaking down the input by type of uses: raw material, energy and auxiliary material. In the search for relationships between input and production a clear separation of raw material and energy proves indispensable. Auxiliary materials, such as lubricants, working clothes, and office and canteen supplies were only roughly estimated but were later completed by the general statistics of the SOEC and the Federal Statistical Office.

Input by uses

In table 17 the total material and energy input was first subdivided into primary materials, energy, and secondary materials. The aggregate "energy" includes products of coal, petroleum and natural gas, which ordinarily serve in all industries as fuel or as the source of power and light. Products serving as basic material (coke for carbide, coke-oven or natural gas for the organic synthesis) are included in "primary materials".

This principle was not applied to electric or thermal energy however. For instance, power which is consumed for the production of chlorine and caustic soda by the electrolysis of rock salt and is incorporated in these products was not separated as such, but was included in the "energy" category. Although more than half of the power consumed by the chemical industry serves such special, direct production purposes the values and quantities of power were not subdivided, so as to avoid excessive complications.

From table 17 it can easily be calculated that 52·9 per cent of the total value of external input materials and energy are primary materials. Although the production pattern also determines the consumption of energy and secondary materials its influence should be most directly felt by primary materials. In terms of quantities, primary materials occupy 75·4 per cent of the total input materials

TABLE 17: MATERIAL AND ENERGY INPUTS OF THE CHEMICAL INDUSTRY (EXCLUDING PLASTICS) OF THE FEDERAL REPUBLIC OF GERMANY, 1959: INPUTS CLASSIFIED BY TYPE OF USE

SOEC code (subdivision)	*Inputs*	*Primary materials*		*Energy*		*Secondary materials*[a]		*Total*	
		Value[b]	*Quantity*[c]	*Value*[b]	*Quantity*[c]	*Value*[b]	*Quantity*[c]	*Value*[b]	*Quantity*[c]
28 (a)	Electricity	—	—	252·2	17,033·0	—	—	252·2	17,033·0
(b)	Gas, compressed air, steam and water	—	—	37·0	—	—	—	37·0	—
2	Coal and related fuels	8·0	795·0	27·4	4,441·0	—	—	35·4	5,236·0
3	Coal products (coke and gas)	161.6	4,596·0	12·6	434·0	—	—	174·2	5,030·0
5 (a)	Petroleum and natural gas	4·4	158·8	—	—	—	—	4·4	158·8
(b)	Petroleum refining	53·8	1,339·2	33·2	913·1	2·4	9·0	89·4	2,261·3
1	Agriculture, forestry and fishing	44·1	289·3	—	—	6·4	21·0	50·5	310·3
7–9 (a)	Vegetable and animal fats and oils	50·0	230·0	—	—	—	—	50·0	230·0
(b)	Sugar	3·5	33·5	—	—	—	—	3·5	33·5
(c)	Miscellaneous food and beverages	29·4	104·1	—	—	25·0	90·0	54·4	194·1
10	Tobacco	—	—	—	—	—	—	—	—
14	Wood and wood products	4·7	142·0	—	—	4·1	32·0	8·8	174·0
15	Pulp, paper and allied products	66·9	406 5	—	—	26·2	55·0	93·1	461·5
4	Iron and non-ferrous ores	41·0	1,419·3	—	—	—	—	41·0	1,419·3
6 (a)	Minerals and non-metallic mineral products other than glass	132·8	12,538·4	—	—	36·8	647·5	169·6	13,185·9
(b)	Glass and related products	—	—	—	—	24·6	50·0	24·6	50·0
21	Non-ferrous metals and allied products	29·5	67·4	—	—	45·5	100·0	75·0	167·4
19	Iron and steel manufacturing products ECSC	2·0	30·0	—	—	0·2	40·0	2·2	70·0
20	Iron and steel manufacturing products except ECSC metal furniture and metal products	—	—	—	—	95·2	140·0	95·2	140·0
22	Foundry products	—	—	—	—	—	—	—	—
23	Non-electrical machinery, railroad cars and aircraft	—	—	—	—	38·6	32·0	38·6	32·0
24	Electrical machinery	—	—	—	—	7·9	12·0	7·9	12·0
25	Ships, motor vehicles, engines and bicycles	—	—	—	—	20·5	21·0	20·5	21·0
26	Precision instruments	—	—	—	—	6·7	0·1	6·7	0·1
11	Textiles	—	—	—	—	27·6	8·0	27·6	8·0
12	Apparel	—	—	—	—	5·7	2·0	5·7	2·0
13	Leather products	—	—	—	—	1·0	0·1	1·0	0·1
17	Rubber and asbestos products	—	—	—	—	15·7	11·0	15·7	11·0
16	Printing and publishing	—	—	—	—	42·1	40·0	42·1	40·0
18 (a)	Plastic products	—	—	—	—	14·5	120·0	14·5	120·0
(b–c)	Imported other chemicals	276·6	[d]	—	—	—	—	276·6	[d]
	External input, sub-total	908·3	22,149·5	362·4	5,788·1[e] (17,033·0)	446·7	1,430·7	1,717·4	29,368·3 (17,033·0)
	(Internal input)	(707·8)		—		(36·9)		(744·7)	—
	Input (materials and energy), total	1,616·1		362·4		483·6		2,462·1	

[a] Installation materials, fillers, lubricants, packaging materials and other technical and auxiliary materials.

[b] In millions of US dollars.

[c] In 1,000 metric tons; electricity in million kWh.

[d] Negligible (less than 0·05 per cent).

[e] Electricity in million kWh.

and energy. The difference between the figures in value and quantity terms, although partly due to the exclusion of electric energy from the total weight, is mainly caused by the fact that any relation between quantities expressed in terms of actual weight is distorted because only part of the primary material (i.e. active substance) is transformed into a chemical product. The concentration of active substance varies considerably; in ores and minerals it is low, but in most non-ferrous metals it is 100 per cent. This distortion is eliminated by expressing the quantities of raw material uniformly as the content of active substance. An example will be given in the next section.

The other cause of this difference is a similar distortion involved in the value-term data. Many materials have run through completely different stages of production and represent different grades of refinement. The grade of refinement of consumed materials as well as of the chemicals produced has proved very enlightening for an understanding of the complex pattern of production.

Differences between the value and the quantity coefficients are generally smaller with the secondary materials for technical use and auxiliary purposes (see table 18). The figures of this table however cannot be considered completely reliable: in many cases they are mere estimates based on averages, and are therefore rather approximate.

TABLE 18: SPECIFIC USES OF "SECONDARY" MATERIALS IN THE CHEMICAL INDUSTRY (EXCLUDING PLASTICS) OF THE FEDERAL REPUBLIC OF GERMANY, 1959

Type of use	*Millions of US dollars*	*Percentage*	*1,000 tons actual weight*	*Percentage*
Technical installations	145·8	(32·6)	678·8	(47·4)
Technical material (fillers, lubricants etc.)	90·0	(20·2)	315·9	(22·1)
Auxiliary material for packaging and operative outfit	146·6	(32·8)	283·0	(19·8)
Other technical and auxiliary material	64·3	(14·4)	153·0	(10·7)
Secondary materials, total[a]	446·7	(100·0)	1,430·7	(100·0)

[a] Excludes internal input.

Production pattern and input

The relationship between production and raw materials is especially close in chemicals. The complex correlation between raw material, production process and composition of the products depends on the special laws of conversion. The choice of auxiliary materials however depends more on other factors and conditions, such as the supply of mechanical industry.

The effects of rationalization or organizational efficiency in chemical production are different in the use of secondary (auxiliary) materials from what they are in production processes and the use of raw materials. Energy occupies an intermediate position because of its double functions. In order to demonstrate some of these characteristic relationships of the chemical industry the input of energy and materials was investigated separately. In the absence of comparable data for other countries the development in the Federal Republic was traced for the years 1956, 1959 and 1961.

Energy input

In table 19 the energy input is divided into "raw material" and "energy" according to its functional use. The figures are given both in quantity and value terms: the former are expressed in 1,000 tons of anthracite equivalent and the latter in millions of US dollars. Electric energy increased from 1956 to 1961 in quantity more than in value. Coal-mining products as a whole have decreased slightly, which is explained by the relative decrease in the coal consumption for internal power generation. The total consumption of petroleum and natural gas derivatives has increased nearly three times in weight and has doubled in value.

About half of the weight of all energy used has served as primary material. This portion has grown from 49·9 per cent in 1956 to 54·6 in 1961, although in value terms it has slightly decreased from 39·5 to 37·2 per cent. The percentage of coal-mining products in value terms was a little less than four times that of oil and gas derivatives in 1956 (41·8 as against 11·6) and only about twice as much in 1961 (32·4 as against 17·7). The margin between coal-mining products and oil and gas derivatives, compared in quantity, has decreased still more rapidly, from 74·0 as against 13·1 per cent (5·8:1) in 1956 to 55·3 as against 30·3 per cent (1·8:1) in 1961.

Input of primary materials

The input of primary materials in 1956, 1959 and 1961 is shown in value as well as quantity terms in table 20 which shows that the relationship of organic to inorganic primary materials in value terms has not changed during these six years, maintaining an approximate ratio of 2:1. Substitution of oil and gas derivatives for raw materials of vegetable and animal origin has made only slow progress. The consumption of the former has risen from 51·6 to 54·7 per cent during the period considered. The trend in quantity terms however appears different in many respects, but it gives rather an unrealistic picture since it is based on the actual weight figures. In order to make different raw materials comparable in terms of quantity they should be adjusted to a uniform measure representing the active substance involved. The investigation by the Chemieverband in this respect is not yet complete, but part of its findings will be discussed in the next section.

Conclusions

This example drawn from the chemical industry has shown that the relationship between input and production patterns becomes clearer when comparisons are made in both value and quantity terms, and also when input materials are well specified with respect to their uses (primary materials, energy and auxiliary materials).

IV. INPUTS AT THE PRIMARY STAGE OF ORGANIC SYNTHESIS

Definition of organic synthesis

In the following discussion those organic basic products that are derived from coal, petroleum or natural gas are designated as organic primary materials. Organic chemicals such as plastics, dyestuffs or pharmaceuticals produced from these through synthesis are not included

TABLE 19: ENERGY INPUTS IN THE CHEMICAL INDUSTRY OF THE FEDERAL REPUBLIC OF GERMANY, BY PRODUCTS AND BY USES—1956, 1959 AND 1961

		28a Electricity	*2 Coal*	*3 Coal products (coke, gas)*	*5a Petroleum and natural gas*	*5b Petroleum products*	*Energy input, total*
A.	*In value terms* ($US 1,000,000)						
1956	Raw materials	—	8·2	160·3	2·7	32·9	204·1
	Energy	240·2	35·0	11·7	—	24·2	311·1
	Total	240·2	43·2	172·0	2·7	57·1	515·2
1959	Raw materials	—	8·0	161·5	4·4	53·8	227·7
	Energy	289·2	27·4	12·7	—	33·2	362·5
	Total	289·2	35·4	174·2	4·4	87·0	590·2
1961	Raw materials	—	10·9	181·0	5·4	71·6	268·9
	Energy	360·4	29·4	12·3	—	51·0	453·1
	Total	360·4	40·3	193·3	5·4	122·6	722·0
B.	*In quantity terms* (1,000 tons of anthracite equivalent[a])						
1956	Raw materials	—	668·0	5,055·0	165·0	813·9	6,701·9
	Energy	1,719·7	3,763·0	421·0	—	775·5	6,679·2
	Total	1,719·7	4,431·0	5,476·0	165·0	1,589·4	13,381·1
1959	Raw materials	—	630·0	4,897·0	249·0	1,609·1	7,385·1
	Energy	2,095·0	2,542·6	447·0	—	1,283·9	6,368·5
	Total	2,095·0	3,172·6	5,344·0	249·0	2,893·0	13,753·6
1961	Raw materials	—	772·0	5,502·0	317·0	2,552·1	9,143·1
	Energy	2,419·1	2,558·0	419·0	—	2,195·7	7,591·8
	Total	2,419·1	3,330·0	5,921·0	317·0	4,747·8	16,734·9

[a] 1 kg anthracite = 7,000 kcal.

TABLE 20: PRIMARY MATERIAL INPUTS IN THE CHEMICAL INDUSTRY OF THE FEDERAL REPUBLIC OF GERMANY, 1956, 1959 AND 1961

	Input	*1956*		*1959*		*1961*	
		Value[a]	*Quantity*[b]	*Value*[a]	*Quantity*[b]	*Value*[a]	*Quantity*[b]
28 (a)	Electrical energy (including distribution)	—	—	—	—	—	—
(b)	Gas, compressed-air, steam and water services	—	—	—	—	—	—
2	Coal and related fuels	8·2	668·0	8·0	795·0	10·9	772·0
3	Coal products (coke, gas)	160·3	4,754·0	161·6	4,596·0	181·0	5,177·0
5 (a)	Petroleum and natural gas	2·7	98·9	4·4	158·8	5·4	205·4
(b)	Petroleum refining (including distribution)	32·9	679·3	53·8	1,180·4	71·6	1,808·0
1	Agricultural products (including wine), forestry and fishery products	38·4	246·0	44·1	289·3	49·5	296·1
7-9 (a)	Vegetable and animal oils and fats	59·0	251·0	50·0	230·0	53·8	230·0
(b)	Sugar	2·9	31·7	3·5	35·5	4·5	40·0
(c)	Miscellaneous food and beverages	24·9	84·1	29·4	104·1	35·6	114·0
10	Tobacco	—	—	—	—	—	—
14	Wood, wood and cork products (including furniture, bedding and allied products)	5·4	141·0	4·7	142·0	6·3	167·0
15	Pulp, paper-board and allied products	61·2	320·7	66·9	406·5	72·7	418·0
4	Iron and non-ferrous ores	33·6	1,170·0	41·0	1,419·3	48·3	1,580·0
6 (a)	Minerals, non-metallic mineral products, excluding glass	123·5	10,942·7	132·8	12,538·4	147·8	13,680·3
(b)	Glass and allied products	—	—	—	—	—	—
21	Non-ferrous metals and allied products	25·7	60·0	29·5	67·4	31·6	64·0
19	Iron and steel products (ECSC)	1·7	25·0	2·0	30·0	3·3	45·0
	Primary materials, total	580·4	19,472·4	631·7	21,992·7	722·3	24,596·8

[a] Millions of US dollars. [b] 1,000 tons (actual weight).

TABLE 21: CONSUMPTION OF PRIMARY ORGANIC CHEMICALS FOR THE PRODUCTION OF ORGANIC SYNTHESIS IN THE FEDERAL REPUBLIC OF GERMANY, 1957, 1959 AND 1961

(In 1,000 tons of carbon content)

	1957		*1959*		*1961*	
Primary organic chemicals	*In 1,000 tons of carbon*	*Percentage obtained from oil and natural gas*	*In 1,000 tons of carbon*	*Percentage obtained from oil and natural gas*	*In 1,000 tons of carbon*	*Percentage obtained from oil and natural gas*
Carbon monoxide	110	(11)	156	(29)	169	(30)
Methane	10	(100)	10	(100)	16	(99)
Acetylene	170	(28)	227	(32)	259	(36)
Ethylene	64	(50)	141	(79)	234	(91)
Propane, propylene	34	(100)	69	(100)	124	(100)
Butane	—	(—)	47	(100)	105	(100)
Butylene	9	(100)				
Butadiene	—	(—)				
Non-aromatic hydrocarbons with 5 and more C	14	(12)	37	(88)	92	(84)
Benzene	170	(0)	235	(0)	281	(4)
Toluene	18	(15)	23	(91)	34	(82)
Xylene	5	(0)	8	(72)	16	(96)
Naphthalene	62	(0)	81	(0)	95	(—)
TOTAL	666	(24)	1,034	(40)	1,425	(50)

in this group. What constitutes the major raw material for organic synthesis is not coal and crude petroleum as such but their products or derivatives obtained by distillation, cracking or similar processes. These input materials are converted[8] at the first stage into hydrocarbons (acetylene, propylene, benzene, etc.) and carbon monoxide. Through diverse processes and complicated synthesis series that pass through many stages and cross one another, higher organic compounds are built up. The number and diversity of these are too large for the structure of input and output for each specific category to be established. For the same reason statistics on specific products cannot be aggregated by simple addition. Because of the complexity of production and the cross-linkage of different stages of synthesis, double counting could not be avoided.

Statistical methods

Since the basic production scheme spreads fan-wise, it is most conveniently measured at its narrowest point, the primary stage of synthesis. This proposal was made by the Chemieverband as a basis for statistical methods, and has been accepted by the OECD Special Committee for Chemical Products and applied by a growing number of its members. The enterprises involved in organic synthesis therefore provided information on their consumption of hydrocarbons and carbon monoxide, measured in terms of actual weight. About 15 primary chemicals are involved, and the part of primary organic materials derived from coal is distinguished from the part of those derived from petroleum and natural gas.

In order to make the actual-weight figures comparable, they were converted into tons of carbon content by means of stoichiometric coefficients, the carbon content being the active substance. The total weight of primary chemicals, expressed in tons of carbon content, therefore represents the total primary stage of organic synthesis.

As table 21 shows, the volume of organic synthesis in the Federal Republic of Germany rose between 1957 and 1961 from 666,000 tons of carbon content to 1,425,000 tons, or by 114 per cent.

Because of their proximity to the primary stage the products considered can on the whole be easily distinguished from those based on coal, petroleum and gas. At higher production stages such a distinction becomes virtually impossible. The dramatic trend towards the substitution of oil and gas for coal appears clearly in the percentage proportions shown in table 21: the consumption of oil-based products in the Federal Republic of Germany rose from 24 to 50 per cent of the total consumption of primary organics during the six years under review.

International comparison

Table 22 presents similarly organized information for four other countries as well. Unfortunately the necessary information on higher hydrocarbons is not available for some of these countries or for Japan, in regard to the very important aromatic hydrocarbons benzene, toluene and xylene. This failure is not due to the method itself and will probably soon be put right.

The Federal Republic of Germany and Japan rank first in terms of total consumption of primary organic chemicals. France and Italy follow, while the Netherlands remains at a much lower level. The proportion of

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[8] Inorganic chemicals derived from the same basic materials are not discussed here.

TABLE 22: CONSUMPTION OF PRIMARY ORGANIC CHEMICALS FOR ORGANIC SYNTHESIS: FEDERAL REPUBLIC OF GERMANY, FRANCE, ITALY, JAPAN AND THE NETHERLANDS, 1964

(In 1,000 tons, actual weight (a.w.) and carbon content)

	France				*Federal Republic of Germany*				*Italy*				*Japan*				*Netherlands*			
	Total		*Of which oil and natural gas*		*Total*		*Of which oil and natural gas*		*Total*		*Of which oil and natural gas*		*Total*		*Of which oil and natural gas*		*Total*		*Of which oil and natural gas*	
Primary organic chemicals	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*	*a.w.*	*C.*
Acetylene	146	135	27	25 (18·5%)	250	231	136	125 (54%)	195	180	130	120 (66·7%)	351	324	—	—	[b]	[b]	[b]	[b]
Ethylene	181	154	151	128 (83·1%)	600	514	592	507 (98·6%)	282	240	282	240 (100%)	468	398	468	398 (100%)	59	50	41	35 (70%)
Propane and propylene	130	109	130	109 (100%)	266	228	266	228 (100%)	158	132	158	132 (100%)	264	221	264	221 (100%)	92	77	92	77 (100%)
Butane, butylene and butadiene	146	125	88	75 (60%)	195	168	195	168 (100%)	77	66	77	66 (100%)	103	88	103	88 (100%)	33	28	33	28 (100%)
Aromatic hydrocarbon	398	365	137	126 (34·5%)	575	529	230	211 (39·9%)	361	331	131	120 (36·3%)	551[a]	508[a]	159[a]	147[a] (28·9%)	69[a]	64[a]	24[a]	22[a] (34·4%)
Hydrocarbon C_5 and higher	126	110	115	100 (90·9%)	235	202	225	194 (96%)	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
TOTAL	1,127	998	648	563 (56·4%)	2,121	1,872	1,644	1,433 (76·5%)	1,073	949	778	678 (71·4%)	1,737	1,539	994	854 (55·5%)	253	219	190	162 (74%)

Source: Reports of the OECD Special Committee for Chemical Products.

[a] Except benzene, toluene, xylene.

[b] No data available.

oil-based products is the highest in the Federal Republic of Germany, Italy and the Netherlands (more than 70 per cent); in France and Japan the rate is closer to 50 per cent. However, for Italy, Japan and the Netherlands the true figure would be higher in reality because the missing data on the higher hydrocarbons are mostly based on oil.

V. SUMMARY

Co-ordination of schemes

The above discussions have made clear the need for uniformity in the classification, definition and method of comparing input-output relations among different countries. It will be possible to achieve these conditions only gradually. The standardization of statistical methods seems to be the most difficult task. The input-output tables of the various countries are based partly on special surveys and partly on their statistics. To establish tables standardized in every sense numerous countries would have either to alter the legal basis of their statistics or to create a new one. It has not yet been possible to achieve this, even among European communities. In the meantime nothing can be done except to supplement national statistics by the use of secondary or auxiliary methods An attempt should be made however to elaborate a uniform scheme on the international level, into which unadjusted national data could be incorporated. In present conditions the common international framework embracing the total economy can only be rough in structure and an examination of it must follow the broad lines of national income accounts familiar to most countries.

Comparability at the expense of detail

One of the choices necessarily arising from international standardization is between more national data on aggregated sectors and less data on more disaggregated sectors. The first requirement of the SOEC, the subdivision of chemical data into five categories, can be met by only one member country. Even a subdivision into three categories could not be met by all members. It is only when any subdivision is renounced that all the five members can contribute tables uniformly classified and defined: and even this has called for considerable concessions with respect to methodology.

The gradual change of categories into larger aggregates may seem to enhance the comparability among different national tables, but the information thus provided then loses its real significance and flexibility from the point of view of its users.

Limits set to ordinary systems

Even if a country had at its disposal a highly refined statistical mechanism, certain limits would be set to the statistical exploration of the chemical industry, if realistic and reasonable description is preferred to a theoretically perfect approach. Such limits are due to the technical and economic peculiarities of the complex pattern of chemical production. They may be either narrow or wide, depending on the individual country. In the United States the breadth of the market and the resultant strong specialization of technical and economic activities seem to have had the effect of promoting statistical refinement. Another factor, which is not to be underestimated, is the open-mindedness of enterprises in regard to statistics and their interest in statistical results, attitudes which have gradually developed in United States industries. The improvements achieved during the last 50 years[9] seem to confirm the importance of this attitude.

The fact that Japanese input-output tables are highly detailed and informative may be partly due to other fortunate circumstances. In other industrialized countries, however, statistics tend to lag behind because of particular national circumstances and as we all know, the speed of a convoy depends on that of the slowest ship.

In the future the interaction between various chemical processes will probably grow more rather than less complex. This can be illustrated by the case of man-made fibres. Their differentiation from the precedent organic synthesis and from the neighbouring plastics is becoming more and more indistinct. Only when a very general survey of economies is expected from international comparisons of input-output tables will it be permissible to forgo any further subdivision of the chemical sector.

To deal with the inputs of the chemical industries proper consideration should be given to at least three points:

(*a*) the categorization of chemical sub-sectors;

(*b*) the functional specification of raw materials; and

(*c*) the provision of information in terms of value as well as of quantity.

(*a*) *Categorization of chemical sub-sectors*

The higher the level of disaggregation of the chemical sector at which basic national data are made available, the more easily can they be regrouped into uniform aggregates common to as many countries as possible. A universal scheme would probably involve at first the following two broad sub-categories:

1.0 basic and intermediate chemicals, and

2.0 special chemicals.

Basic and intermediate chemicals are mainly definite (monomer) chemical compounds such as sulphuric acid or methanol. As a rule they are not produced for a specific purpose fixed in advance, but serve as various intermediates. Only a small part of them leaves the chemical industry; most of them re-enter further various chemical processes. Special chemicals are, however, produced for a specific purpose defined beforehand. They are not generally definite individual compounds but

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[9] The statistical imperfections in earlier years (such as 1919) were illustrated in table 3.

TABLE 23: PRINCIPAL SPECIAL CHEMICALS

Category	*Primary inputs*[a] *I*	*O*	*S*	*N*	*Major users*
Fertilizers	+				Agriculture
Pesticides	+	+			Agriculture
Plastics and synthetic rubber		+			Various (especially construction, miscellaneous manufactures, vehicles)
Man-made fibres		+		+	Textiles, automotives, miscellaneous manufacturing
Synthetic organic dyestuffs		+			Textiles, leather, paper
Pigments	+			+	Construction, lacquers
Paints and varnishes	+	+	+	+	Construction, furniture, vehicles, machinery
Printing ink and artists' colours		+	+		Printing, arts and crafts
Pharmaceutical products		+		+	Consumption
Tanning products, auxiliary products for textiles, and other industries	+	+		+	Leather, textiles, paper
Wood and building preserving agents, putty and cement, linoleum, roofing felt		+		+	Construction
Photochemicals		+	+	+	Consumption
Soaps and detergents	+	+		+	Consumption
Toilet preparations		+		+	Consumption
Chemical supplies for offices		+	+	+	Consumption

[a] I = inorganic basic and intermediate chemicals; O = organic basic and intermediate chemicals; S = special chemicals; N = non-chemical input.

mixtures of compounds of the most varied types. Most of them leave the chemical industry and are processed in other industries or sold directly to consumers. Basic and intermediate chemicals are usually divided into:

1.1 inorganic basic and intermediate chemicals, and

1.2 organic basic and intermediate chemicals.

Special chemicals are further subdivided into:

1.21 products of organic synthesis, and

1.22 derivatives of vegetable and animal origin.

The term petrochemicals should be avoided for products of the higher stages of syntheses. As has been seen above in section IV, a considerable part of synthetic chemicals is still derived from other bases. It is often impossible moreover at higher stages of synthesis to identify the origin of chemical substances.

Although special chemicals mainly belong to a higher production stage than basic and intermediate chemicals their raw materials do not come exclusively from chemical industries. A considerable part of the external input goes directly into the special chemicals without passing through the basic or intermediate chemical sector. When their bases can be identified special chemicals may be classified as organic or inorganic: often however they are from both bases. The principal special chemicals are shown in table 23.

The exact classification of the groups and of the few less important chemicals not specified in the table can be made according to international specifications such as Statistics and Tariff Classification for Foreign Trade, the Standard International Trade Classification or the production specification prepared by the SOEC.

In most countries it will be possible to separate the input into inorganic or organic basic and intermediate chemicals. The possibility of separating the subsequent special chemicals from the basic and intermediate chemicals is limited. In the Federal Republic of Germany, for instance, it would hardly be possible and of little advantage to isolate plastics and synthetic organic dyestuffs from organic basic and intermediate chemicals. A separation of toilet preparations would however be easier.

(*b*) *Functional specification of raw materials*

Differentiation by main uses, especially between raw materials and energy, has proved more important than rather artificial division of chemical sectors for the analysis of structural relationships between inputs and production. The fact that functional relationships in quantity terms are subject to stoichiometric equations is of special advantage in the case of chemical production—an advantage that outweighs even the disadvantage arising from the complexity of chemical production patterns. The input of raw materials and energy can be estimated to some extent, without recourse to special inquiries, provided that the available production statistics are sufficiently reliable. If necessary the input of maintenance and other auxiliary materials, which has less influence on the production pattern, can be taken from general statistics or other data.

(*c*) *Quantity and value*

It is necessary to know not only the values but also the quantities of inputs. This is especially true of raw materials and energy, the quantity figures of which should first be collected in terms of actual weight and then converted into those of "active substance". The quantities of maintenance and auxiliary materials are less important, particularly as adequate measures of weight are not available. Quantities in conventional physical units may even be misleading.

Proposal for an international working programme

In view of the diversity and imperfection of national input-output statistics five steps can be recommended for the establishment of uniform chemical tables.

(*a*) All available national input-output statistics should be examined for their suitability to a general survey embracing as many countries as possible. At the beginning there will probably be some parallel surveys of different country groups. No matter how crude the aggregates in the first surveys may be the chemical and related industries should in every case be uniformly defined according to international classifications.

(*b*) Making the most of experience so far, a general scheme for chemicals should be developed. It can be gradually improved and refined.

(*c*) Governments, scientific institutes, and organizations of the countries involved should be encouraged to improve or to complete input-output investigations based as far as possible on this general scheme.

(*d*) The work should not be exclusively oriented toward the compilation of gross national product, as has been the case until now. The more the work is adapted to the actual situation and the requirements of industrial enterprises, the more co-operation may be obtained from the latter. The co-operation of industrial enterprises seems indispensable for obtaining realistic results. In the Federal Republic of Germany all the enterprises concerned participate in the census (which has no legal weight) voluntarily and only because they are interested in the results.

(*e*) An effort should be made to improve the classical tables, and raw material balances of some sort should be established. This work could be started with selected important inorganics such as sulphuric acid, chlorine, caustic soda and nitrogen. For organic chemicals complex tables could be developed in accordance with the method described above in section IV. The initial material balance could be completed by extending, for example, the raw material balance of sulphuric acid to the whole sulphur group. The whole organic synthesis should be extended to the special chemicals.

With the help of horizontal and vertical supplements a special chemical framework for input and output can be established. This will help to corroborate the figures that remain aggregated despite continued subdividing.

A further advantage of this programme would be that a census of enterprises would not be required. Arrangements would have to be made to obtain specific answers from industrial experts.

APPROACHES TO THE PROBLEM OF INTERCOUNTRY COMPARISON OF INPUT-OUTPUT RELATIONS: A SURVEY AND SUGGESTIONS FOR FURTHER RESEARCH

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I. INTERNATIONAL COMPARISONS OF INPUT-OUTPUT TABLES

Although considerable difficulties still exist in making useful international comparisons of input-output tables several attempts have been made in recent years. These studies will shed some light on a further exploration of comparative production structures particularly as to (i) the possibility of establishing meaningful relationships between the over-all degree of industrialization and the pattern of industrialization, (ii) techniques which may be useful in identifying and appraising various economic problems in developing countries for which the existing statistical information is insufficiently detailed, and (iii) the criteria for the international standardization of the input-output accounting system and its conceptual consistency.

International comparisons have so far been made with respect to the following three aspects of the input-output model:

1. The over-all comparison of the structure of production, chiefly on the basis of input-output coefficient matrices A;[1]

2. comparisons of individual input-output coefficients;[2]

3. over-all comparisons of direct and indirect effects, based on inverse matrices,[3] i.e. $(I-A)^{-1}$.

It must be emphasized that a truly meaningful comparative study can be made possible only by a careful reconsolidation of individual national tables on a uniform basis. From this point of view the present discussion should be considered as only tentative.

1. *Over-all comparison of the production structure*

Major findings from the first type of approach may be summarized under three headings.

(*a*) The nature of the interdependence of productive sectors was studied regarding two aspects: types of productive sectors in terms of u and w, and positions of sectors in the triangular arrangement. The types of production sectors were identified by the ratio of purchased input to the total production:

$$u_j = \sum_i X_{ij}/X_j$$

and also by the ratio of intermediate demand to total demand: i.e.,

$$w_i = \sum_j X_{ij}/X_i\,.^{4}$$

According to the $u-w$ classification an individual productive sector can be characterized as "Final manufacture" ($u \geq \cdot 45$, $w \leq \cdot 45$), "Final primary production" ($u \leq \cdot 45$, $w \leq \cdot 45$), "Intermediate manufacture" ($w \geq \cdot 45$, $u \geq \cdot 45$) and "Intermediate primary production" ($w \geq \cdot 45$, $u \leq \cdot 45$). Applying this two-way classification to actual input-output tables, it will be useful to assess similarity of over-all patterns of interdependence among different countries. A typical example of this approach applied to four countries (Italy, Japan, Norway and the United States) is shown in table 1.

(*b*) The second approach was based on the triangular arrangement of the input-output matrix[5] to examine the existence of one-way interdependence such as sequences of raw cotton-textiles-clothing. Although strict triangularity (arrangement of the input-output matrix in a triangular form having only zeros on one side of the diagonal) cannot usually be attained from actual tables, a considerable degree of triangularity can be detected in the tables of several countries. For example, the experimental triangulation in Italy, Japan, Norway and the United States, conducted by Chenery and Watanabe, gave such a high degree of triangularity that the percentage of transactions above the diagonal were 1·9, 5·7, 4·2, and 5·4, respectively.

(*c*) The third approach was comparison by type of production. The four-country comparison mentioned employed the following measure of differences in input coefficients between country k and country l:

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[1] See H. B. Chenery and T. Watanabe, "International Comparisons of the Structure of Production", in *Econometrica*, Vol. 26, No. 4, 1958, p. 487; and V. Cao-Pinna, "Principali caratteristiche strutturali di due economie mediterranee: Spagna e Italia", in *Economia Internazionale*, Vol. 11, No. 2, 1958, p. 259.

[2] See T. Watanabe, "A Test of the Constancy of Input-Output Coefficients Among Countries", in *International Economic Review*, 1961.

[3] See T. Watanabe, "An Experimental Comparison of the Production Structures: EEC Countries and Japan", in *Weltwirtschaftliches Archiv* Bd. 92, 1964, p. 409.

[4] X_{ij}: consumption in the j-th industry of the goods produced by the i-th industry.
X_j: output of the j-th industry.

[5] The discussion on the triangularity of input-output matrix was further elaborated and several useful results were obtained by D. Simpson and J. Tsukui: "The Fundamental Structure of Input-Output Tables: an International Comparison", in *Review of Economics and Statistics*, Vol. 47, 1965. See also the paper in this volume by Professor Ernst Helmstädter.

TABLE 1 : TYPES OF PRODUCTIVE SECTOR

	Final	*w*	*u*	*Intermediate*	*w*	*u*
Manufacturing	III. *Final manufacture*			II. *Intermediate manufacture*		
	3. Clothing	·12	·69			
	4. Shipbuilding	·14	·58	13. Iron and steel	·78	·66
	8. Leather and leather products	·37	·66	22. Paper and paper products	·78	·57
	1. Processed foods	·15	·61	28. Petroleum products	·68	·65
	2. Grain-mill products	·42	·89	19. Non-ferrous metals	·81	·61
	5. Transport equipment	·20	·60	16. Chemicals	·69	·60
	7. Machinery	·28	·51	23. Coal products	·67	·63
	15. Lumber and wood products	·38	·61	11. Rubber products	·48	·51
	14. Non-metallic mineral products	·30	·47	12. Textiles	·57	·69
	10. Industry, other	·20	·43	9. Printing and publishing	·46	·49
Primary production	IV. *Final primary production*			I. *Intermediate primary production*		
	A. Commodities :			17. Agriculture and forestry	·72	·31
	6. Fishing	·36	·24	27. Coal-mining	·87	·23
				20. Metal mining	·93	·21
	B. Services :			29. Petroleum and natural gas	·97	·15
	25. Transport	·26	·31	18. Non-metallic minerals	·52	·17
	21. Trade	·17	·16	24. Electric power	·59	·27
	26. Services	·34	·19			

Source : Chenery and Watanabe, *op. cit.*

$$\gamma_{\substack{kl\\j}} = \frac{\Sigma \mid a^k_{ij} - a^l_{ij} \mid}{\frac{1}{2}\Sigma\,(a^k_{ij} + a^l_{ij})}\,\cdot$$[6]

This test showed that comparability of coefficients in the manufacturing sectors was significantly higher than that in other sectors. Similarity in total interindustry use may also be examined by

$$\rho^{kl}_i = \sum_j a^k_{ij}\,X^l_j \,/\, \sum_j a^l_{ij}\,X^l_j\,.$$

In this comparison due attention should be paid to the possibilities of substitution between inputs and differences in input prices.

To judge from the results of those approaches it may be possible to state that the pattern of sectoral interdependence is reasonably similar among at least the four industrialized countries investigated. It may thus be said that the results of an analysis of interindustry relations in one country may be of some applicability to other countries, although at this stage of investigation these findings should not be taken to imply "direct transferability" of interindustry data from one country to another.

2. *Comparison of individual input coefficients*

This type of comparison was originally applied to the historical data within a single country.[7] With regard to the constancy of individual input-output coefficients there are two alternative hypotheses: the coefficients can be interpreted either as purely technological parameters that are defined in physical terms[7] or as ratios in value terms.[8]

In testing the plausibility of these two interpretations by using intercountry data the fact has to be faced that no sufficient data are available for prices; the test therefore cannot make use of quantities in terms of physical units. Some theoretical qualification is consequently needed before a statistical analysis can be formulated. The following is a summary of the study made by Watanabe.[9]

Within the framework of neoclassical economics the production function will be stated as follows:

$$X = f\,(X_1,...,X_n), \qquad (1)$$

where $X_1,...,X_n$ are factors of production employed to produce output X. This function is assumed to satisfy all the neoclassical conditions. Given the prices of factors of production, $P_1,...,P_n$ and of output P, the principle of profit maximization gives the following marginal conditions:

$$\frac{P_i}{P} = \frac{\partial f}{\partial x_i} \qquad \text{(for all } i = 1,....\text{n).} \qquad (2)$$

Since our statistical information is limited to the product of price and quantity, i.e. PX and $P_i\,X_i$ for all i, we have

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[6] $a^{\,k}_{ij}$ input coefficient in the i-j cell of the k-th country.

[7] See W. Leontief and others, *Studies in the Structure of the American Economy* (New York, 1953), p. 17.

[8] See L. R. Klein, "On the Interpretation of Professor Leontief's System", in *Review of Economic Studies*, Vol. 20, No. 52, 1952–53, p. 131.

[9] T. Watanabe, "A Test of the Constancy of Input-Output Coefficients Among Countries".

to convert equation (2) into the one expressing its theoretical consequence: constancy of the share of each production factor in the total value of production:

$$P_i\, X_i = c_i\,(PX) \quad (\text{for all } i = 1,\ldots,\text{n}), \tag{3}$$

where c_i is constant. This implies that only the Cobb-Douglas type of production function can be derived under the statistical limitation mentioned above. As a statistical equation corresponding to equation (3):

$$\log\,(P_iX_i)^k = \log \beta_{0i} + \beta_{1i} \log\,(PX)^k + u^k \tag{4}$$

was set up and applied to intercountry data; u refers to random disturbance and k represents countries.

The testing criterion for equation (4) is that $\beta_{1i} = 1$ for all $i = 1,\ldots,n$. If $\beta_{1i} = 1$ for all i, the estimates of β_{0i} are equal to c_i for all i. Furthermore, if $\Sigma\beta_{0i} = 1$, we can say the production function is the Cobb-Douglas with constant return to scale. Then the constancy of the input-output coefficients can be interpreted in the same way as Klein's coefficients.[10]

The lack of sufficient variation of relative prices among countries (P_i/P) will give a significant limitation to the above interpretation. If the variation of (P_i/P) is not sufficiently large among countries concerned—which implies that our observations are concentrated in the local range of an equilibrium point on the production function (1)—then different production functions, including the Leontief function, have to be considered.

A statistical test based on the above formulation was applied to fifteen input-output tables. These were for five countries with a *per capita* income of less than about $200 (India, Japan, Peru, Spain and Yugoslavia), five with income varying between $200 and $600 (Argentina, Colombia, Italy, the Netherlands and Puerto Rico) and five with an income of over $600 (Australia, Canada, Norway, the United Kingdom and the United States). The principal input coefficients were determined from the relative size of each coefficient in each industry and also from common technological knowledge. As a result of this statistical test, the hypothesis that $\beta_{1i}=1$ for all i was not rejected in seven manufacturing industries. Estimated values of the principal input coefficients are shown in table 2 for the twelve sectors to which the test was applied, the hypothesis being acceptable only for the seven which are asterisked.[11]

From these findings the following tentative conclusions may be drawn: (i) the "principal" input-output coefficients and the value added ratios are not very dissimilar between different countries; (ii) the similarity of these parameters, particularly in manufacturing industries, is much stronger than in other sectors; and (iii) the principal input coefficients estimated as in table 2 may be at least partly utilized as a kind of international reference data.

3. *Over-all comparison in terms of inverse matrices*

The approach in terms of inverse matrix can be formulated in the following way,[12] although this particular formulation may be only one of several possible alternatives. The basic framework of input-output theory provides us with the following relation:

$$\begin{aligned} B^kf_i^k = X_i^k \quad & (i = 1, \ldots I) \\ & (k = 1, \ldots K)^{13} \end{aligned} \tag{5}$$

where subscript i designates specific column of final demand (e.g. private consumption, government expenditure, capital formation etc.) and superscript k represents country. In order to analyse differences in the production structure equation (1) can be decomposed as follows:

$$\begin{aligned} X_i^k = X_i^l = B^kf_i^k &= B^lf_i^l \\ &= (B^k - B^l)f_i^l = B^k(f_i^k - f_i^l) \\ &= \Delta B^{kl}f_i^l + B^l\Delta f_i^{kl} + \Delta B^{kl}\Delta f_i^{kl}\ ^{14} \end{aligned} \tag{6}$$

The three components of the right-hand side of the equation may be termed, respectively, (*a*) a structural difference, (*b*) a difference due to the level of income and (*c*) interaction of the two preceding components. (For the sake of simplicity we assume the relation $f_i^k=g(y^k)$, where y^k is the *per capita* income in the k-th country.) Thus the structural difference can be interpreted as differences in direct and indirect requirements arising from the same pattern of the final demand, though such an interpretation involves an assumption that input-output coefficients as well as elements in the inverse matrix are free from changes in the level of income.

A few implications can be drawn from the above decomposition.

(*a*) The smaller the interaction effect, the higher the degree of similarity between two national economies.

(*b*) Even when difference in income level (and hence in budget proportions) is large, it is possible to have a negligible order of structural difference, i.e. $\triangle B^{kl}f_i^l$. This proposition can be tested both for a national economy as a whole and for an individual industry.

(*c*) Among the final demand columns private consumption expenditures will usually show the strongest association with income level and hence contribute to the relevancy of the following sign condition. Assume the logarithmic relation with regard to each specific item of *per capita* private consumption (say foods) and the level of *per capita* income: $\log C_j = \alpha_{0j} + \alpha_{1j} \log y$, where C_j and y represent *per capita* private consumption of j-th item and *per capita* income respectively. Assuming further the stability of coefficient α_{1j} among different

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[10] See L. R. Klein, *op. cit.*

[11] The test was applied to three other sectors: agriculture, mining and electricity. The hypothesis was rejected for these, however.

[12] For a detailed discussion see Watanabe, *op. cit.*

[13] B^k: inverse coefficient matrix of the k-th country.
f_i^k: the i-th column of the final demand of the k-th country, elements of which are expressed in percentage proportions.
X_i^k: production level induced by f_i^k alone.

[14] $\triangle B^{kl} = B^k - B^l$
$\triangle f_i^{kl} = f_i^k - f_i^l$

TABLE 2 : ESTIMATES OF PRINCIPAL INPUT-OUTPUT COEFFICIENTS

Purchasing sector	*Selling sector*[a]	*Input-output coefficients (range with ± one standard error)*[b]
Food (20–22)	Agriculture	0·1922 (0·1129 0·3272)
	Service, trade and transport	0·0824 (0·0522 0·1299)
	Others	0·3771 (0·1103 0·2897)
	Primary factors	0·3055 (0·1875 0·4977)
Textiles (23)[c]	Agriculture	0·2257 (0·1461 0·3488)
	Chemicals	0·0092 (0·0049 0·0172)
	Others	0·3149 (0·2134 0·4646)
	Primary factors	0·4436 (0·3404 0·5781)
Clothing (22)[c]	Textiles	0·3501 (0·2461 0·4980)
	Chemicals	0·0150 (0·0036 0·0579)
	Others	0·1245 (0·0632 0·2406)
	Primary factors	0·5497 (0·3252 0·7381)
Wood products (25–26)[c]	Agriculture	0·4227 (0·3428 0·5212)
	Energy	0·1085 (0·0758 0·1554)
	Others	0·2110 (0·1561 0·2853)
	Primary factors	0·3865 (0·3021 0·4945)
Paper and printing (27–28)[c]	Energy	0·1564 (0·0793 0·3085)
	Service, trade and transport	0·1966 (0·1468 0·2574)
	Others	0·3634 (0·2802 0·4714)
	Primary factors	0·4301 (0·3678 0·5030)
Leather products (29)	Agriculture	0·4095 (0·2939 0·5704)
	Chemicals	0·0946 (0·0539 0·1659)
	Service, trade and transport	0·0675 (0·0410 0·1113)
	Others	0·0966 (0·0514 0·1670)
	Primary factors	0·2594 (0·1991 0·3381)
Rubber products (30)	Agriculture	0·2359 (0·1663 0·3348)
	Clothing and textiles	0·1093 (0·0855 0·1399)
	Chemicals	0·0370 (0·0238 0·0574)
	Others	0·0701 (0·0497 0·0991)
	Primary factors	0·6165 (0·4570 0·8165)
Chemicals (31)[c]	Agriculture	0·0534 (0·0296 0·0962)
	Mining	0·1537 (0·0674 0·3504)
	Energy	0·0515 (0·0236 0·1121)
	Others	0·3793 (0·3266 0·4406)
	Primary factors	0·5040 (0·4339 0·5853)
Non-metallic mineral products (33)	Mining	0·1696 (0·1046 0·2751)
	Chemicals	0·0190 (0·0112 0·0324)
	Energy	0·0766 (0·0368 0·1593)
	Others	0·1395 (0·0911 0·2137)
	Primary factors	0·6974 (0·4949 0·9829)
Metal products (34–35)[c]	Mining	0·1365 (0·1033 0·1729)
	Energy	0·0315 (0·1536 0·6464)
	Others	0·2660 (0·1927 0·3672)
	Primary factors	0·5182 (0·3400 0·7898)
Machinery and transport equipment (36–38)[c]	Chemicals	0·1816 (0·1256 0·2625)
	Metal product	0·1659 (0·1002 0·2685)
	Others	0·1921 (0·1464 0·2639)
	Primary factors	0·6247 (0·4951 0·7883)
Construction (40)	Wood product	0·0212 (0·0076 0·0594)
	Non-metal mining products	0·4939 (0·3218 0·7579)
	Metal product	0·1094 (0·0547 0·2188)
	Others	0·1546 (0·0684 0·3493)
	Primary factors	0·4611 (0·3257 0·6528)

Source: This table was produced by the CID Secretariat on the basis of the estimation results presented in Watanabe, *A test of the Constancy of Input-output Coefficients among Countries.*

[a] The ISIC code numbers for selling sectors are: 01, 02, 03, 04 for "agriculture"; 11, 12, 13, 14, 19 for "mining"; 51, 52 for "energy"; 61, 64, 71, 73, 81, 83, 90 for "tertiary"; the code numbers for "chemicals", "textiles", and "metal products" are the same as indicated for purchasing sectors.

[b] The range was derived as: anti (log $\hat{\beta}_{ij} \pm S\log\hat{\beta}_{ij}$). It should be noted that the standard errors interpreted in this manner involve certain biases, since the model used for statistical estimation was specified in logarithmic terms.

[c] In this sector the hypothesis that $\beta_{ii}=1$ for all i was *not* rejected.

TABLE 3 : DECOMPOSITION OF THE DIFFERENCES IN PRODUCTION STRUCTURES : THE FEDERAL REPUBLIC OF GERMANY, FRANCE AND ITALY, AS COMPARED WITH JAPAN

(Percentages)

Industry	*Federal Republic of Germany*			*France*			*Italy*		
	BΔf	ΔBf	ΔBΔf	BΔf	ΔBf	ΔBΔf	BΔf	ΔBf	ΔBΔf
Agriculture and forestry	−1·5	−6·7	0·1	0·2	−8·9	−0·2	12·8	−5·6	1·2
Processed foods	−4·2	−3·1	0·6	−5·0	−1·2	0	−2·2	−3·2	1·8
Coal (including manufactured gas)	2·2	1·1	0	1·3	−0·4	0	0·3	−0·6	−0·1
Electricity	0·8	−0·1	−0·1	−0·1	−0·9	−0·1	0·1	−0·1	0
Petroleum and natural gas	−0·2	−0·2	0·6	1·6	1·8	−0·1	1·5	0·8	0·2
Construction materials	0·7	0·5	−0·3	0·3	−0·6	−0·1	0·3	−0·3	0
Iron and steel	2·6	−1·1	−0·6	2·4	−2·6	−1·0	0·2	−1·1	0·2
Non-ferrous metals	1·4	−0·2	−0·4	0·9	−0·5	−0·3	0·3	−0·5	0
Machinery	9·5	0·4	0·4	7·7	−0·6	0·2	2·9	−0·7	0·6
Chemicals	3·1	0·3	−0·6	1·5	−2·0	−0·1	1·4	−2·5	0
Textiles, clothing and leather products	0·4	−0·3	0	1·3	−0·3	0	2·1	−0·5	0·1
Industry, other	0	−0·4	0·1	0·9	−4·3	0	−0·8	−4·8	0·5
Construction	−2·1	1·0	−0·2	0·2	0	0	−3·1	0	0
Transport and communications ..	−2·2	0·3	0·3	−2·0	0·3	0·4	−1·2	−3·0	1·0
Services	−5·9	−4·7	0	−9·2	−4·0	−0·2	−13·5	−8·6	4·4
Trade	−2·6	−0·1	0·2	−1·2	7·6	0·5	−4·9	−1·2	0·6

Source: Reproduced from T. Watanabe, "An Experimental Comparison of the Production Structures: EEC Countries and Japan", in *Weltwirtschaftliches Archiv*, Bd. 92, 1964.

The input-output tables used for the three countries of the European Economic Community are those shown in "Méthodes de prévision du développement économique à long terme". Rapport d'un groupe d'experts, EEC, in *Information Statistique*, No 6, Bruxelles, 1960.

countries the following sign condition will easily be derived:

$$\text{Sign}\left\{\ \Delta f_{ij}^{kl}\ \right\} = \text{Sign}\left\{\left(\frac{y^k}{y^l}\right)^{\alpha_{1j}-1} - 1\right\}, \quad (7)$$

where if $\alpha_{1j} \gtreqless 1$, then $\Delta f_{ij}^{kl} \gtreqless 0$;

therefore, $\alpha_{1j} \gtreqless 1$ implies $B^l \Delta f_{ij}^{kl} \gtreqless 0$,

since the elements of B^l matrix are all positive.

The trichotomy defined in equation (6) was applied to the four input-output tables of France, the Federal Republic of Germany, Italy and Japan. Table 3 shows the results of the computation for the first three countries, Japan being the basis of comparison.

As can be seen from this table the interaction effects are significantly smaller than the other two components, except in the case of processed food (Italy) and iron and steel (France). The variance due to differences in budget proportions is generally larger than the structural difference between those four countries, where the range of *per capita* income is approximately from $300 to $900. These two findings may be interpreted as an evidence of similarity in the production structures. The relative smallness of interaction effects implies that the above type of comparison will be effective at least for industrialized countries.

The average magnitude of structural differences, $\Delta B^{kl} f_i^l$, is compiled in table 4. The average degree of structural difference does not seem to be very large, at least among the four countries considered here: such difference is especially small for manufacturing industries.[15]

4. *A further examination*

Although the approaches mentioned above could indicate several interesting aspects of the input-output relations in different countries, they may be described as

TABLE 4 : AVERAGE SIZE OF STRUCTURAL DIFFERENCES[a]

(Percentages)

Country	*Federal Republic of Germany*	*France*	*Italy*	*Japan*
Federal Republic of Germany	0·0	1·5 (0·4)	1·1 (0·4)	1·5 (0·6)
France	1·6 (0·5)	0·0	1·7 (0·3)	2·4 (0·7)
Italy	1·3 (1·5)	1·9 (0·3)	0·0	1·7 (1·6)
Japan	1·5 (0·4)	2·2 (0·4)	2·1 (0·4)	0·0

[a] Figures within parentheses are tne average magnitude of structural difference for the eleven manufacturing industries alone.

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[15] For details see T. Watanabe, "An Experimental Comparison of the Production Structures: EEC Countries and Japan".

taxonomic in a straightforward interpretation. Certain fundamental characteristics which may be found in the production structure of modern economic systems can be derived from these findings and may be extended to the evaluation of the production structure in developing countries. Such fundamental characteristics are presented by Simpson and Tsukui[16] in terms of (a) decomposability, (b) bloc independence, (c) triangularity and (d) physical homogeneity of bloc.

Simpson and Tsukui's definition of these concepts is as follows:

(a) *Decomposability*

When industries are grouped according to their physical qualities, and blocs are arranged in the order of metal, non-metal, energy and services, then the matrix appears to be decomposable in such a way that the blocs follow the order of sectors in the triangulated matrix: this property of the matrix is sometimes described as "bloc-triangularity".

(b) *Bloc independence*

The matrix of industries grouped in this manner shows an appreciable degree of independence among the blocs. That is to say, an industry is not strongly related to other industries outside its own bloc. This property is sometimes described as "bloc-diagonality". With the exception of the "services" bloc, the blocs referred to above appear to be almost independent of one another in the input-output tables of the fewcountries studied by Simpson and Tsukui.

(c) *Triangularity*

The framework matrix shows not only these two above properties but also the property of being almost triangular in all its elements.

(d) *Physical homogeneity of blocs*

The industries of each bloc have a common physical characteristic. Before it is possible to clarify what those fundamental characteristics actually imply, two problems have to be investigated: how to determine the principal input-output coefficients which constitute the framework matrix and what are the effects of changes in the product-mix. The first problem was handled by Simpson and Tsukui in a rather arbitrary manner: they simply discarded those a_{ij} coefficients which are smaller than an arbitrarily given critical value, and maintained the remaining ones as principal coefficients in their framework matrix.[17]

One way to evaluate the appropriateness of the critical value may be as follows: if two input-output matrices, say $\bar{A}$ and A, are different only with respect to non-principal coefficient matrix D $(= \bar{A} - A)$—that is to say, all elements in D will be smaller than a given critical value and the principal coefficients are assumed to be all equal between the two matrices $\bar{A}$ and A—then the structural difference weighted by a given pattern of final demand will be:

$$u = [(I - \bar{A})^{-1} - (I - A)^{-1}]\, Y = [+\bar{B}D - (\bar{B}D)^2 + \dots]\, \bar{X} \qquad 8)$$

where $\bar{X} = (I - \bar{A})^{-1}\, Y = \bar{B}Y$. In general, the convergence of the series of u will be easily proven and it will usually be possible to truncate this series at the lower order, say, at the second. The importance of matrix D (non-principal coefficients) can thus be evaluated according to the size of u.

As to the second problem—variation in the product-mix—it is worth noting that this factor has played a significant role in accounting for the changes in individual coefficients over time within a single country; for example in the Japanese table, most of the changes in input-output coefficients during the recent five-year period have been attributed to changes in the product-mix. It is already known that the pattern of industrial growth measured in terms of the product-mix of manufacturing industry is largely dependent on the level of *per capita* income.[18] The variation of product-mix will no doubt be an important problem in international comparisons of input-output matrices.

To conclude this section a few lines of further research may be suggested to be conducted in this field of international comparisons of input-output matrices. They are: (*a*) the determination of principal coefficients, (*b*) an assessment of the nature of interdependence revealed in the inverse matrices, (*c*) a comparison between the principal coefficient matrix and the whole matrix, and (*d*) an analysis of the effects of the variation of product-mix.

II. INTERNATIONAL COMPARISON OF CAPITAL-OUTPUT RATIOS[19]

One of the most crucial variables encountered in a quantitative approach to the problem of economic development is the capital-output ratio. Even though the notion is conceptually clear to most economists very few studies have succeeded in finding consistent and reliable measurements of capital-output ratios, especially in the case of developing countries.

One way to make the concept of capital-output ratios more useful in development programmes is to undertake a systematic comparison of available estimates suitable

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[16] Simpson and Tsukui, *op. cit.*

[17] Simpson and Tsukui used the following rule:

$$a_{ij} \leq \left(\frac{100}{n}\right) \text{ per cent,}$$

where n is the number of sectors.

[18] See United Nations, Centre for Industrial Development, *A Study of Industrial Growth* (New York, Sales No. 1963 II.B.2).

[19] This section is a revised and enlarged version of T. Watanabe: "A Note on the Japanese capital-output ratio", Memorandum C-4, Stanford Project for Quantitative Research in Economic Development, July 1957.

for the derivation of a hypothesis or bench-mark against which available estimates of capital-output ratios can be checked.

The investigation in this section of the possibility of constructing such a hypothesis about capital-output relations is divided into three parts: 1. a comparison of over-all capital-output ratios; 2. a comparison of capital-output ratios by industry, and 3. a comparison of capital-labour ratios between the United States and Japan.

To summarize the principal conclusions: 1. The over-all capital-output ratios appear to be stable, but significantly dependent upon the degree of industrialization in each country. 2. Cross-country difference in the capital-output ratios for specific industries would be greatly reduced when allowance is made for the variation of the size of the firm. 3. Capital-labour ratios are a sensitive indicator of the degree of economic development and the unbalanced structure of these capital-labour ratios among industries can be associated with economic backwardness.

1. *Over-all capital-output ratios*

An extensive survey of national wealth estimates has been carried out by the International Association for Research in Income and Wealth.[20] This survey includes over-all capital-output ratios over a period of time for eight countries, as well as similar ratios for specified years (between 1950 and 1955) for 16 countries.[21]

It points out that considerable differences exist in the valuation methods, the relative prices, and the nature of the basic statistics used. This survey however suggests three tentative hypotheses: (*a*) over-all capital-output ratios over time appear to be concentrated between 3·0 and 5·0; (*b*) intercountry comparison of over-all capital-output ratios shows a similar range of values; and (*c*) there is more likelihood under certain circumstances that capital-output ratios will be higher in underdeveloped than in developed countries.[22] The common neo-classical interpretation implying that relative scarcity of capital prevails in relatively underdeveloped economies does not appear to be in accordance with the findings of the survey.

The problem is to provide a consistent interpretation of the above three hypotheses from the point of view of development theory. Although there are several possible ways only one will be explored here.[23]

Our interpretation will be based primarily on an intercountry study of investment functions.[24] First the following variables are defined:

K_t^* = desirable stock of capital in the t^{th} period;
K_{t-1} = stock of capital available at the beginning of the t^{th} period;
I_t = gross fixed capital formation during the t^{th} period,
Y^t = gross national product in the t^{th} period;
Y_{At} = agricultural income in the t-th period;
$\Delta Y_t = Y_t - Y_{t-1}$

All variables are defined in *per capita* terms.

Second, within the theoretical framework used here the following relations are assumed:

$$\left.\begin{aligned} I_t &= \alpha(K_t^* - K_{t-1}) \\ K_t^* &= \beta_1 Y_t + \beta_2(Y_{At} - Y_{At}^*) \\ \Delta I_t &= I_t - I_{t-1} \end{aligned}\right\} \tag{9}$$

where Y_{At}^* is the predicted (or standard) income originating from agriculture, and is estimated on the basis of *per capita* national income, (Y) and population, (N) using the following double-logarithmic statistical equation:

$$\log Y_{At}^* = \theta_0 + \theta_1 \log Y_t + \theta_2 \log N_t \tag{10}$$

This relation between agricultural income and total national income was investigated extensively by Chenery.[25] If a country (the United Kingdom, for example) is relatively industrialized in the sense that the predicted agricultural income exceeds the actual one, i.e. $Y_{At} < Y_{At}^*$, then the second equation in (9) implies that the actual capital-output ratio is higher than the standard ratio (β_1), provided that β_2 is negative. Conversely, if $Y_{At} > Y_{At}^*$, the actual capital-output ratio is smaller than the standard one. The values for $\frac{(Y_A - Y_A^*)_t}{Y_t}$ are given in table 5.

The implications of equations (9) can be tested by the following statistical procedure. From equation (9) and with the definition of identity:

$$K_{t-1} - K_{t-2} = I_{t-1}$$

we will have:

$$\Delta I_t = \alpha\,\{\beta_1 \Delta Y_t + \beta_2 \Delta(Y_A - Y_A{}^*)_t - I_{t-1}\}$$

Then the statistical equation to be applied on intercountry data follows:

$$\frac{I_t}{Y_t} = \delta_0 + \delta_1 \frac{\Delta Y_t}{Y_t} + \delta_2 \frac{\Delta(Y_A - Y_A^*)_t}{Y_t} + \delta_3 \frac{I_{t-1}}{Y_t} \tag{11}$$

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[20] International Association for Research in Income and Wealth, *The Measurement of National Wealth*, ed. by R. Goldsmith and C. Saunders. Income and Wealth Series VIII, London, Bowes and Bowes, 1959.

[21] See R. Goldsmith and C. Saunders, *op. cit.*, tables VI and VII, pp. 30-32.

[22] These are not the present author's own views. S. A. Abbas in *Capital Requirement for the Development of South and South-East Asia* (Lounz, New York, 1956), gave almost the same hypotheses in his studies, which were based on different observations.

[23] Abbas gave one alternative answer which is based mainly on the relative size of "pre-condition" sectors to economic development (*ibid.* chap. VI).

[24] The following part of this section is a tentative application of investment studies which will be reported separately in more complete form as a part of a series of international comparative studies undertaken by the Stanford Project for Quantitative Research in Economic Development. The author has benefited from helpful suggestions by Professors I. Adelman and H. S. Houthakker with regard to the formulation of investment functions.

[25] H. B. Chenery, "Patterns of Industrial Growth", in *American Economic Review*, Sept. 1960.

TABLE 5 : DATA FOR INVESTMENT STUDIES[a]

(*Percentages*)

Country	I_t/Y_t	$\Delta Y_t/Y_t$	I_{t-1}/Y^t	$\frac{\Delta(Y_A-Y_A^*)_t}{Y_t}$	$\frac{(Y_A-Y_A^*)_t}{Y_t}$
Argentina	19·58	6·36	16·91	1·41	3·71
Austria	22·06	6·52	22·34	−·55	−2·50
Belgium	16·47	3·62	14·95	−·03	−3·29
Brazil	13·97	2·12	14·02	−2·06	2·61
Burma	18·54	−7·09	20·19	−2·68	−13·74
Canada	26·07	6·81	21·11	·53	1·40
Ceylon	10·35	−7·73	10·59	−6·27	13·68
China (Taiwan)	12·01	1·64	12·30	−·43	5·87
Congo (Democratic Republic of) [a]	22·67	3·44	26·22	−·87	−12·67
Costa Rica	19·69	−1·52	19.69	−5·78	12·08
Denmark	16·82	·58	17·06	·51	6·83
Ecuador	14·31	3·30	13·85	1·57	5·28
Federal Republic of Germany	22·91	3·01	21·42	−·21	−2·42
Greece	15·56	11·26	12·41	2·72	12·76
Honduras	14·10	4·21	12·63	2·31	20·75
Ireland	14·04	−2·37	14·05	−2·97	12·14
Italy	20·81	2·81	19·59	−1·64	6·22
Jamaica	22·84	12·03	12·83	−·62	3·37
Japan	22·95	10·00	16·71	−1·83	0·51
Luxembourg	19·86	8·22	20·52	·82	−3·55
Mauritius	11·22	2·10	12·53	·99	0·64
Morocco	11·71	1·07	15·40	·09	2·72
Netherlands	24·59	4·01	21·78	−·58	−2·32
Peru	25·83	2·25	23·87	−3·77	−5·28
Philippines	7·91	4·31	6·87	−·38	14·90
Portugal	14·35	2·96	13·68	·47	2·07
Puerto Rico	20·74	3·21	17·38	−2·16	−3·62
Trinidad	23·34	5·87	21·89	−2·25	−8·61
United Kingdom	14·89	1·95	14·39	−·21	−5·34

Source: Derived from the United Nations: *Yearbook of National Accounts Statistics 1958*.
Note: *t* represents 1956.
[a] Prior to independence.

where $\delta_1 = \alpha\beta_1$, $\delta_2 = \alpha\beta_2$, and $\delta_3 = 1 - \alpha$. Common denominator Y_t was introduced mainly to avoid exchange rate inconsistencies. Using the data given in the *Yearbook of National Accounts Statistics 1958*[26] and also the values of

$$\theta_0 = .805, \theta_1 = .474, \quad \text{and } \theta_2 = -.088,$$

for the coefficient in equation (10), we have the following equation:

$$\frac{I_t}{Y_t} = \delta_0 + .57\frac{\Delta Y_t}{Y_t} + .85\frac{I_{t-1}}{Y_t} - .66\frac{\Delta(Y_A - Y_A^*)_t}{Y_t} \qquad (12)$$

where $R^2 = ·8701$ and the degrees of freedom are 25. The statistical data used are shown in table 5. According to this result, $\alpha = .15$, $\beta_1 = 3.8$ and $\beta_2 = -4.4$. We may conclude then that the standard capital-output ratio is 3·8, which is fairly compatible with the observed estimates given in The Measurement of National Wealth.[27] The fluctuations of actual values around 3·8 represent differences in the degree of industrialization in individual countries: that is,

$$\frac{K}{Y} = 3.8 - 4.4\frac{(Y_A - Y_A^*)}{Y}. \qquad (13)$$

Thus the present hypothesis implies that there is no unique value for the actual capital-output ratios among different countries: the degree of concentration of these ratios around the standard value, 3·8 appears however to be quite high.[28]

2. *Capital-output ratios by industry*

It is often observed that in the capital-output ratios of specific industries little difference exists between developed and underdeveloped countries; the validity of this statement may however be weakened by possible variations in technology, price structure, capacity

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[26] United Nations, *Yearbook of National Accounts Statistics 1958* (New York, 1959).

[27] R. Goldsmith and C. Saunders, *op. cit.*

[28] It may be noted here that use of Y_A^* as an indicator for the degree of economic development is due mainly to the fact that sufficient data exist to permit the estimation of such an indicator.

utilization etc.[29] This hypothesis may or may not be compatible with structural differences, which are due mainly to differences in the product-mix of each given industry among different countries. To examine this point further we will introduce the following notations:

K_i^n = stock of capital of the i^{th} industry in the n^{th} country

X_i^n = output (or capacity) of the i^{th} industry in the n^{th} country;

K_{ij}^n= stock of capital for the j^{th} group of activities (products) of the i^{th} industry in the n^{th} country;

X_{ij}^n = output of the j^{th} group of activities (products) of the i^{th} industry in the n^{th} country.

In terms of the above notations the capital-output ratio of a given industry, k_i^n will be defined as:

$$k_i^n = \frac{\sum_j K_{ij}^n}{\sum_j X_{ij}^n} \text{ for the } n^{\text{th}} \text{ country.}$$

Since $k_{ij}^n = \dfrac{K_{ij}^n}{X_{ij}^n}$, we will have:

$$k_i^n = \sum_j k_{ij}^n\, w_{ij}^n\,, \tag{14}$$

where $w_{ij}^n = \dfrac{X_{ij}^n}{\sum_j X_{ij}^n}$ i.e., the share of output produced by the j^{th} group of activities (products) in the total output of the i^{th} industry.

In order that $k_i^n = k_i^m$ when $w_{ij}^n \neq w_{ij}^m$, which seems to be a reasonable assumption for the purpose of comparison between underdeveloped and developed countries, the condition: $k_{ij}^n = k_{ij}^m = k_i^n = k_i^m$ must be satisfied. This last condition implies there should be no difference between larger and smaller firms within a country, nor between different countries, in the capital-output ratio of a specific industry. This appears to be dubious, however, in cases when both highly advanced production techniques and extremely primitive production techniques are used side by side as is often the case with underdeveloped countries. Consequently the degree of similarity of the capital-output ratio of specific industries between different countries must be examined more carefully.

A comparison may be made between Japan and the United States, since in both countries the data for capital-output ratios are readily available.

The 1947 capital and inventory coefficients were prepared for the United States 190 industries by the Harvard Economic Research Project.[30] Approximately 60 per cent of the capital-output ratios for 1947 were computed as incremental coefficients, mainly on the basis of engineering data.

The Japanese capital-output ratios, which were derived from the 1955 National Wealth Survey,[31] may have different characteristics, although most of the components used in the definition of capital-output ratios of these two countries are very similar. There is however no mixture of the average ratio and the incremental ratio in the Japanese estimates, unlike the United States data. There may also be slight differences in the definition of the denominator used; in 1947 United States industries were operating at nearly full capacity, while in 1955 almost all Japanese industries were operating at less than full capacity. This difference in the degrees of capacity utilization may lead to generally higher capital-output ratios in Japan than in the United States.

Direct comparison of capital-output ratios by industry is shown in table 6. The 1955 Japanese coefficients for manufactured gas, land transportation and housing appear somewhat higher than those of the United States, but all other coefficients look fairly comparable between the two countries.

For the purpose of over-all comparison however, total gross output or capacity might not be suitable, since this includes many intra-firm transactions and large values of raw materials, most of which are imported at relatively high prices in Japan. For this reason capital-income ratios may be preferred to capital-output ratios. Capital-income ratios, of which the denominators are defined as national income originated by specific industry, computed for the four aggregative sectors of the economy are shown in table 7. A comparison of tables 6 and 7 shows that capital-income ratios are more similar between the two countries than the corresponding capital-output ratios, even though there is a larger gap between the years of estimate in the two countries.

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[29] See S. A. Abbas, *op. cit.*; V. V. Bhatt, "Capital-Output Ratios of Certain Industries: A Comparative Study of Certain Countries", in *Review of Economics and Statistics*, Vol. 36, No. 3, Aug. 1954; and R. N. Grosse, "The Structure of Capital", in W. Leontief and others, *Studies in the Structure of the American Economy.*

[30] Detailed information about data sources and methods used is to be found in Harvard Economic Research Project: *Estimates of the Capital Structure of American Industries*, 1947 (mimeographed, 1953). For bilateral comparison between the United States and Japan a 190-industry classification was further aggregated into 30 industry classifications. The capital-output ratios in the latter classification were computed as the weighted average, using output as weight.

[31] In 1955 the Economic Planning Agency of Japan made a National Wealth Survey which covered almost all economic units and which provided an adequate and uniform statistical basis for determining capital coefficients. Using statistical information from this survey together with other sources two types of capital coefficients were computed: the average capital-output ratio and the marginal capital-output ratio. The former is defined as the ratio of existing fixed capital assets (excluding land) at the end of the specific year to the value of output during that year. The latter coefficient is defined as the ratio of the increment of fixed capital stock over the specific years (from 1951 to 1955) to the corresponding increment in output. Further information about computation procedure and data sources is given in Economic Research Institute, Economic Planning Agency, Japan, *National Income Accounts, 1957 and National Wealth Survey, 1955* (Economic Bulletin No. 1, Feb. 1959); *Capital Structure and Differentials between Firms* (Research Series No. 6, Mar. 1960) (in Japanese); and Council for Industrial Planning, *Capital Structure of the Japanese Economy* (Tokyo, 1958).

TABLE 6 : CAPITAL-OUTPUT RATIOS FOR 32 INDUSTRIES

	Japan				*United States*	*Japan*
	Average capital-output ratio		*Marginal capital-output ratio*		*Capital-output ratio 1947*[a]	*Leading firms*[b] *Average capital-output ratio, 1955, at current prices*
	1955 at current prices	*1954 at 1951 prices*	*1951–1955*	*1951–1954*		
All industry	1·080	0·993	0·364	0·340		
I. Agriculture, forestry and fishing	1·227	1·548	0·298	0·531		
1. Agriculture	1·430	1·889	0·278	0·639	1·611	
2. Forestry	0·433	0·487	0·427	0·504		
3. Fishing	0·691	0·619	0·243	0·223	1·127	
II. Mining	0·553	0·492	0·504	0·469		
4. Coal	0·563	0·489	1·392	1·179	0·809	0·918
5. Other mining	0·535	0·499	0·156	0·186	1·567	
III. Manufacturing	0·213	0·168	0·235	0·191		
6. Processed foods	0·140	0·133	0·174	0·177	0·228	0·146
7. Textiles	0·174	0·121	0·105	0·075	0·308	0·400
8. Lumber and wood	0·282	0·327	0·016	−0·027	0·438	0·382
9. Paper and pulp	0·195	0·136	0·429	0·349	0·458	0·483
10. Printing	0·179	0·104	0·276	0·173	0·394	0·399
11. Chemicals	0·284	0·220	0·379	0·319	0·428	0·584
12. Coal and petroleum products	0·287	0·241	0·160	0·132	1·256	1·252
13. Rubber	0·162	0·111	0·080	0·038	0·334	0·302
14. Leather	0·093	0·060	0·192	0·129	0·110	0·219
15. Non-metallic mineral products	0·406	0·296	0·745	0·499	0·870	0·581
16. Metal products	0·202	0·159	0·324	0·296	0·432	0·750
17. Machinery	0·340	0·279	0·374	0·279	0·475	0·453
18. Transport equipment	0·324	0·301	0·066	0·007	0·467	0·475
19. Industry (other)	0·089	0·058	0·218	0·184		
IV. Transportation, communications and other public utilities	2·610	3·071	2·131	2·592		
20. Manufactured gas	0·900	1·069	0·791	0·695	1·295	
21. Electricity	3·304	4·124	5·166	6·448	3·298	
22. Water supply	6·852	7·220	3·400	2·800		
23. Land transport	2·698	3·260	1·194	1·573	2·544	
24. Water transport	2·078	2·030	1·858	2·258	2·488	
25. Communications	1·826	2·340	1·531	1·967	4·329	
V. 26. Construction	0·063	0·070	0·109	0·138	0·140	
VI. Trade and services	2·217	2·349	0·269	0·258	2·547	
27. Trade	0·556	0·492	0·022	− 0·008	0·985	
28. Non-residential building	0·472	0·576	0·472	1·247		
29. Housing	31·870	59·776	31·870	34·000	8·159	
30. Financial and other services	0·774	1·029	0·235	0·304		
31. Central government services	1·925	3·756	−0·408	0·317		
32. Local government services	17·780	17·584	21·671	17·584		

[a] Compiled from Harvard Economic Research Project, *Estimates of the Capital Structure of American Industries, 1947*.
[b] Leading firms are defined as those holding large amounts of capital assets relative to other firms in each industry (see the text).

The next step is to make a more detailed breakdown of industry. The ranking of industries according to size of capital-output ratios is indicated in table 8.

In 1947 in the United States, transportation, communication and public utilities involved the largest amounts of fixed capital assets per unit of output; extractive industries, such as agriculture, mining, forestry and fishing came next; and after them the processing of mineral products. The marginal capital-output ratios of the Japanese industries show a considerable divergence from this tendency,[32] whereas the ranking based on the average ratios is, on the whole, comparable to that of the United States industries.

Relatively large differences in the ranking between the United States and the Japanese average coefficients are

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[32] Since the computational procedure is questionable, no conclusive statement can be made about marginal coefficients. Further internal checking of the Japanese marginal coefficients might enable a more precise interpretation to be made.

TABLE 7 : CAPITAL-INCOME RATIOS

	United States 1939	*Japan 1955*
I. Agriculture	1·64	1·37
II. Mining	1·56	1·15
III. Manufacturing	1·23	1·11
IV. Transport, communications and other public utilities	5·53	5·19
V. Total	2·29	1·87

Source: Compiled by S. Shishido. [Existing fixed capital assets in both countries exclude government assets and land.]

TABLE 8 : RANKING OF INDUSTRIES IN THE UNITED STATES AND IN JAPAN BY SIZE OF CAPITAL-OUTPUT RATIOS

Industry	*United States*	*Japan*	
		(*a*)	(*b*)
Communications	1	3	4
Electricity	2	1	1
Overland transport	3	5	2
Overseas transport	4	2	3
Agriculture	5	12	5
Mining, other than coal	6	18	10
Manufactured gas	7	6	6
Coal and petroleum products	8	17	14
Fishing	9	14	7
Trade	10	24	9
Non-metallic mineral products	11	7	11
Coal-mining	12	4	8
Machinery	13	10	12
Transport equipment	14	22	13
Paper and pulp	15	8	18
Lumber and wood	16	23	16
Metal products	17	11	17
Chemicals	18	9	15
Printing	19	13	19
Rubber	20	21	21
Textiles	21	20	20
Processed foods	22	16	22
Construction	23	19	24
Leather	24	15	23

Note: Column (*a*) ranks Japanese industries according to marginal capital-output ratios 1951–55, as in column 3 in table 6. Column (*b*) ranks Japanese industries according to average capital-output ratio 1955 at current prices as in column 1 in table 6.

seen in line 6, "Mining, other than coal" and line 8, "Coal and petroleum products". These differences can be explained by the large discrepancy as regards petroleum, natural resources of which are almost non-existent in Japan.

These tendencies are confirmed by the capital-output ratios of the Japanese firms which were computed by classifying all the firms within each industry into from fifteen to seventeen groups according to the size of the capital assets owned by each firm, and computing the capital-output ratio for each such group. The firms most heavily endowed with capital assets are classified as the leading firms. Each firm in this group holds capital assets valued at about ten thousand million yen (some 30 million United States dollars).[33] The capital-output ratios of the leading firms are shown in column 6 of table 6.

This shows striking similarities to column 5 of table 6. This implies that the leading Japanese firms are operating under almost the same conditions with respect to their capital-output ratios as the average United States firm in each manufacturing industry. A comparison of column 5 with column 1 shows that the Japanese firms are small and with relatively low capital-output ratios; this would imply a relatively high labour intensity in these firms. The hypothesis that $k_{ij}^{n}=k_{i}^{n}$ is therefore obviously untenable if the size distribution of firms within industry is taken into account. But if the weight for the leading firms is sufficiently large or if the amount of output produced by the group of leading firms as compared with total output in a single industry is large enough, the degree of comparability of the capital-output ratio in each industry will not be affected too greatly by the difference in the size distribution of firms.

Under such conditions it may not be altogether unreasonable to apply the estimates of the capital-output ratios for specific industries obtained in a country like the United States to similar industries in underdeveloped countries. When the weight of the leading firms is not large enough, the upper limit of capital requirements might be obtained with reference to the average capital-output ratios of the developed countries.

We can therefore conclude that there is not much difference in the capital-output ratios of specific industries between different countries, if proper consideration is given to the size distribution of firms within each industry.[34]

3. *Comparison of the capital-labour ratios by industry between the United States and Japan*

So far our discussion has been limited to the concept of capital-output ratio. Intercountry similarities of capital-output ratios, however, do not imply comparability of countries as to the degree of economic development. A measure which would more vividly reflect the differences in the degree of economic development therefore seems to call for discussion.

The neoclassical production theory states that a larger

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[33] The largest amount of capital assets owned by individual firms varies from industry to industry. For example, the smallest amount, about 20 million yen of capital assets, is observed in the furniture industry. Most of the heavy industries hold 20 billion yen or over. This computation was reported in *Capital Structure and Differentials between Firms* (see footnote 31).

[34] The size distribution according to the number of employees was also investigated in *Capital Structure and Differentials between Firms* and supported similar conclusions with respect to the capital-output ratios. This distribution was based on the 1957 survey of firms.

TABLE 9 : FIXED CAPITAL ASSETS PER EMPLOYEE

(Thousands of United States dollars)

	(1) United States (1947)	(2) Japan (1954)	(3) (1)/(2)	(4) Japan leading firms (1955)	(5) (1)/(4)
1. Agriculture and forestry	19·58	0·37	52·91	—	—
2. Fishing	2·24	0·47	4·77	—	—
3. Coal-mining	4·86	0·65	7·48	—	—
4. Other mining	24·29	1·02	23·81	—	—
5. Processed foods	5·07	0·55	9·22	3·38	1·50
6. Textiles	2·78	0·57	4·88	1·95	1·43
7. Lumber and wood products	3·13	0·37	8·46	1·19	2·63
8. Paper and allied products	6·07	0·76	7·98	4·14	1·47
9. Printing and publishing	3·45	0·21	16·44	1·05	3·29
10. Chemicals	7·80	1·19	6·56	2·67	2·92
11. Coal products	35·84	4·44	8·07	27·05	1·32
12. Petroleum products	38·18	6·23	5·64		
13. Rubber products	3·43	0·46	7·46	2·05	1·67
14. Leather products	1·00	0·20	5·00	—	—
15. Non-metallic mineral products	6·96	0·46	15·13	5·62	1·24
16. Iron and steel products	7·89	1·19	6·63	4·58	1·72
17. Non-ferrous metal products	9·26	1·43	1·48	2·29	4·04
18. Machinery	4·95	0·46	10·76	1·59	3·11
19. Transport equipment	5·40	0·65	8·31	1·44	3·75
20. Industry (other)	2·19	0·12	18·25	1·04	2·11
21. Electricity	46·36	13·85	3·35	—	—
22. Transportation	15·57	3·61	4·31	—	—
23. Trade	6·18	0·40	15·45	—	—

Source: Column 1 is compiled from Harvard Economic Research Project: *Estimates of the Capital Structure of American Industries, 1947* and *Report and Research*; column 2 from *National Income Accounts, 1957* and *National Wealth Survey, 1955* ; and column 4 from *Capital Structure and Differentials between Firms* (see footnote 31).

degree of variation exists in capital-labour ratios than in capital-output ratios; more precisely, if labour productivity goes up, the capital-labour ratio will go up faster than the capital-output ratio. This statement implies that advanced economies tend to be much more capital-intensive than underdeveloped economies.

Actually, the lower wage rates and the higher capital costs in the Japanese economy seem to have resulted in an extensive substitution of labour for capital, as can be seen from the comparison of capital-labour ratios between Japanese and the United States industries in table 9, which indicates several characteristics reflecting the relative backwardness of the Japanese economy.[35]

(*a*) Generally speaking the United States capital-labour ratios are about seven or eight times larger than the Japanese ratios; in six out of the 23 industries differences are more than ten times larger (see column 3 in table 9). These six industries (agriculture and forestry, other mining, printing and publishing, non-metallic mineral products, industry (other), and trade) are mainly composed of small firms, over 90 per cent of which have less than 20 employees, mostly family workers.

(*b*) There is a larger variation of capital-intensity among the Japanese industries than among those of the United States. The range of variation among the Japanese industries is almost 2·5 times that of the United States as a whole; however, it should be noted that the range of variation within manufacturing industries is about the same in both countries.

(*c*) The ranking of industries according to the size of capital-labour ratios, given in table 10, is quite similar in the two countries, with the exception of industries like agriculture, non-metallic mineral products, trade, coal mining, and textiles. Among these the first three are

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[35] The results in table 9 were computed without any adjustment for prices and employment conditions. In the case of the United States, however, the wholesale price index for machinery, which is a key component of fixed capital assets, increased by some 25 per cent from 1947 to 1954. On the other hand, the general level of employment increased by about 10 per cent. Even assuming that there had been no increase in the stock of capital from 1947 to 1954, fixed capital assets per employee in the United States industries for 1954 might have had a slight upward tendency. Another adjustment must be made for the official exchange rate. There is no adequate information on the purchasing power parity for this purpose, except an approximate computation in T. Watanabe and R. Komiya, "Findings from Price Comparisons, principally Japan vs. the United States", in *Weltwirtschaftliches Archiv*, Oct. 1958. In general, purchasing equivalence between the United States dollar and the Japanese yen is probably lower than the official exchange rate ($US 1 = yen 360); a comparison of wholesale prices showed $US 1 = yen 330. The exchange rate problem therefore may not be so critical in accounting for the apparent differences of capital-labour ratios.

TABLE 10 : RANKING OF CERTAIN INDUSTRIES BY SIZE OF CAPITAL-LABOUR RATIO

Industry	*United States*	*Japan*
Electricity	1	1
Petroleum products	2	2
Coal products	3	3
Other mining	4	8
Agriculture and forestry	5	19
Transportation	6	4
Non-ferrous metal products	7	5
Iron and steel products	8	6
Chemicals	9	7
Non-metallic mineral products	10	16
Trade	11	18
Paper and allied products	12	9
Transport equipment	13	10
Processed foods	14	13
Machinery	15	17
Coal-mining	16	11
Printing and publishing	17	21
Rubber products	18	15
Lumber and wood products	19	20
Textiles	20	12
Fishing	21	14
Leather products	22	22

Source: Compiled from table 9.

relatively less capital-intensive in Japan than in the United States, and the latter two relatively more capital-intensive.[36] The Spearman rank correlation coefficient proves in fact to be ·75.

(*d*) A comparison of table 10 with table 8 indicates that the similarity in ranking between United States and Japanese industry is greater in relation to their capital-output than to their capital-labour ratios. The Spearman rank correlation coefficient was ·95 for the former and ·75 for the latter. The ranking of industries with respect to capital-output ratios and capital-labour ratios in the United States shows a high correlation but a very low one in the case of Japan (the Spearman coefficient is ·76 for the United States and ·30 for Japan).

(*e*) Large deviations between the capital-labour ratios of the United States and the Japanese industries will be reduced sharply if the ratios of the average United States firm are compared with those of the leading Japanese firms (see column 5 in table 9). This implies that a greater part of the over-all differences between the two countries is accounted for by very large differences in the capital-labour ratios between small and large firms within Japanese manufacturing industries.[37]

These observations may enable us to confirm our previous conjectures that (*a*) the degree of economic development is reflected much more readily in the magnitude of capital-labour ratios than of capital-output ratios; (*b*) the most important factor responsible for the relative backwardness of an economy is an unbalanced structure of production within an industry in which a number of small firms with primitive technologies operate together with large technologically advanced firms; (*c*) the use of modern technologies with high capital-intensity is likely, because of financial and other restrictions, to be concentrated in a small number of large leading firms.

III. SUGGESTIONS ON INPUT-OUTPUT ANALYSIS FOR DEVELOPING COUNTRIES

1. *Data for technical coefficient matrix*

There is no doubt that a standardized set of technical coefficient vectors would be of great use in the industrial programming of the developing countries. Tentative suggestions on this subject, based on the discussions of the previous sections, are presented below.

(a) *Industrial classification*

Since the major concern of the Centre's "proposal" is industry level rather than plant level, individual sectors should preferably be defined on a standard industrial classification such as the ISIC in view of the practicality in data collection and an analytical linkage of the proposed study with conventional industrial studies. This does not, of course, deny the need for some additional alternative classification systems, designed for particular analytical use, covering such sectors as energy industries, light manufactures, heavy manufactures, import-substituting, and export-oriented. Such analytical requirements can be fully taken into account in determining the degree of disaggregation on the ISIC basis. It should be noted, however, that some adjustment of the ISIC may be inevitable for analysis on an activity basis, as has been pointed out earlier.

(b) *Activity or technical-unit basis*

Conventional census data on an establishment basis will be of limited use for our purposes. Conversion of such data to an activity or technical unit basis will be essential in order to have a standardized set of technical coefficient vectors or matrices. As noted earlier, the use of a product-mix coefficient matrix may be helpful, if the basic cost data are not directly available on an activity basis.

In this context the output of an individual sector should be defined in gross terms. Particularly in the case of sectors of strategic importance for industrial programming, since the technical coefficients for such sectors must be highly comparable with those of other countries.

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[36] Relatively speaking the textile industry in Japan is mature and the coal-mining industry is the one which has had very large government subsidy during the post-war period. Agriculture, trade and the non-metallic mineral products industry have been organized in small-scale firms.

[37] For the distribution of the capital-labour ratios by size of firms see *Capital Structure and Differentials between Firms* (see footnote 31).

(c) *Technical coefficient matrix*

The technical coefficient matrix will preferably have many more columns than rows because the change in product-mix is the most influential factor affecting coefficients. The number of rows for manufacturing industries need not be very detailed for the purpose of analysis of sectoral output, imports, employment and capital requirements. Though it is very difficult to decide the optimal size of this rectangular matrix, approximately 50 × 200 may be considered as a bench-mark suitable for dealing with the problem of technological progress in most of the developing countries.

The industrial classification as specified in the rows must have special reference to natural resource endowment and possibilities of import substitution in developing countries. In addition to this row classification, functional divisions of inputs, such as energy inputs, distribution costs, principal direct production materials, etc., will also be useful.

As for the columns for manufactures the sectoral classification must be as detailed as basic data permit, particularly in those sectors where the product-mix is changing fast with the changes in *per capita* incomes technologies, import and export patterns, etc.

(d) *Gross and net input with respect to by-product and scrap*

In practice input coefficients are computed on a net basis, i.e. after deducting coefficients for by-products and scrap, in the case of "negative-input method". In view of the need for a technical analysis it would be preferable to have a reference matrix for by-products and scrap so as to facilitate the conversion to a gross coefficient matrix (i.e. technical coefficients before such deduction).

(e) *Valuation*

It is generally accepted that producer's price is desirable in the compilation of the technical coefficient matrix, since the homogeneity of the row in the matrix can be more firmly secured by the use of producer's price valuation.

For indirect taxes (net of price subsidies) it will be convenient for analytical purposes if the coefficients at market prices are converted into those at factory prices by using the following formulae:

$$I' = V' \ (I - A)^{-1} \tag{1}$$

$$P' = V' (I - A)^{-1} \tag{2}$$

$$I' = \bar{V}_f' (I - A_f)^{-1} \tag{3}$$

In this case,

$$A_f = \hat{P} A \hat{P}^{-1} \tag{4}$$

$$\bar{V}_f' = V_f' P^{-1} \tag{5}$$

where I' = unit vector for price levels; A = technical coefficient matrix at market prices; A_f = the same at factor costs; P = vector of price levels at factor costs; V = vector of value added ratios at market prices; V_f = the same at factor costs before adjustment of output; $\bar{V}_f$ = the same at factor costs after adjustment of output for the factor cost basis. A notation with a prime indicates row vector, and one with a circumflex a diagonal matrix.

As can be seen from the above, matrix A_f, valued at factor costs, will be more stable and suitable for international comparison, since coefficient matrix A is more subject to changes in government price policies.

This formula can also be extended to a more general case where any factor giving rise to price distortions needs to be eliminated. For instance, factors such as customs duties, import restrictions and multiple exchange rates tend to distort their relative prices, which might dilute the practical applicability of the technical coefficients valued at market prices. Thus it would be desirable to remove various distorting factors so that the technical coefficients reflect purely technological relations based on a certain normalized set of relative prices. The adoption of international prices would be considered as a first approximation.

(f) *Physical relationships*

A physical balance or quantity table, as prepared in Japan and other countries, is also useful for checking the workability of the standard coefficients in value terms. Engineering data also serve similar purposes, but they may be of more limited use because they are available only at plant level. Thus it would be desirable to prepare the standard technical coefficients at industry level in physical terms at least for selected sectors of strategic importance for industrial programming.

2. *Input-output simulation for developing countries*

From the findings in the sections above, a tentative suggestion may be drawn as to the input-output simulation for those developing countries which do not have sufficient statistical information for their planning purposes. In some developing countries the availability of the statistical information needed for the compilation of input-output tables may be quite high but the compilation of an input-output matrix and its use for projections and planning by their own data may not be so fruitful because of insufficiencies in the existing technologies and also of rapid obsolescence of the existing information. Thus an input-output simulation based on our standardized coefficient matrices would provide useful bench-mark data for planning and programming purposes.

(a) *Determination of principal input-output coefficients*

The following procedures may be suggested for the purposes of determining the principal input-output coefficients.

(i) Coefficients may be discarded by the use of the formula suggested in the previous section; this method is particularly useful for countries where (*a*) imports are relatively small; (*b*) there is no significant serious price control, especially of the materials to be purchased by manufacturing sectors; (*c*) classification of industries is based on the international code; (*d*) statistical information about a thousand or more commodities is available, at least with regard to their total output; and (*e*) there is the possibility of using an input-output matrix with at least 40 sectors, of which more than 30 should represent manufacturing industries.

(ii) The engineering and economic properties of the principal coefficients should be examined.

(iii) Decomposability, bloc interdependence and triangularity in the principal coefficient matrices should be tested for various industrialized countries, the number of countries should be larger than five, and significant differences in relative prices should be corrected as indicated in section III (1) (e) above.

(b) *Test of possible variations in the principal coefficients due to changes in the product-mix*

This test would be specially needed to clarify the nature of the principal coefficients applicable to developing countries. In several developing countries, such as India, estimates of those coefficients are already available. For countries where no estimates of principal coefficients are available it is desirable to conduct a special survey.

(c) *Compilation of a standard principal coefficient matrix*

Using the information collected through the above two procedures, a standard matrix can be constructed whose elements are only principal coefficients.

(d) *Test of the standard principal coefficient matrix*

From the standard principal coefficient matrix A^* it is possible to compute $(I - A^*)^{-1}$. Multiplying this inverse matrix by the final demand vectors of several countries for which reliable input-output tables are available some deviations will be found between the actual and the computed outputs. It will be necessary to trace possible causes of deviations.

(e) *Application of the standard principal coefficient matrix*

(i) For those countries which have relatively sufficient statistical information to compile vectors of output and final demand, compute:

$$(I - A^*)X^{act.} = Y^{est.}$$

and

$$(I - A^*)^{-1}Y^{act.} = X^{est.}$$

(ii) For those countries which have information for either X or Y, compute either

$$(I - A^*)X^{act.} = Y^{est.}$$

or

$$(I - A^*)^{-1}Y^{act.} = X^{est.}$$

and compare the results with other available data, such as those in national income accounts.

(iii) For those countries which have no information about X or Y, derive a hypothetical vector X by using *A Study of Industrial Growth*,[38] and then compute $(I - A^*)X^{est.} = Y^{est.}$ Check the estimate of $Y^{est.}$ against whatever information is available for income and production.

It has to be emphasized here that the above type of simulation alone may not be very meaningful for the developing countries which are still at the pre-industrial stage. For these countries it will be desirable to utilize the labour coefficients as a principal tool of analysis since the combination of principal inputs, capital input and labour input would be one of the most important aspects of economic growth. In this connexion it may be noted that the principal coefficient matrix may well be constructed excluding service sectors and probably agriculture sectors, since these may involve a mixture of elements of both traditional life and industrial institutions, especially in most of the developing countries.

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[38] United Nations, *op. cit.* (see footnote 18, page 192).

NOTE ON THE POSSIBILITIES OF UTILIZING THE TECHNIQUES AND DATA OF INTERNATIONAL COMPARISONS FOR INDUSTRIAL PROGRAMMING IN THE DEVELOPING COUNTRIES

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In working out policies for economic development one is faced with two kinds of problems. First of all the image of the future economy which a country wishes to attain ought to be constructed in terms that are clear and operational—and consequently relatively detailed and precise. In solving this problem of what to do, the Leontief tables have proved quite useful. But then one should be able to formulate specific economic policies which can lead to given desired situations: we are dealing with a problem of how to do it, for the solution of which a great deal other than the conventional Leontief tables will be required.

Consider a particular industry: say the cotton textile industry or the electronic industry. To study the problem of what to do for the future development of such an industry one would wish to have a series of historical monographs for various industrialized countries, describing in an analytically comparable framework the various aspects and factors of their past development, such as the diverse circumstances which governed the birth, growth and eventual decline of the industry, changes in the techniques of production and marketing, quantitative and qualitative changes in production, evolution of investment and employment, functional linkage between the industry and the rest of the national economy, particular policy measures adopted and their impact, etc. In this perspective an inspection of both cases of failure and success would provide equally valuable lessons. History often repeats itself, and each country should adapt the lessons obtained from experience in other countries to particular conditions of its own economy and industries. It is clear that such monographs dealing with the historical development of an industry in various countries would provide an extremely useful source of information for those persons who are concerned with the promotion of similar industries in other countries.

Now to turn back to the precise objective of this note: we are all aware of the fact that the planners of developing countries cannot resort to the conventional method of utilizing an input-output table, which consists of determining production targets of each sector from given hypotheses concerning the growth of final demand and the technical coefficients relating to use of raw materials, energy, capital and labour. In the case of developing economies the technical coefficients compiled for a recent year can represent only a forlorn past and seldom be of practical use for projection purposes; projections would often involve replacement of the whole system of coefficients by a new system, covering new lines of industrial activities envisaged for a given plan period. Again, in evaluating the probable magnitude of individual coefficients (which in fact becomes possible only after such a new system is called forth for projection purposes) one would have to draw upon the method of international comparisons rather than the country's own historical data. To what extent then can the planners of developing economies take one aspect here and another there, in the form of coefficients borrowed from different countries, in drawing up input-output tables for their future economies? What knowledge should they have about those borrowed coefficients in order to integrate them *mutatis mutandis* into an operationally consistent system?

The Leontief tables which have been compiled in various developed countries do not seem all equally adaptable to the needs of planners in developing countries. Certain highly developed countries place full confidence in private enterprises as regards their capability to adapt themselves to changes in market conditions. Such is especially true of a country like the United States. Under such circumstances an input-output table is expected to be not so much a detailed description of the flow of products characterizing various specific production processes as a national-accounting device clarifying ways in which value-added is generated in various activities and then transformed into final demand of consumption and investment. This is certainly one of the reasons why the industry classifications adopted in these countries are generally based on the grouping of enterprises rather than of products, and thus meet very poorly the need of persons who wish to draw up a precise programme for future industrial development in developing countries.

In other countries, such as France, somewhat less confidence is placed in the rapidity of adaptation of enterprises; governments in such countries are therefore more concerned with the problem of keeping them alert to future perspectives by setting up serious market studies for the principal products. In such cases the input-output information bears principally upon the description of production processes, and its compilation tends to be oriented for the product-basis classification. In principle the coefficients established in this manner would be indicative of the production conditions, both technical and economic, of each stage of production. The approach by detailed product groups proves inappropriate to deal with the value-added aspect of the production structure;

but this limitation is not so important for those who wish to draw up development programmes for the future, since this type of table permits detailed analysis of the production processes of an industrially more developed country, as required in the context of forward planning for a less developed country. But experience proves that even this type of detailed table is not easily usable in fact by the planners of developing countries.

One of the key factors responsible for the relative ineffectiveness of many existing tables for programming purposes is the high level of aggregation involved in the underlying sector classifications. A detailed classification scheme, which would make the resulting table useful for the planners of developing economies, may however not necessarily be found so useful for those of developed economies. For the latter it would suffice to question any foreseeable changes in individual technical coefficients extracted from the table of the base year. In fact the classification of activities and products which define these coefficients might not be so seriously implicated in that type of projection; a classification scheme of the order of 100 or 200 sectors usually permits only such a highly rudimentary description of production processes that many of the technical coefficients defined in that scheme may appear almost unchanged for five years or so.

In fact however, even if their nominal titles remain unchanged, their substantive contents undergo changes under the influence of various factors characterizing the dynamism of economic development, such as installation of new technologies, launching of new products, substitution among different materials, modifications in the internal structure of industries, changes in relative prices, entrepreneurial behaviour in respect of investment, research and development, specific policy measures of the public authorities, etc. Technical coefficients derived from a table of only a few hundred sector alignment can only reflect the consequences of these various development factors; they cannot explain how such and such factors influence such and such coefficients. Thus the apparent stability of nomenclatures masks a fundamental problem posed by the planning of developed countries as well as of developing countries.

The interindustry tables now available for many developed countries have proved in fact to be poor instruments for planning and *ex ante* analysis; rather they are instruments for *ex post* analysis, often more effective in describing the remunerations of primary production factors than the network of interindustry transactions *per se*. Therefore the planners of developing countries should not hope for too much from the possibility of borrowing technical coefficients from the tables of developed economies for the purpose of industrial programming in their own countries.

If too much aggregation is the key source of the whole complaint, it is no doubt only of a transitory nature. "Insufficient information", often referred to as a major excuse, is in fact not always the case. On the contrary the information of various types which we usually manage to collect to construct a Leontief table cannot all be utilized effectively; the nomenclature to be retained at the final stage of compilation is much less detailed than what would appear possible at the outset; thus a nomenclature which can be common to all products has to be aligned along the product groups whose specific markets or consumptions are not really well known. Consequently such a nomenclature can mobilize only part of the available information. Another—and more important—reason is simply that we do not know enough about the nature and causes of the wealth of nations: even a table built under a highly detailed nomenclature would not easily be utilized for planning purposes, since detailed analysis of production processes will not be of much use when it is impossible to project final demand and technical coefficients under the same detailed nomenclature. Projections of technical coefficients for example can be set up only through the synthetic dialogue between economists and engineers, which is actually almost impossible owing to the lack of common language.

These difficulties, if surmountable at all, will not be overcome without cost and patient effort and possibly not within the foreseeable future. What then can possibly be done to assist today's developing countries by way of programming data for interindustry relations?

I. DETAILED DESCRIPTION OF VARIOUS PRODUCTION BLOCS OF DEVELOPED COUNTRIES

If we cannot hope for a complete reorganization of interindustry compilation in developed countries we may still be able to provide planners of developing countries with some form of description of the functional and structural detail of industries in developed countries. This descriptive approach might release us from the tough constraint of input-output compilation—the need to force the alignment of classifications upon the products and processes which do not fit well into any statistical scheme. For that matter, instead of attempting to describe a whole national system of production, it would be convenient to draw an elaborate picture of each individual bloc of production (or *filière de production*) which constitutes part of the total system.

The industrial system normally involves an uneven structure of interrelations. Although one industry maintains strong connexions with some other particular industry or industries its linkage with the rest of the system may be comparatively weak. For example the linen, cotton, wool, silk, synthetic fibres, knitted goods, clothing, and similar industries constitute a tight conglomerate; its interior may be characterized by a particularly rigid hierarchy. Such a group is in fact composed of those industries which occupy different stages of transformation within the same line of production, ranging from processing of raw materials to delivery of finished products. Thus the activity of the clothing industry is directly influenced by the demand of final consumers; the activity of the weaving industry is immediately dependent on that of the clothing industry, and these two industries directly command the activity of the spinning industry. Such a group of linearly dependent industries may be so distinguished and treated as a bloc. It may also be noted that these blocs are not completely independent of one another but are themselves subject to a degree of hierarchy (bloc-triangularity). Thus, with some caution, we shall be able to treat each bloc separately, at least for the sake of procedural convenience.

We shall gain a considerable degree of freedom as to the way to handle each bloc. First of all there will be no need to secure strict correspondence between the nomenclature of activities and of products. Furthermore a nomenclature applied to the description of the detail of one bloc does not have to be the same as that applied to the detail of another bloc, but different nomenclatures may be selected in an *ad hoc* manner in accordance with the specific features of individual blocs. Descriptions can be given in terms of physical units or of value or of both.

With the problem of nomenclature out of the way for the moment the descriptive scheme for each bloc ought to be designed so as to meet the requirements for international comparability. For that purpose each bloc would have to be analysed from a few different angles, in each case with the use of whatever nomenclature may be considered particularly suitable. Such a task may cover at least three stages:

(*a*) qualitative analysis of technical processes;

(*b*) numerical economic analysis in the greatest possible statistical detail; and

(*c*) integration of the above analysis into an over-all Leontief frame.

(a) *Qualitative technical analysis*

The principal aim is to describe the technical aspects of the transformation process at each of the stages involved in a given bloc of production. Techniques utilized at different stages may often be mutually dependent. The classifications of activities and products to be used will generally be far more detailed than those normally employed for gathering basic statistical information. Such classifications may not always permit quantitative description but would be of great interest from the point of view of intertemporal comparisons as well as international comparisons of technical coefficients.

The historical transformation of a bloc considered in a given country may be traced in terms of modifications of the nomenclatures of activities and products; the chronological series of nomenclatures applied to different periods would reveal the nature and extent of technical progress, speed of emergence of new products, tendency to lengthening or shortening of each of the processing stages, etc. It would be interesting to see through this series, for example, the cyclical movement between simplicity and complexity of production processes which characterizes technological progress: an originally simple process becoming increasingly complex to improve the qualities of products, then becoming simplified by virtue of technological innovation until the need for further qualitative improvements leads again to more complex technological devices.

The descriptive technical analysis would probably bring to light the precise pattern of dependence between the techniques used at different stages within a given bloc of production; in which case the technical coefficients pertaining to the particular bloc would have to be examined as a whole body, and comparisons of coefficients, whether intertemporal or international, would have to be made, not for an individual coefficient but for an individual bloc as a whole.

(b) *Numerical economic analysis*

Numerical economic analysis consists of analytical description of the production and consumption on the one hand and the purchases and sales on the other hand of materials and energy actually taking place among enterprises for production purposes. The description should be in quantitative terms in both physical and value units wherever possible. The nomenclatures to be used would not be very different from those used for the collection of basic statistical information and would generally be more aggregative than those required for the technical analysis.

The linkage of a given bloc with the rest of the economy would be set out in two directions: one relating to those industries consuming the products of the bloc, and the other to the products of other industries consumed by the bloc. There would thus be four types of nomenclatures involved in the analysis. First come two types of activity nomenclatures: one relating to the industries within the bloc and the other relating to consuming industries outside the bloc. Second are two types of product nomenclatures: one relating to the commodities produced within the bloc and the other to the products to be acquired from outside it and consumed inside it. Each of these nomenclatures may be chosen more freely than in the case when data for different blocs are integrated into a single table covering the whole economy.

This scheme of quantitative description should reveal two aspects: the one pertaining to production-consumption of materials and the other to deliveries-purchases between industries. Changes in input-output coefficients, when viewed in the former context, can be associated with the process of technical progress described in the preceding qualitative analysis. The same changes may also be interpreted, in the latter context, as structural changes affecting the organizational structure of enterprises in the bloc, such as tendency towards concentration, vertical or horizontal integration, etc.

(c) *Integration of the preceding analyses into an over-all Leontief frame*

The nomenclature for an over-all Leontief table will be obtained for the industries involved in each bloc studied by simple aggregation of the activities referred to in the preceding partial numerical analysis. Consistency of nomenclatures between the partial and the over-all numerical analyses will generally be secured because the different nomenclatures of numerical description are themselves dependent on those used for the gathering of basic statistical information.

This triform approach to interindustry coefficients will permit the provision of the analytical instruments necessary to put together the experience of all who are to assist in the preparation of operational plans and programmes: engineering experts, who can provide information on the characteristics of products and fabrication processes; professional managers of industries, who know from experience the organization of their industries and their specific economic problems; and national accountants, who can interpret the particular development of each industry in terms of over-all economic progress. On the one hand a close collaboration among these three categories permits the formation of realistic views on the past and current conditions of different industries in developed economies; on the other hand the data compiled in this manner may possibly serve as a source of reference programming data for planners of developing economies.

Intercountry comparisons

Now the data of various developed economies organized by such an approach will have to be studied carefully with a view to assessing their adaptability to the conditions of developing economies. Such comparative evaluation may take various forms, of which the following seem to be the most interesting:

(*a*) analysis of the relationship between the structure of final demand and the structure of a given bloc of production;

(*b*) comparison of relative prices of various materials and products;

(*c*) analysis of the organizational structure of the enterprises in the proper functioning of the bloc; and

(*d*) analysis of the structure of the machine park attached to each bloc and the technical progress connected with the machine park.

We have already noted that there exists a somewhat strict interdependence among different stages of the production process, which is set out in the form of the technical coefficients of a given bloc. These coefficients are also dependent on the conditions of demand markets, which command the development of the whole bloc. From this point of view the demand to be satisfied by the particular bloc, the characteristics of its products, and its technological structure together form the total object of study; and they have to be treated as such. Differences in quantitative and qualitative final demand between developed and developing economies are specially likely to be an important factor responsible for the dissimilarities of technical coefficients of similar blocs between different economies.

Obviously the relative prices play an important role in the choice of raw materials and fabrication processes wherever there is scope for substitution. The structure of relative prices is indeed different among developed countries and still more so between developed and developing countries. The nomenclature of products and processes to be utilized in technical qualitative analysis—and sometimes also that entering into the detailed economic analysis of blocs—will define the products for which individual market prices can be studied rather easily. It will thus become possible to investigate for each country the connexion between the price structure relevant to a particular bloc and the technological structure of that bloc. Although it may not be possible to establish strict and distinct relationships between them the information organized in this manner will no doubt provide indications useful in practice to the countries making decisions as to the creation or development of the production bloc considered.

Confrontation of the technological structure of a bloc with the organizational structure of the group of enterprises involved in it may also reveal an aspect of strategic importance. Whether the given bloc is composed of a number of small enterprises or of only a few enterprises with strong vertical integration will certainly make much difference to the alignment of technical coefficients, their values and modes of changes. The intercountry adaptability of technical coefficients cannot therefore properly be evaluated without information on the underlying organizational structure: the number and size of enterprises; the degree of concentration at different stages of the bloc; the causes, speed and modality of organizational changes; the pattern of transactions between the enterprises at different stages of the bloc, etc.

The circulation and transformation of materials—in other words, technical coefficients corresponding to the technical qualitative analysis—are in most cases tightly conditioned by the characteristics of the particular machinery and equipment involved. This connexion seems to be even closer than that between the technical coefficients and the specifications of labour, as revealed by certain comparisons between the production data of developed countries and of developing countries. It is therefore necessary to gather, for each activity classified for technical description, the information relating to the machine park by type of equipment, age structure, extent of automation, and other technical characteristics. Machine parks to be set up in a developing country tend to be different from those actually existing in a developed country; the former will generally be relatively young, although the machines may be acquired partly from used-machine markets.[1]

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[1] One might then be tempted to search for technical coefficients effective for developing countries by isolating the characteristics of new investments taking place in developed countries. For that purpose, suppose that for an advanced country the value of the same coefficient be compared at intervals of from three to five years; on the basis of some reasonable assumptions the observed changes might be imputed to the new investment undertaken during the period considered. Unfortunately such an approach would not make much sense for a number of reasons: first of all, new machinery and equipment are not usually destined to build up a new bloc rivalling an old machine park but are distributed more or less evenly over the assets of old blocs. The marginal productivity of capital could thus normally not be assimilated to the average productivity of new capital.

In elaborating a plan for a developing country the values of technical coefficients derived from the data of developed economies ought to be extrapolated with due allowance for the differences between the actual machine park of the reference countries and the one projected for the developing country. This extrapolation will have the better likelihood of being valid the better the quality of information regarding the structure of different parks and the technical progress implied in shifting from one park to another.

To sum up: the descriptive data offered by the classical Leontief table should be elaborated by means of as much detailed numerical economic analysis of various blocs of production as possible, as well as highly precise qualitative descriptions of their technological structures. A good deal of data concerning the structure of final demand, relative prices, organization of enterprises, machine parks etc. should be gathered systematically, to complete these analyses of blocs. When such studies for various important blocs of production become available from many developed countries the planners of developing countries will be in a better position to construct an image of their future economies; they will then be equipped with the means of talking usefully with the economists and engineers of developed countries specializing in various industries. The same studies moreover will equally benefit the planners of developed countries. Some of these latter appear to be tempted to shy away from the cumbersome problems of planning by orienting themselves toward the elaboration of abstract models which are seductive enough intellectually but of limited use in practice. Studies resulting from the present suggested approach might help planners of both developed and developing countries to remember the real concrete problems facing them in the organization of economic growth.

II. STRUCTURE OF THE TRANSACTIONS WITHIN THE BLOC OF TEXTILE INDUSTRIES IN FRANCE: AN ILLUSTRATION OF THE PROPOSED APPROACH[2]

An experiment has been conducted in France along the lines suggested above, referring in particular to the bloc of "primary textile materials, the textile industries, and industries of clothing and allied textile products". It was intended to provide only quick illustration of the work to be accomplished and not a complete exemplification of the proposed approach. Part of the basic information obtained by the author from personal sources moreover is considered as confidential and can be released to the public only to the extent that other countries are ready to furnish similar information.

Qualitative analysis

It seems possible without too much difficulty to set out a nomenclature of production stages, their products and their consumers, detailed enough to reveal their technological characteristics.

Figure I presents such a description relating to the man-made fibre textiles alone.[3] For the sake of clarity however it indicates the nature of the operations to be executed (carding, drawing and so on) without mentioning the various specialized machinery intervening at each stage of transformation. For example, drawing is done through several passages on roller-drafting and an additional operation on flyer-spinning when the materials are treated according to the cotton-type processing cycle, and by three operations on intersections and one passage on finisher in the combed-wool-type treatment cycle. Such a diagram could be prepared in greater detail and eventually supplemented by technological monographs relating to each industry.

Figure I reveals that the length of process varies according to whether it involves the treatment of staple fibres or that of filament yarn, the latter permitting the avoidance of a long spinning process. While this variation in the length of time taken by processing at the stage of the semi-finished product is caused particularly by the use of primary textile materials of chemical origin, a similar phenomenon occurs at the final stage as well; most knitting plants involve a shorter cycle of treatment than the weaving plants, which require special preparation of warp-yarns and pirning of weft-yarns in the case of classical weaving crafts (shuttles equipped with cylinders).

This particular figure is already simplified and does not explain how the new technologies modify the traditional technical relations. For example a weaving machine without shuttles (such as the Sulzer type) does away with the pirning operation; techniques developed parallel to those of textile processing permit the obtaining of fabrics directly from staple fibres of all types or from chemical materials in liquid form flowing out of extrusion plates. The shortened cycle of transformation has been created for products with specialized usage but which are at least partly competitive with certain classical products. Such aspects of technological progress are an indispensable part of the nomenclature needed for the analysis of technical coefficients.

In an analysis of a figure of this sort it is advisable to bear in mind that the complexity of the transformation network of a given type of fibre itself depends on historical traditions. Thus five types of man-made fibre are distinguished in France: four of them require different types of treatment in spinning and the last one in throwing. This differentiation is linked to the traditional structure of the textile industries in a country that became developed some time ago. It seems possible to

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[2] The author wishes to thank Miss Guiriec, a textile-industry specialist in the *Bureau d'informations et de prévisions économiques*, for her assistance in preparing this section. Miss Sermage, statistician in the same *Bureau*, collaborated in the elaboration of the statistical tables.

[3] The remaining part of the textile industries can also be described in similar detail, but cannot be revealed to the public so long as the "reciprocity clause" is not satisfied at the international level.

distinguish at least three stages in the history of the development of the textile industries. In the earliest days the transformation lines were organized according to types of natural fibres, each line being specialized. This juxtaposition of different lines without notable interconnexion among them lasted until the emergence of chemical textiles. Since that time interindustrial connexions have become increasingly complex, and are coupled with the development of mixing techniques. What one finds today is a huge complex of interlocking processing lines. This state however already promises to be transitory and a reverse movement appears to be taking place, aiming at the simplification of networks; this movement is due to equipment enabling the integration of several traditionally separated operations into a continuous flow, as well as the development of polyvalent inter-fibre materials.

The technological structure of the textile industries is thus undergoing relatively rapid changes. The nomenclatures for our qualitative technical analysis, if established for different time periods or for different countries, will be able to reveal the dynamic of technological structures and the technical coefficients which depend on them.

Quantitative analysis

Tables 1 and 2, compiled for the present purpose, relate only to the flows of raw and semi-finished products in the textile industry bloc. Table 1 indicates the balance in terms of tonnage between the supply and the utilization of primary textile materials and semi-finished products. Table 2 shows the balance in value terms but expresses it in the form of technical coefficients.[4] Figure II indicates a classification scheme suitable to economic analysis. The figure and the two tables include knitting mills but exclude the final stage of the apparel industries.

Obviously there is a difference between the nomenclature of the official table of the French National Accounts and that adopted in this study. The latter is much closer to the one utilized by the textile syndicates which collect the basic statistical information in this field.

The nomenclature in the official table of the French National Accounts

This nomenclature relates to the interindustry transactions table for 1958, published in 1966 by the National Printing Office. In the 77-sector table, which is the most detailed among those officially available, the textile industries are classified into five branches:

1. Natural textile fibres: this branch includes raw wool and products of its primary preparation (combed wool and chemical fibres); raw cotton, linters, cotton waste, and other natural fibres;
2. Man-made (regenerated and synthetic) primary fibres and filaments;
3. Yarns and threads: this sector includes combed and carded yarns; threads of cotton, flax and hemp; threads from schappe spinning and silk yarn; threads of regenerated and synthetic fibres; threads from jute and other hard fibres; cordage and twine; thrown yarns;
4. Fabrics and allied products: this comprises fabrics, felt and carpets of wool; fabrics of cotton, linen and hemp and articles made from them; fabrics and ribbons of silk and man-made fibres; fabrics, carpets and sacks of jute and other fibres; lace, tulle, embroideries, *point lace*, trimmings and allied cotton industry products; cotton-wool; rubberizing;
5. Products of knitting mills: knitted fabrics and articles made therefrom.

The nomenclature in this study

The nomenclature used by the Office for Economic Information and Planning (BIPE) for the analysis of textile industries can easily be aggregated into the five branches of the French National Accounts, but its level of disaggregation corresponds to the statistical information gathered by the syndicates.

1. Natural textile fibres:
   1 Wool evaluated in thoroughly washed form; virgin wool fibre, combing and spinning wastes, teasing waste;
   2 Cotton: raw cotton fibres, linters, spinning waste, teasing wastes;
   3 Flax: flax fibres called "strands";
   4 Ramie: fibres;
   5 Hemp: fibres or "strands";
   6 Sisal, manilla and other hard fibres;
   7 Jute: raw fibres and teasing wastes;
   8 Raw silk and silk waste.

In the presentation of the table, the industries at the pre-fibre stage (such as teasing, stripping, steeping and scutching) are omitted.

2. Primary materials of chemical origin:
   9 Rayon (silk type): continuous viscose filament, reinforced rayon filament, acetate and triacetate continuous filament;
   10 Rayon staple (cotton type) called "fibranne": discontinuous fibres of viscose and polynosic, acetate and triacetate, and wastes (including those of continuous rayon filament);
   11 Synthetic yarn: continuous yarn of polyamide 66 (nylon) and polyamide 11 (rilsan), continuous

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[4] Here again, information not available to the general public was involved. For that reason only the coefficient table can be shown here.

TABLE 2 : TECHNICAL CO-EFFICIENTS RELATIVE TO THE CONSUMPTION OF TEXTILE RAW MATERIALS AND SEMI-FINISHED PRODUCTS FOR OUTPUT=1,000 BY VALUE

Year: 1962 June 1966

	Spinning						*Weaving*					
	Worsted and woollen	*Cotton*	*Flax and hemp*	*Throwing*	*Thread spinning*	*Manufacture of twine and cord*	*Wool*	*Cotton*	*Linen*	*Silk*	*Manufacture of cotton wool*	*Hosiery*
Wool (tub-washed), waste, reclaimed products	117											
Cotton (fibres), linters, waste, reclaimed products	11	405									373	
Flax (fibres)			452									
Ramie												
Hemp (fibres)			3			23						
Sisal, manilla						385						
Jute and reclaimed products						3						
Raw silk and silk waste				59						9		
Regenerated cellulosic filament yarn				88			12	19		64		5
Regenerated cellulosic staple fibre	22	49	34								17	
Synthetic filament yarn				604	50			15		151		50
Synthetic staple fibre	32	23	21			12						
Materials without detailed breakdown												
Products of wool-combing	513											
Products of spinning combed wool	//////	//////	//////				371					154
carded wool	//////	//////	//////				280					19
cotton	//////	//////	//////		161		4	640	170	12		64
flax and hemp	//////	//////	//////		22	75			367			4
jute	//////	//////	//////				3	2				
schappe	//////	//////	//////							42		
Throwing				////////			48			53		59
Thread spinning					////////							
Manufacture of twine and cord						////////						
Products of wool weaving							//////	//////	//////	//////		
cotton weaving							//////	//////	//////	//////		
linen weaving							//////	//////	//////	//////		
silk weaving							//////	//////	//////	//////		
jute weaving							//////	//////	//////	//////		
Milled felt												
Manufacture of cotton wool											////////	
Needle punching												
Hosiery												////////
Output	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

polyester yarn (tergal), continuous chlorofibres (rhovyl and clorène), continuous acrylic yarn (crylor and courtelle);

12 Synthetic fibres: discontinuous fibres of polyamide 66 and 11, polyesters, chlorofibres and acrylic fibres.

3. Intermediate products and threads:

13 Wool combing (including chemical fibres);

14 Worsted spinning (including chemical fibres, combed or uncombed);

15 Woollen spinning (including uncombed chemical fibres);

16 Cotton spinning;

17 Spinning of flax and hemp;

18 Spinning of jute;

19 Schappe spinning (silk and chemical fibres);

20 Throwing: silk and rayon throwing and "bulking" or "texturing" of synthetic yarns;

21 Sewing-thread manufacture;

22 Twine and cordage.

4 and 5. Final textile products, woven, knitted and others:

23 Wool fabrics: fabrics for clothing, coverings, technical fabrics (endless sleeves for paper mills, filters, fabrics for slippers, etc.); woollen carpets.

24 Cotton fabrics: fabrics for clothes, lingerie, household linen, upholstery coverings; fabrics for technical uses (canvas covers, window blinds, belts, filters, materials for canvas shoes, fabrics for sails etc.); carpets.

25 Silk fabrics: patterned fabrics for clothes and furniture; plain fabrics for clothes, lingerie, voile and technical uses (gauze for flour mills, aeronautic fabrics, sails etc.); ribbons.

26 Flax fabrics: fabrics for clothes, household linen, upholstery, and other technical uses.

27 Jute fabrics: furniture fabrics, technical fabrics (for tailoring, upholstery etc.); sacks for packing.

28 Felts of fulled wool: for technical uses (paper mills, filters, jointing, thermic and phonic insulation etc.)

29 Quiltings: for medical and technical uses.

30 Stitch knitting: of jute principally for technical uses (insulating packaging, covering etc.).

31 Knitted goods: knitted goods of cotton, wool, artificial and synthetic fibres; stockings, socks, lingerie, undergarments, coats and other articles (layette, bathing costumes, berets, gloves etc.).

For the sake of simplicity, certain textile industries of an auxiliary nature are here grouped into one sector, together with other industrial sectors and agriculture: they are those based on non-standard technologies and often considered as secondary, such as lace, tulle, point-lace and embroidery, trimmings, narrow fabrics, elastic cloth, water-proofing etc., and also dressmaking and the like (which are excluded from the textile industries in the strict sense).

Justification of the selected year of reference

Both tables are for the year 1962, which is considered as being more normal than other years in the recent period.[5] In this year the conditions of various branches of the textile industry were representative enough of their relative position: chemical fibre production and rayon yarn were both on a strong expansionist trend, while the knitted-goods sector was growing at a moderate pace; woollen and cotton textiles remained relatively stationary and even slightly depressed. The choice of 1962 avoids the problem of temporary structural disequilibria which would otherwise have to be taken into account.

Resource balances evaluated in tons of primary materials and fabricated products (table 1)

The elaboration of accounts in physical quantities (tons) constitutes the basis of the quantitative description of the bloc. These are in fact based on the most detailed and reliable statistical information that is available for the purpose of constructing the balance of each product or industry branch. The balance of resources and uses for each product or activity involves the following relationships:

Resources = uses
Resources = production + imports
Uses = intermediate consumption by enterprises
+final consumption by households and governments
+exports
+variation of stocks.

Table 1 shows a representative structure of the textile industry of a developed country. It involves both categories of expensive fibres (wool and synthetic) and less expensive fibres (cotton and regenerated). This industry is characterized by the fabrication of elaborate products —as demonstrated by the development of the process of the "long treatment" cycle of worsted spinning for example—and the development of modern processes such as texturing of synthetic yarns throwing; it comprises various branches producing all kinds of fabrics and knitwear, in addition to specialized activities in the production of textiles for technical use (felts of fulled wool, stitch-knittings, quilting etc.).

The construction of such a table encounters certain difficulties, especially those arising from the complexity of flows of interdependence.

(i) First come the difficulties connected with the non-concordance of nomenclatures—the differences of nomenclature between trade statistics and production statistics. Another difficulty is related to the regime of temporary

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[5] The year 1963 was characterized by a very strong expansion provoked by the repatriation from Algeria of its European population and increased tax revenues, while 1964 and 1965 were affected by the crisis of overproduction which followed the 1963 expansion.

admissions. Customs statistics do not permit a distinction between thrown man-made yarns and single yarns. The temporary admissions make it difficult to grasp the nature of treated products: for example 5,000 tons of unspecified materials consumed by the throwing industry correspond partly to temporary admissions and partly to raw materials of national origin, which include spun glass twisted or coated for industrial uses.

(ii) Then there are the difficulties arising from the non-homogeneity of statistical sources. In order to arrive at a numerical balance it is often necessary to arbitrate between incoherent data. Appreciable differences often exist between the identified deliveries from a branch of industry and the identified receipts or fabrications by client industries. While some gaps may be accounted for by competitive imports there are also gaps stemming from the uneven coverage of enterprises involved in statistical inquiries; the coverage depends on the size and the degree of integration of enterprises. This necessitates the provision of a category "miscellaneous goods not specified in kind", as in the case of the material consumption of woollen spinning.

(iii) Difficulties also arise in connexion with the lack of precision of nomenclatures which cover heterogeneous products. Raw materials consumed at the stage of spinning are, despite price differences, generally homogeneous enough to permit a calculation of meaningful technical coefficients for that particular stage; but the same thing cannot be said of the materials consumed at subsequent stages. In weaving and knitting mills the input materials are highly heterogeneous because of the mixture of different fibres occurring in spinning, and factors influencing the quality and price of materials bear great significance at these stages; the quality of spun goods depends on various factors such as fineness, torsion, appearance, composition of fibres etc. It hardly makes sense to calculate the materials consumed by the clothing industry entirely in terms of tons, without due allowance for the differences in quality and costs among various kinds of fabrics. A resource balance described in tonnage, as in table 1, even though established under the most detailed nomenclature that the statistical information can afford, is not by itself capable of expressing the complexity of the real existing structures.

(iv) There are also difficulties connected with shifting in time. Another difficulty in the analysis of interindustry linkages arises from the time elapsing between the fabrication of a product, its delivery from the factory, its receipt by using sectors, and its consumption in these sectors. This factor is particularly important in the case of the textile industries, which cover a relatively wide range of activities; more than one year can elapse between the treatment of raw materials serving for the production of hosiery and the consumers' purchase of the final product. The effects of this time factor are possibly reflected in the column for stocks and adjustments in table 1, but it is extremely difficult to analyse them without sufficient information.

Table 1, showing the resources and uses of products evaluated in tons, seems to provide an analytical tool indispensable for studying the interrelations among various branches of textile industries: but it cannot be considered as any more than a means of partial analysis. A table in terms of tons can hardly be sufficient by itself to determine the technical coefficients for the many stages of transformation involved in the textile industries. The conversion of such a table into value terms thus constitutes a necessary second step.

Technical coefficients relating to textile raw materials and semi-products (table 2)

The coefficients shown in table 2 are derived from the transactions expressed in value terms. This stage of analysis too is subject to many difficulties, and the table should be considered only as an attempt of a preliminary nature.

The difficulties encountered at this stage relate to the choice of representative prices for the group of products of which each production stage is composed. This problem is in fact less serious at raw material stages, especially when raw materials are imported. But in the valuation of domestic production the heterogeneity of the products involved in a given branch prohibits the application of a nominal price relating to any single particular product. Furthermore business turnovers are seldom specified with sufficient product nomenclature; the part of the transactions not accompanied by monetary clearance is usually excluded in turnover statistics; this is typically the case of enterprises with integrated plants of woollen spinning and weaving. Thus recourse is made to an average price in order to put together different sets of information which are often incompatible: nominal prices, turnovers and export prices. In this case the average price reflects rather the structure of transactions than the actual selling price.

While the results presented in value terms in table 2 should be considered as a preliminary summary of our knowledge about the textile industries it is hoped that they will also serve as an illustration of the framework of research which has been proposed to facilitate international comparisons of interindustry relations.

To sum up: this note is intended to indicate only the first step towards making international comparisons of technical coefficients easier and more profitable. It has no other ambition than to show that this approach is feasible.

A detailed approach to the economic and technical aspects of industry would help to reveal fundamental structural data characterizing the modes of development of each industry, which can vary from country to country. The information to be derived from an international comparison under this approach would help to define the degree of technological and economic development implied in the structure of interindustry transactions of each country considered. The structural data assembled through this approach could reinforce the information contained in the conventional form of Leontief tables, which is rather too synthetic to meet the real requirements of industrial planning.

International comparisons ought to go beyond the limited frame of a study of technical coefficients. The industries of different countries should be compared with reference not only to the specific components of an individual branch of industry but also to general data characterizing each of the countries considered and the structure of internal demand. This is particularly necessary in the case of the textile industries, where products have to be well adapted to a specific demand pattern. Experience indicates that textile products indeed depend on income levels and climatic conditions as well as the social habits of individual countries.

The need for a precise knowledge of the demand structure is particularly acute in the case of the textile industries because of the rigorous linkage between the products to be fabricated and the nature of the equipment suitable to produce them. Raw materials are still highly specialized according to the fibres to be treated, and their lengths and properties, despite the effort made in the past decade to create polyvalent interfibre materials. The quality of products depends even more on the nature and the length of the transformation process involved than on the qualities of the fibres themselves. Thus synthetic yarns when "textured" become quite different from what they were previously.

In the textile industries the raw materials are valorized according to precise uses defined beforehand. This strong linkage between demand, products and fabrication techniques makes it necessary to establish a special scheme of analysis dealing with the bloc of textile industries as a whole in the context of international comparisons.

Table 1 : Balance between resources and the uses of raw materials and textile products

(In metric tons)

Year: 1962

June 1966

	Textile raw materials	Wool combing	Spinning						Throwing	Thread spinning	Manufacture of twine and cord	Weaving					Milled felt	Manufacture of cotton wool	Needle punching	Hosiery	Other sectors of activity[a]	Consumption by enterprises	Final consumption by households and Government	Exports	Stock and adjustments	Total uses
			Worsted	Woollen	Cotton	Flax and hemp	Jute	Schappe				Wool	Cotton	Linen	Silk	Jute										
Wool (tub-washed), waste, reclaimed products	////	106,000	1,100	31,200													2,500				—	140,800		34,100	+5,060	179,960
Cotton (fibres), linters, waste, reclaimed products	////			8,600	295,400													17,410				321,410		13,670	—34,560	300,520
Flax (fibres)	////					38,930																38,930		29,470		68,400
Ramie	////					760																760		50		810
Hemp (fibres)	////					280					3,310										1,810	5,400		240		5,640
Sisal, manilla	////										68,000											68,000		150	+1,340	69,490
Jute and broken products	////						83,010				570								16,000			99,580		1,140	+4,520	105,240
Raw silk and silk waste	////							60	600						240							900		90	+ 210	1,200
Regenerated cellulosic filament yarn	////								6,350			2,500	6,000		13,100					1,850	17,100	46,900		11,010	+2,630	60,540
Regenerated cellulosic staple fibre	////	8,640		13,500	27,000	1,800	500	390										560			1,420	53,810		25,520	+4,000	83,330
Synthetic filament yarn	////								16,600	600			1,750		11,600					6,500	2,870	39,320		3,750	+ 230	43,300
Synthetic staple fibre	////	8,060	4,340	3,200	4,830	400		2,200			280								2,510			25,820		4,920	— 540	30,200
Materials without detailed breakdown	////		1,580	4,370	320				5,000								430	2,320								
Products of wool-combing		////	92,300																			92,300		24,210	—1,170	115,340
Products of spinning combed wool			////	////	////	////	////	////				30,300								21,000		51,300	10,800	30,980		93,080
carded wool			////	////	////	////	////	////				46,200								5,100		51,300	200	1,640	— 10	53,130
cotton			////	////	////	////	////	////		5,700		900	225,500	8,500	2,830					24,250	12,640	280,320		15,890	+1,400	297,610
flax and hemp			////	////	////	////	////	////		900	2,840			21,060								24,800		8,610	—1,650	31,760
jute			////	////	////	////	////	////				2,800	2,120			65,550					11,320	81,790		1,200	+ 400	83,390
schappe			////	////	////	////	////	////							2,000							2,000		480		2,480
Throwing			////	////	////	////	////	////	////			4,100			4,470					8,300	6,330	23,200		4,380	+ 820	28,400
Thread-spinning										////												4,650	2,510			7,160
Manufacture of twine and cord											////											74,190		4,790		78,980
Products of wool weaving												////	////	////	////	////					52,730	52,730	23,300	9,420		85,450
cotton weaving												////	////	////	////	////					113,400	113,400	67,500	52,170	— 110	232,960
linen weaving												////	////	////	////	////					4,100	4,100	23,320	910		28,330
silk weaving												////	////	////	////	////					14,700	14,700	10,770	9,300	+ 480	35,250
jute weaving												////	////	////	////	////					52,320	52,320	6,000	5,840	+1,350	65,510
Milled felt																	////					2,830		1,570		4,400
Making of cotton wool																		////				17,060		280		17,340
Needle punching																			////		18,510	18,510				18,510
Hosiery																				////			55,040	8,930		63,970
																					////					
Consumption of textile materials		122,700	99,320	60,870	327,550	42,170	83,510	2,650	28,550	7,200	75,000	86,800	235,370	29,560	34,240	65,550	2,930	20,290	18,510	67,000						
Estimated loss of weight or volume (percentage)		8·0	6·8	13·1	9·5	26·0	5·0	6·4	0·9	0·6	0·9	9·4	5·1	4·6	6·6	3·0	27·6	16·7	0	8·2						
Output		112,880	92,570	52,903	296,510	31,210	79,320	2,480	28,300	7,160	74,300	78,620	223,480	28,210	31,970	63,560	2,120	16,910	18,510	61,500						
Imports		2,460	510	222	1,100	550	4,070	—	100	—	4,680	6,830	9,480	120	3,280	1,950	2,280	430		2,470						
TOTAL RESOURCES	948,630	115,340	93,080	53,130	297,610	31,760	83,390	2,480	28,400	7,160	78,980	85,450	232,960	28,330	35,250	65,510	4,400	17,340	18,510	63,970		1,803,130	199,440	304,710	—15,600	2,291,680

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[a] Including made-up goods.

FIGURE I: TEXTILE INDUSTRY STAGES IN THE PRODUCTION OF ARTIFICIAL FIBRES

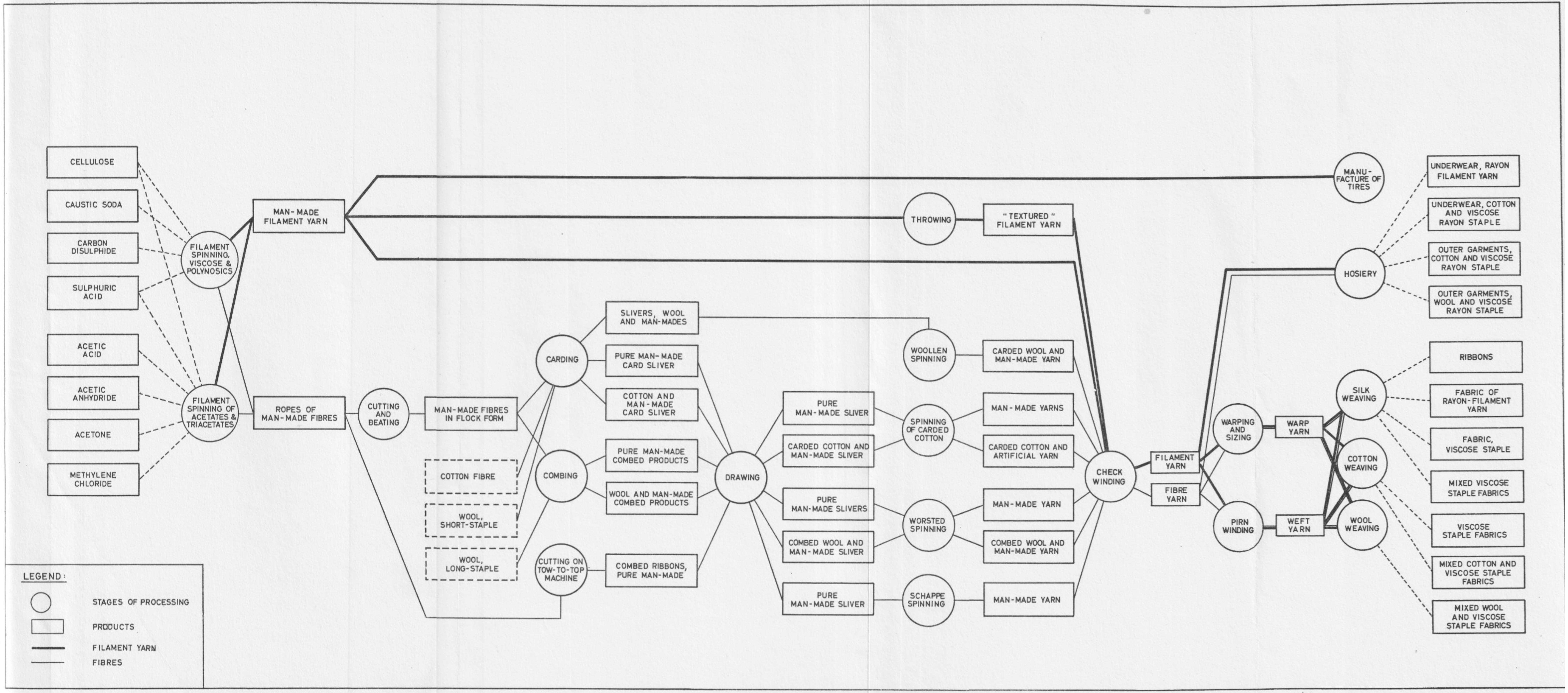
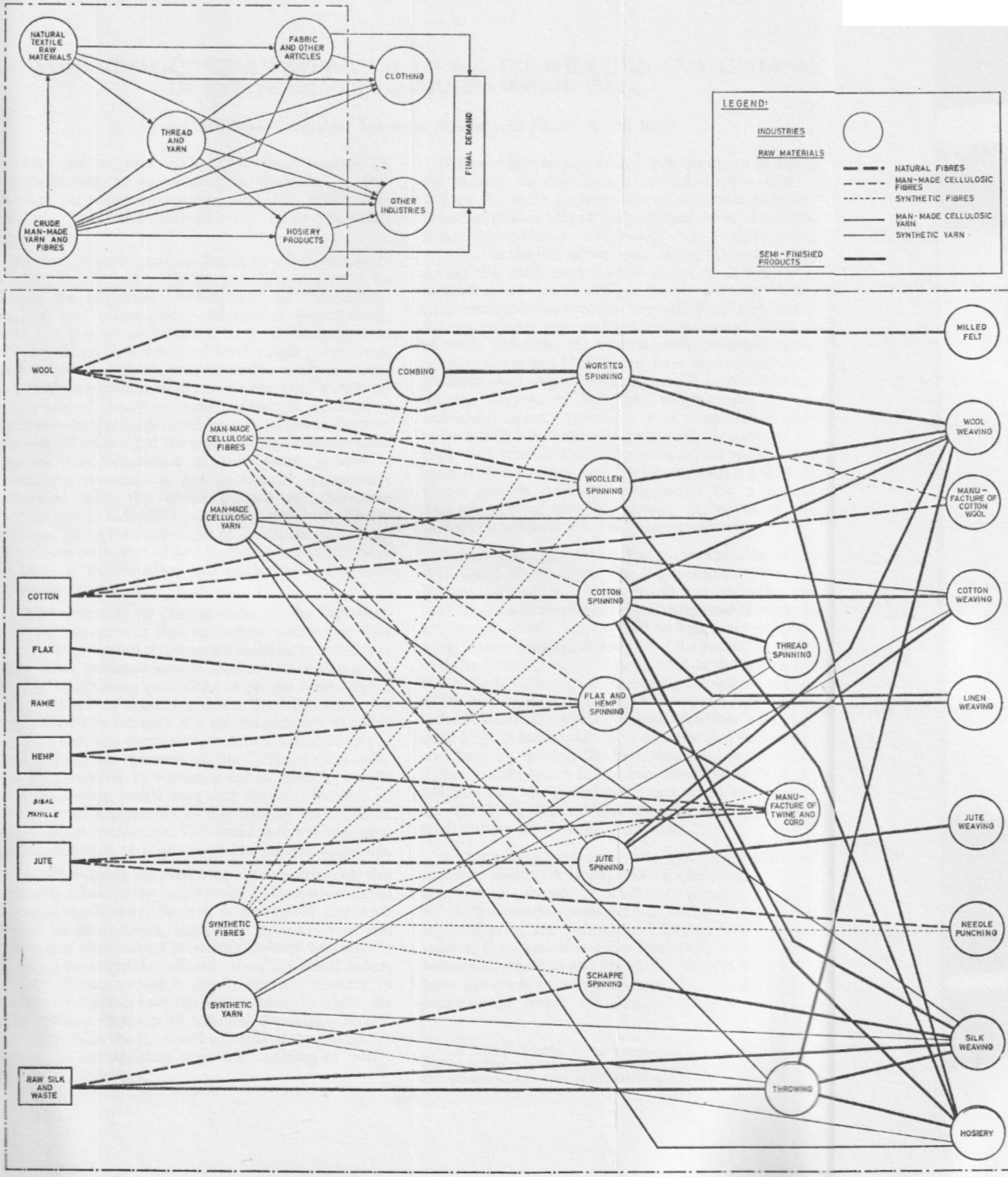


FIGURE II: EXCHANGE OF PRIMARY MATERIALS AND SEMI-FINISHED PRODUCTS IN THE TEXTILE INDUSTRY

FRENCH INPUT - OUTPUT DIAGRAM, 1959
(INSEE PUBLICATION, NATIONAL PRINTING PRESS, 1966)



AN INDUSTRIAL-COMPLEX APPROACH TO THE COMPILATION AND ANALYSIS OF INTERINDUSTRIAL PROGRAMMING DATA

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There are at least three interrelated reasons for recommending the organization of proposed research through the industrial-complex approach rather than through the single-industry or single-commodity approaches.

The major one is readily indicated by the general scope of the task assigned to the programming section of the Centre for Industrial Development, i.e. "to collect, analyse and disseminate quantitative programming data . . . that would be useful to developing countries in formulating their industrial development programmes and policies". Indeed, a comparative analysis of the technical and market relationships observed within the major sets of closely associated industrial processes in various countries helps developing countries to evaluate the over-all impact and the costs of alternative industrial policies. The formulation of development policies in developing countries is not in fact so immediately concerned with the implementation of alternative technologies in individual industries (which is the type of problem facing the final stages of operational planning) as with the evaluation of development projects expressed in terms of combinations and integrations of various industrial processes.

Another reason for placing stress on the industrial-complex approach is that up-to-date engineering data for specific industrial processes are available in abundance from either public or private sources and can be easily utilized by planning authorities or private firms, once a decision has been taken to promote the expansion or the creation of new capacity in a specific industry. It seems to be of little use therefore to assemble scattered sets of data supposedly representing the "technological standards" prevailing at a given point of time in specific industry sectors, unless such data can be processed so as to permit explanation of intercountry variations of input-output coefficients. This latter task will not easily be accomplished through the single-industry approach.

The third reason for preferring the industrial-complex approach relates to the major sources of variations in the technical coefficients. Since it is recognized that such factors as product-mix, input-mix, price structure and production scale cannot be strictly isolated with respect to actual operational conditions of an individual sector, all these factors should be jointly analysed country by country in order to investigate the extent to which the cross-country variation of technical coefficients reflects the variation in the structural patterns of the productive system, as distinguished from the variation of purely technological factors.

It should also be pointed out that the extent to which the already existing sources of information can be utilized for these purposes—especially basic statistical materials hidden behind the published form of conventional input-output tables—will be limited rather severely. In the first place, most of the tables compiled during the early experimental stages in this area of research could not be utilized for the purposes of the study because of the practical impossibility of eliminating the compilatory gaps and specification errors involved in them. Secondly, the most recently published tables relate to the period 1958–60 and have been compiled for the purpose of general macro-economic analysis and not for the purpose of industrial programming for an individual sector. Therefore, even assuming (rather optimistically) that it would be possible to assemble the basic data used in the compilation of the most recent input-output tables, it is doubtful that such a collection would provide adequate information for a correct interpretation of the intercountry variations in the technical coefficients of many industry sectors.

Recent experience obtained in the compilation of the 1959 input-output tables for the European Common Market countries has shown on the one hand that the use of a common commodity classification and of common accounting criteria helps indeed to bring into evidence some similarities and peculiarities of the general structure of the various productive systems,[1] but on the other hand that it is not sufficient for discovering the specific origins of the intercountry variations observed as to the magnitudes of technical coefficients; such variations are in fact quite large in many cases. It is doubtful that in Belgium and Italy for example the basic data used in the inter-industry compilation for certain broad areas (such as chemical and mechanical industries) would be adequate for identifying the real dissimilarities of input-output relationships between these countries.

A comparison between the two sets of accounts presented in tables 1A (Italy) and 1B (Belgium) and also between the two sets of coefficients presented in table 1C (both countries) indicates that within the particular subsections of the Belgian and Italian tables (which relate to the chemical and allied industries) the difference between the absolute and the relative importance of some input groups is by no means negligible; the intrasector consumption within the five producing sectors first

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[1] See Statistical Office of the European Communities, *Tableaux entrées-sorties pour les pays de la Communauté Economique Européenne—Annexe aux informations statistiques*, Brussels, 1964.

TABLE 1A: ITALY—INPUT-OUTPUT SUBMATRIX OF THE CHEMICAL AND ALLIED INDUSTRIES, IN THE CONTEXT OF THE 85×85 INPUT-OUTPUT TABLE FOR 1959
(*Transactions expressed in millions of lire*)

No.	*Purchasing sectors* / *Producing sectors*	*Origin of the flows*[b]	*Interindustry transactions*[a]						*Other intermediate sectors* *B*	*Total intermediate consumption* *C*	*Final demand* *D*	*Total resources* *Ep, Ei*	*Ratios*	
			39	*40*	*37*	*38*	*44*	*Total* *A*					*A:C*	*C:E*
39	Synthetic materials and artificial fibres	d i	14,094 7,411	7,138 —	2,308 7,397	43,873 14,503	— —	67,413 29,311	95,806 6,456	163,219 35,767	78,369 —	241,588 35,767	0·41 0·82	0·68 1·00
40	Other basic and final chemical products (excluding pharmaceuticals)	d i	41,195 2,029	595,347 88,094	10,694 533	4,746 292	8,181 407	660,163 91,355	477,738 23,491	1,137,901 114,846	315,960 13,572	1,453,861 128,418	0·58 0·80	0·78 0·89
37	Rubber and asbestos manufactures	d i	203 13	1,382 84	7,424 275	1,113 68	6 1	10,128 441	102,271 5,804	112,399 6,245	55,758 321	168,157 6,566	0·09 0·07	0·67 0·95
38	Plastic manufactures	d i	— —	5,246 280	— —	— —		5,246 280	66,336 1,275	71,582 1,555	43,975 874	115,557 2,429	0·07 0·18	0·62 0·64
44	Petroleum derivatives (production and distribution)	d i	7,028 327	58,719 2,297	1,016 —	295 —	52,054 255	119,112 2,879	463,683 42,110	582,795 44,989	345,018 4,764	927,813 49,753	0·20 0·06	0·63 0·90
A	*Total*	d i	62,520 9,780	667,832 90,755	21,442 8,205	50,027 14,863	60,241 663	862,062 124,266	1,205,834 79,136	2,067,896 203,402	839,080 19,531	2,906,976 222,933	0·42 0·61	0·71 0·91
B	Other intermediate sectors	d i	62,498 5,092	296,606 59,348	48,032 27,042	14,902 490	56,410 295,791	478,448 387,763	12,616,825 1,517,994	13,095,273 1,905,757	19,068,006 559,956	32,163,279 2,465,713	0·04 0·20	0·41 0·77
C	*Total intermediate consumption*	d i	125,018 14,872	964,438 150,103	69,474 35,247	64,929 15,353	116,651 296,454	1,340,510 512,029	13,822,659 1,597,130	19,163,169 2,109,159	19,907,086 579,487	35,070,255 2,688,646	0·09 0·24	0·43 0·78
	Ratios Ad:Cd	d	0·50	0·69	0·31	0·77	0·52	0·64	0·09	0·14	0·04	0·08	—	—
	Ratios Ai:Ci	i	0·66	0·60	0·23	0·97	...	0·24	0·05	0·10	0·03	0·08	—	—
D_1	Wages and salaries	d	28,448	113,538	28,342	10,067	16,916	197,311	6,203,863	6,401,174				
D_2	Social security contributions	d	10,731	48,658	8,616	4,315	5,979	78,299	1,714,243	1,792,542				
D_3 D_4	Amortizations and other revenues	d	55,623	140,305	22,056	16,192	66,676	300,852	1,471,784	1,772,636				
D	Value-added	d	94,802	302,501	59,014	30,574	89,571	576,462	15,389,890	15,966,352				
Ep_1	Production at factor cost (including intrasector consumption)	d	234,692	1,417,042	163,735	110,856	502,676	2,429,001	30,809,679	33,238,680				
Ep_2	Indirect taxes (less subsidies) on domestic products	d	6,896	36,819	4,422	4,701	425,137	477,975	1,429,850	1,907,825				
Ep	Production at ex-factory prices (including intrasector consumption)	d	241,588	1,453,861	168,157	115,557	927,813	2,906,976	32,239,529	35,146,505[c]				
Ei_1	Imports (c.i.f.) of similar products	i	30,122	110,188	5,339	1,890	37,905	185,444	2,080,503	2,265,947				
Ei_2	Indirect taxes (less subsidies) on imports of similar products	i	5,645	18,230	1,227	539	11,848	37,489	308,960	346,449				
Ei	Imports at ex-customs prices	i	35,767	128,418	6,566	2,429	49,753	222,933	2,389,463	2,612,396[c]				

Source: Statistical Office of the European Communities, Brussels, 1964.

[a] Including intrasector consumption.

[b] d = domestic ; i = imported.

[c] The row and column values of total production and total imports do not coincide: this is due to the transfer, to domestic production, of sea and air transportation services incorporated in the c.i.f. values of imported goods.

imported goods.

TABLE 1B: BELGIUM—INPUT-OUTPUT SUBMATRIX OF THE CHEMICAL AND ALLIED INDUSTRIES, IN THE CONTEXT OF THE 85×85 INPUT-OUTPUT TABLE FOR 1959
(Transactions expressed in millions of Belgian francs)

No.	Purchasing sectors / Producing sectors	Origin of the flows[b]	Interindustry transactions[a]								Final demand D	Total resources Ep, Ei	Ratios	
			39	40	37	38	44	Total A	Other intermediate sectors B	Total intermediate consumption C			A:C	C:E
39	Synthetic materials and artificial fibres	d i	370 520	20 40	— 190	170 250	— —	560 1,000	800 1,940	1,360 2,940	1,850 10	3,210 2,950	0·41 0·34	0·42 1·00
40	Other basic and final chemical products (excluding pharmaceuticals)	d i	250 280	1,010 660	50 110	— —	70 80	1,380 1,070	3,690 5,130	5,070 6,200	6,340 1,500	11,410 7,700	0·27 0·17	0·44 0·81
37	Rubber and asbestos manufactures	d i	— —	10 —	— 10	— —	— —	10 10	1,720 1,660	1,730 1,670	770 80	2,500 1,790	0·01 0·01	0·69 0·95
38	Plastic manufactures	d i	— —	— —	— —	— —	40 30	40 30	590 520	630 550	490 180	1,120 730	0·06 0·05	0·56 0·75
44	Petroleum derivatives (production and distribution)	d i	— —	180 110	20 —	— —	600 —	800 110	6,980 4,380	7,780 4,490	12,250 3,490	20,030 7,980	0·10 0·02	0·39 0·56
A	*Total*	d i	620 740	1,220 810	70 310	170 250	710 110	2,790 2,220	13,780 13,630	16,570 15,850	21,700 5,260	38,270 21,110	0·17 0·14	0·43 0·75
B	Other intermediate sectors	d i	410 310	3,680 1,710	640 480	210 10	1,090 7,320	6,030 9,830	277,080 106,910	283,110 116,740	624,280 58.210	907,390 174,950	0·02 0·08	0·31 0·67
C	*Total intermediate consumption*	d i	1,030 1,050	4,900 2,520	710 790	380 260	1,800 7,430	8,820 12,050	290,860 120,540	299,680 132,590	645,980 63,470	945,560 196,060	0·03 0·09	0·32 0·68
	Ratios Ad:Cd	d	0·60	0·25	0·10	0·45	0·39	0·32	0·04	0·06	0·03	0·04	—	—
	Ai:Ci	i	0·70	0·32	0·39	0·96	0·01	0·18	0·11	0·12	0·08	0·11	—	—
D_1	Wages and salaries	d	540	2,130	690	270	1,480	5,110	211,810	216,920				
D_2	Social security contributions	d	70	230	80	30	170	580	23,020	23,600				
D_3	Amortization	d	280	1,040	110	50	1,430	2,910	50,240	53,150				
D_4	Other revenues	d	170	320	30	70	1,670	2,260	183,520	185,780				
D	Value added	d	1,060	3,720	910	420	4,750	10,860	468,590	479,450				
Ep_1	Production at factor cost (including intrasector consumption)	d	3,140	11,140	2,410	1,060	13,980	31,730	879,990	911,720				
Ep_2	Indirect taxes (less subsidies) on domestic products	d	70	270	90	60	6,050	6,540	27,400	33,940				
Ep	Production at ex-factory prices (including intrasector consumption)	d	3,210	11,410	2,500	1,120	20,030	38,270	907,390	945,660				
Ei_1	Imports (c.i.f.) of similar products	i	2,680	7,190	1,530	600	5,420	17,420	160,120	177,540				
Ei_2	Indirect taxes (less subsidies) on imports of similar products	d	270	510	220	130	2,560	3,690	14,830	18,520				
Ei	Imports at ex-customs prices	i	2,950	7,700	1,750	730	7,980	21,110	174,950	196,060				

Source: Statistical Office of the European Communities, Brussels, 1964.
[a] Including intrasector consumption.
[b] d = domestic ; i = imported.

TABLE 1C: INPUT-OUTPUT COEFFICIENTS OF THE CHEMICAL AND ALLIED INDUSTRIES IN ITALY AND BELGIUM, 1959

Producing sectors	*Purchasing sectors*	*I = Italy B = Belgium*	*Domestic and imported inputs*				
			39	*40*	*37*	*38*	*44*
39	Synthetic materials and artificial fibres	I	·0890	·0049	·0577	·5052	—
		B	·2773	·0052	·0760	·3750	—
40	Other basic and final chemical products (excluding pharmaceuticals)	I	·1789	·4701	·0668	·0436	·0093
		B	·1464	·1464	·0640	—	·0075
37	Rubber and amiant manufactures	I	·0009	·0010	·0458	·0102	...
		B	—	·0009	·0040	—	—
38	Plastics manufactures	I	—	·0038	—	—	—
		B	—	—	—	—	·035
44	Petrol derivatives (production and distribution)	I	·0304	·0420	·0060	·0025	·0564
		B	—	·0254	·0080	—	·0299
A	*Total*	I	·2992	·5218	·1763	·5615	·0657
		B	·4237	·1779	·1520	·3750	·0409
B	Other intermediate consumption	I	·2798	·2448	·4465	·1332	·3796
		B	·2243	·4724	·4480	·1964	·4199
C	*Total intermediate consumption*	I	·5790	·7666	·6228	·6947	·4453
		B	·6480	·6503	·6000	·5714	·4608
D_1	Wages and salaries	I	·1177	·0781	·1685	·0871	·0182
		B	·1682	·1867	·2760	·2411	·0739
D_2	Social security contributions	I	·0444	·0335	·0512	·0374	·0064
		B	·0218	·0202	·0320	·0268	·0085
D_3	Amortization and other revenues	I	·2303	·0965	·1312	·1401	·0719
		B	·1402	·1191	·0560	·1071	·1548
D	Value-added	I	·3924	·2081	·3509	·2646	·0965
		B	·3302	·3260	·3640	·3750	·2372
Ep_1	Production at factor cost (including intrasector consumption)	I	·9714	·9747	·9737	·9593	·5418
		B	·9782	·9763	·9640	·9464	·6980
Ep_2	Indirect taxes (less subsidies) paid on respective products	I	·0286	·0253	·0263	·0407	·4582
		B	·0218	·0237	·0360	·0536	·3020
Ep	Production at ex-factory prices (including intra-sector consumption)	I	1·0000	1·0000	1·0000	1·0000	1·0000
		B	1·0000	1·0000	1·0000	1·0000	1·0000

Source: Tables 1A and 1B.

considered appears to be quite different in the two countries.

The difficulty in measuring and evaluating intrasector flows is one of the major factors hampering the intercountry comparison of input-output tables. Obviously the only way to eliminate this handicap is to reduce the magnitude of such flows by disaggregating as much as possible of each sectoral activity (and of its product-mix and input-mix) into the various constituent industrial processes. But it would be simply an illusion that such a a task could be achieved on the basis of the existing body of national statistics with the help of the generally vague and limited knowledge of statisticians about the complex technologies prevailing in various industrial processes.

It is worth pointing out that many of the most striking differences observed in the 1959 tables of the European Common Market countries seem to be almost inexplicable, even for the steel and energy sectors, for which fairly detailed sub-matrices were compiled in both physical and value terms.

In the light of the recent experience gained in the field of intercountry comparisons of conventional input-output tables therefore one should assume that it is about time seriously to consider the advisability of diverting part of the considerable amount of time and money consumed in the preparation of such tables to the organisation of a new data system which would permit not only an improvement in social account estimates or the elaboration of consistent sets of macro-economic projections but also the incorporation of technological information into economic model-building so as to meet present and future needs for operational planning. This suggestion (already put forward by others since 1961[2]) should receive full consideration in formulating the parameter patterns project of the CID. This would help to bridge the gap between statisticians and industrial engineers and also to improve the qualitative standards of input-output systems (at least with regard to fast-growing industries and new products arising from the most advanced technologies).

This proposal should not be interpreted as a suggestion encouraging a shift from general to partial economic analysis: on the contrary selective studies on the technological aspects of industrial development should be organized in such a way that any pool of technical data could be easily reassembled into the general framework of classical (static or dynamic) input-output analysis.

Nor does that proposal imply that the new data system should necessarily cover an entire national economy, since there are a number of sections of the productive system which are not very strongly interrelated; such sections are typically more directly linked to consumers' behavioural patterns than to technological progress, and consequently their development can be analysed by means of other analytical tools.

The proposed project of the Centre for Industrial Development may or may not be easily adaptable to the institutionalization of this new data system, for such an institutional matter should be handled through the work programme of the United Nations Statistical Office. However the proposed research of the Centre will in any event have to face many problems which could not be adequately solved without implementing, if only in a tentative and *ad hoc* manner, such a new data system.

These problems may be grouped under the following headings:

I. Delimitation of an industrial-complex area and its relationships with the rest of the economy;

II. Preparation of a detailed classification scheme for the inputs and products of an industrial-complex area;

III. Preparation of a document specifying the criteria to be followed in compiling various specific submatrices and dovetailing them into an over-all framework of the economy;

IV. Preparation of special questionnaires for collecting data not readily available from the existing stock of statistics.

Some suggestions follow as to the first three types of problems.

I. DELIMITATION OF AN INDUSTRIAL-COMPLEX AREA AND ITS RELATIONSHIPS WITH THE REST OF THE ECONOMY

It is hardly necessary to mention the difficulty of establishing the frontiers of an industrial-complex in the context of an over-all input-output model. However, since the process of vertical and horizontal integration within and between industries is so rapid in developed economies, rather broad terms of definition may be accepted in delimiting each set of closely related activities. It is evident that some common and objective criteria must be used for isolating specific industries whose technological relationships are to be analysed in detail in terms of an industrial-complex sub-matrix.

The delimitation of the five broad areas proposed by the Centre is not based on a common criterion, since only the third one (chemicals, rubber products, petroleum and coal products) covers a partial but sufficiently self-contained set of interrelated industrial processes. The fourth (paper, woodworking and non-metallic mineral products) and the final area (textiles, leather, food-processing and other miscellaneous consumer goods) seem to be too broadly defined and lacking in congruity of terms of interrelationship among their constituent productive processes.

The common origin of the basic inputs (farm products in the latter examples) can in fact be a valid delimitation criterion only if the basic inputs are so specialized (as in the case of forestry products, fibres, animal breeding etc.) that one-way processing sequences can be easily identified. It appears therefore that those last two areas have been proposed with a view to implementing the single-industry or commodity approach rather than the industrial-complex approach.

The basic criterion to be used in establishing an industrial complex should be grounded on the nature and extent of technological interdependence among various industries. It is known that such interdependence arises from the multi-uses of the product-mix of an industry, and from the complexity of technological processes within an industry.

The first aspect suggests that the production scale and product-mix of a given industry depend to a large extent on the demand levels and the technologies prevailing in many other productive sectors; the second aspect on the other hand suggests that the production scale and product-mix of other productive sectors depend on the output level and the technology prevailing in that particular sector. And it is also known that the industries producing intermediate goods in particular are strongly affected by the first type of relationship, while the second type tends to be specially important for industries producing finished goods.

This distinction however cannot be very clear-cut in the productive systems of developed countries, since many industries are closely connected in both directions. The strict definition of an industrial-complex area should therefore relate to the tightness of interrelations on both the demand and the supply sides.

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[2] See W. I. Abraham and M. Hoffenberg, *Some Problems of Standardization,* presented at the International Conference on Input-Output Techniques, Geneva, 1961.

Delimitation of an industry-complex area may be undertaken by grouping together industries characterized by such two-way interdependencies or by one-way relationships with the rest of the productive sectors. Among various possible criteria a very interesting one has been suggested in the presentation of an analogue of the 1958 United States input-output relations.[3] The most peculiar features of this multi-coloured and triangulated table are that in each cell of the 81 × 81 interindustry table are registered three types of figures, of which the first represents the absolute figure of the interindustry transaction, the second the corresponding input-output coefficient, and the third the corresponding coefficient of the inverse matrix $(I\text{-}a_{ij})^{-1}$. The cells with input coefficients greater than 1/81 are coloured for visual aid. Different colours are used to distinguish the six major areas into which the 81 productive sectors are classified: final non-metals, final metals, basic non-metals, basic metals, energy and services. The critical ratio of 1/81 = 0·0123457 corresponds to what would result if all the sectors were interrelated to an equal extent.

Although this procedure is obviously affected by the particular aggregation level involved in the United States input-output table for 1958 the method may provide a practically useful criterion for delimiting the external framework of an industrial-complex submatrix (which relates to a group of sectors whose relationships with the rest of the productive system run characteristically in a one-way direction). The same approach also suggests a criterion which might be used for delimiting an industrial-complex area covering the most relevant two-way relationships within a given set of closely associated activities. It would be preferable however to use different

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[3] See W. W. Leontief, "The Structure of the U.S. Economy", in *Scientific American*, April, 1965.

TABLE 2. POSSIBLE DELIMITATION OF THE INDUSTRIAL-COMPLEX AREA FOR THE CHEMICAL AND ALLIED INDUSTRIES IN THE CONTEXT OF THE ITALIAN PRODUCTIVE SYSTEM

(Sectorial standard ratios of total requirement of domestic inputs and actual net input-output coefficients)

(Sectorial standard ratios of total supply and actual distribution of respective net production)

	Purchasing industries *Producing industries*	1 (1:25=.0400)	2 (1:24=.0417)	3 (1:46=.0217)	4 (1:26=.0385)	5 (1:28=.0357)	*Total*
1	*Petroleum derivatives* (1:63=.0159)	*(a)*	.0309 .0080	.0684 .0670	.0025 .0003	.0063 .0012	.0765
2	*Synthetic materials and artificial fibres* (1:13=.0769)	– –	*(a)*	.0083 .0314	.3797 .1929	.0144 .0101	.2344
3	*Basic and final chemicals (excluding pharmaceuticals)* (1:65=.0154)	.0093 .0095	.1811 .0480	*(a)*	.0411 .0055	.0665 .0125	.0755
4	*Plastic manufactures* (1:32=.0313)	– –	– –	.0061 .0454	–	– –	.0454
5	*Rubber manufactures* (1:63=.0159)	... ...	.0009 .0013	.0016 .0086	.0096 .0069	*(a)*	.0168
	Total	.0093	.2129	.0844	.4329	.0872	

Source: The 1959 input-output table, published by the Statistical Office of the European Communities.

(a)–Intraconsumption to be accounted, whenever possible.

critical ratios for different sectors; this differentiation may be made according to the number of effective interindustry transactions originated (on both demand and supply sides) by the production level of each sector, and thus the delimitation brings into evidence only those interindustry transactions which imply higher ratios than the critical ones, computed for columns and rows respectively. Suppose for instance that in an 81 × 81 input-output table the number of effective transactions between a given sector and other productive sectors was 20 along the column and 50 along the row (this sort of situation occurs typically for an intermediate sector): then the critical column and row ratio for this sector would be 0·50 (1:20), and 0·020 (1:50) respectively.

The meaning of such sectorally diversified ratios may be less abstract than that of the single over-all critical ratio, since they imply an identical degree of interdependence only between a given sector and the part of the remaining sectors with which it does in fact have transactions. The deviations from such sectoral ratios of the actual column and row distributions of the transactions of individual industries of which the sector is composed would provide an objective measure of the degree of concentration involved in the input and the market structure of the sector.

This criterion is applied tentatively to the table for 1959 of input-output in Italy, to define an industrial-complex area associated with the chemical industries. As can be seen in table 2 the input coefficients and the row distribution coefficients of the five industries considered (both net of intrasector consumption) are registered in the upper and the lower section in each cell respectively, and only the triangles containing coefficients higher than the corresponding critical row and column ratios (as above defined) are shadowed.

This device brings into evidence the fact that in the Italian productive system the industrial-complex area of the chemical industry is rather broad, covering practically all the five sectors considered. The following characteristics may be noted in particular:

(*a*) Transactions between the chemical industry and the synthetic materials and artificial fibres industry greatly exceed the magnitude represented by the respective critical column and row ratios;

(*b*) transactions between the petroleum derivatives industry and the basic and final chemicals industry and (obviously) those between the synthetic materials industry and the manufactures of plastics are also of great significance in relation to the critical ratios; and

(*c*) significant one-way relationships exist however between rubber manufactures and the chemical industry and also between the plastics manufactures and the chemical industry.

The delimitation of this five-sector complex would be better warranted if one had started with a further disaggregation of these sectors, and had investigated first the most tightly packed sub-area composed by the chemical and synthetic materials industries alone.

In an analysis of industrial complexes it is evident that attention cannot be confined to the interrelationships within the selected area, since its relationships with other productive sectors should be carefully investigated from a technological viewpoint in order to make sure that such relationships run, if approximately, only in a one-way direction.

The less restrictive criterion used by Professor Leontief in his presentation of the 1958 input-output table for the United States as applied to the same Italian table, are presented in table 3. Here, in addition to the cells of the submatrix relating to the five chemical and related industries, a cross is registered also in those cells for transactions of these industries with other supplying and purchasing sectors whose relative magnitudes exceed the over-all critical ratio: 1:65 = 0·015384 (66 being the order of the Italian input-output table and 65 the maximum number of transactions of each sector, when intra-sector consumption is excluded). This table can thus be considered as indicating the minimum desirable level of disaggregation which should be used in designing a general framework for the analysis of the industrial complex area considered in this example.

II. CLASSIFICATION OF INPUTS AND OUTPUTS FOR THE INDUSTRIAL-COMPLEX ANALYSIS

Another major problem concerns the desirable degree of disaggregation to be adopted in describing and analysing the input-mix and the output-mix of the sectors covered by an industrial-complex area. This problem of classification ought to be tackled simultaneously for all the areas of the productive system to be studied in terms of industrial complexes.

Preliminary investigations should therefore be made not only on the spread of technological and market relationships and the degree of specialization to be involved in each industrial-complex sub-matrix but also on the practical possibility of integrating various sets of detailed information into the general framework of a classical input-output model without incurring serious gaps or inconsistencies in the process of rearranging various submatrices.

The use of transformation matrices would indeed permit the consolidation of a commodity-flow table into an interindustry matrix in an almost mechanical manner.[4] The problem is however much more complicated than it appears at first sight because more than one different approach would have to be followed in investigating the technical relationships within each industrial-complex area. For many industries the within- and between-industry relationships can be investigated on a commodity-basis, both for the input and the output sides of transactions. For certain industries however only the process-approach can shed light on technological relationships. In some industries the changes in product-

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[4] See University of Cambridge Department of Applied Economics, "A Social Accounting Matrix for 1960", *A Programme for Growth* (Chapman and Hall, London, 1962).

TABLE 3: ITALY—MAJOR WITHIN AND BETWEEN-INDUSTRY

(Domestic flows only, net

Purchasing sectors / *Producing sectors*		*Industrial complex area*																
		Petroleum derivatives	*Synthetic materials and artificial fibres*	*Basic and final chemicals (excluding pharmaceuticals)*	*Plastics manufactures*	*Rubber manufactures*	*Fats and oils*	*Textiles*	*Lumber*	*Paper and paperboard*	*Non-metallic minerals*	*Non-ferrous metals*	*Motor car repairs*	*Electricity*	*Agriculture and forestry*	*Solid fuels*	*Iron ores*	*Other metallic ores*
	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Petroleum derivatives	1	X		X			X			X	X		X	X				
Synthetic materials, artificial fibres	2	—	X		X			X										
Basic and final chemicals (excluding pharmaceuticals)	3		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
Plastics manufactures	4	—		X	—	—			X									
Rubber manufactures	5												X					
TOTAL	1–5	X	X	X	X	X												
Fats and oils	6			X														
Textiles	7				X	X												
Lumber	8				X													
Paper and paperboard	9		X															
Non-metallic minerals	10			X														
Non-ferrous metals	11			X														
Motor-car repairs	12			X														
Electricity	13		X	X		X												
Road transportation	36			X														
Commerce	39		X															
Manufactured gas	41		X	X														
Credit and insurance services	42			X														

Note: Between-industry relationships out of the industrial-complex coefficients of purchasing sectors are above the general standard ratio

mix are in fact so closely related to changes in input-mix that technologies are far from being constant, even at the individual plant level.

It is possible to distinguish three cases in any attempt to solve the classification problems to be faced in the setting up of an industrial-complex submatrix.

(*a*) The simplest case refers to those industries where fixed proportions of given basic inputs are required per unit of a given product (this is likely to be the case for some chemical products such as fertilizers, and for many mechanical products).

(*b*) A less simple case relates to those industries where fixed proportions of alternative basic inputs may be used per unit of a given product (for instance, in the production of synthetic materials).

(*c*) The most complex case occurs in those industries where alternative basic inputs may be used in varying proportions per unit of a given product: a typical example is offered by petroleum products derived from crude oils of different qualities and/or from different types of processing.

For the first case a detailed analysis of product-mix may be sufficient to determine the consumption of relevant basic inputs. In the second, detailed information on both product-mix and input-mix should be available for investigating intercountry variations in production technologies. Finally, in the most complex cases the joint variation of input-mix and product-mix may make it practically impossible to find any stable pattern of technological relationships.

Thus for the first two types of industry groups it would

RELATIONSHIPS OF THE CHEMICAL AND ALLIED INDUSTRIES

of intrasector consumption)

The rest of the productive system																							
Non-metallic minerals (for construction)	*Fishing*	*Beverages*	*Sugar*	*Preserved food*	*Leather*	*Footwear repairs*	*Printing, editing*	*Non-metallic mineral works*	*Glass and glassware*	*Foundry*	*Farm machinery*	*Electrical machinery and equipment*	*Motor cars*	*Miscellaneous manufactures*	*Pharmaceuticals*	*Residential construction*	*Public works*	*Road transportation*	*Sea transportation*	*Auxiliary transportation services*	*Commerce*	*Services not elsewhere specified*	*All other sectors*
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	......
X	X	X	X	X				X	X				X				X	X	X	X	X	X	
														X									
X		X			X		X	X	X	X				X	X	X						X	
					X							X		X			X						
						X					X		X					X					

area are registered (X) only if the net input-output 1:65 =0·015384.

be comparatively easy to set up (with the help of industrial engineers) an appropriate and detailed classification for inputs and outputs, and to quantify in physical terms the corresponding technical relationships. For the third type however classification may possibly be limited to the major categories of basic inputs and end-products, without attempting to specify the various semi-finished products and by-products circulating within the various industrial processes operated with a given equipment-mix.

Tables 4A, 4B and 5 attempt, with the assistance of an industrial engineer, to set up:

(*a*) a two-way classification scheme in the Italian language for the major basic inputs and the principal uses of the major products of the synthetic materials industry in Italy and

(*b*) a (simplified) two-way classification scheme indicating the sequences of intraindustry consumption of the intermediate products of the petroleum derivatives industry (this scheme is reproduced only to point out the difficulty of quantifying all the cells marked by a cross).

III. COMPILATION SCHEME FOR AN INDUSTRIAL-COMPLEX SUB-MATRIX

The size and form of an industrial-complex submatrix will obviously depend on the degree of specification adopted for recording the within- and between-industry relationships of the selected areas. It can be anticipated however that either the central section of a submatrix or the general framework into which it should be fitted will be in most cases in a rectangular rather than a square form.

The type of data needed for compiling various submatrices will also vary with the type of industries concerned and the degree of specification applied to relevant flows. While both quantitative and value data may be obtained (through a careful preparation of *ad hoc* questionnaires) for most of the purchased inputs and of the intermediate products delivered to other sectors, it is too much to expect (unless some arbitrary cost imputation criteria are employed) that value data can also be obtained for intraindustry consumption flows for each of the industries covered by an industrial-complex area. Research may here be limited to the collection of quantitative data, or of the corresponding engineering coefficients, from which might be derived intraindustry consumption flows among specific processes.

As regards secondary and by-products it seems advisable to employ the "fictitious sales" approach, and to abandon the ordinary procedure of input-output compilation, in which secondary products and by-products are separated from the output of the industry where they originate or are treated as negative inputs of the industry concerned.

Among many other problems arising in the compilation of a specific submatrix (which will have to be carefully examined case by case) only the very general ones can be considered at this quite preliminary stage of investigation: such problems relate to: (*a*) treatment of imported inputs; (*b*) treatment of transportation costs; (*c*) treatment of indirect taxation; (*d*) price levels of individual and aggregate flows.

These problems might be treated in the following manner.

(*a*) Imported inputs might be separately registered

TABLE 4A: ITALY—BASIC INPUTS OF PRINCIPAL PLASTIC MATERIALS

Outputs / *Basic inputs*	*Polveri fenoliche da stampaggio*	*Resine fenoliche per laminati*	*Polveri ureiche da stampaggio*	*Polveri melaminiche da stampaggio*	*Resine melaminiche per laminati*	*Resine poliestere*	*Altre*	*Policloruro di vinimile e polimeri*	*Poliolefine*	*Polistirolo*	*Resine metacriliche*	*Resine poliammidiche*	*Acetato e aceto butirrato di cellulosa*	*Altre*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
Basic chemicals														
Acetato di vinile								X						
Acido acetico													(X)	
„ adipico						(X)						(X)		
„ butirrico													(X)	
„ fumatico						(X)								
„ maleico						(X)								
„ metacrilico											X			
„ solforico													X	
„ tereftalico						(X)								
Cuprolottame												(X)		
Cloruro di vinile								X						
Esametilendiammina												X		
Etilene									X					
Fenolo	X	X												
Formaldeide	X	X	X	X	X									
Glicole etilenico						(X)								
„ propilenico						(X)								
Gomma sintetica										X				
Melamina				X	X									
Propilene									X					
Stirolo										X				
Urea			X											
Cellulosa													X	
Altri prod. chim.	X	X	X	X	X	(X)	X	X	X	X	X	X	X	
Other basic inputs (for the utilization of plastic materials)														
Glass fibres						X					X			
Paper waste, rags, mineral powder, etc.	X		X	X		X	X	X	X	X		X	X	X
Other	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: The symbol X indicates significant entries; the symbol (X) indicates possible alternative combinations of basic chemical inputs.

(so far as possible in both quantitative and value terms) in each cell of the column vectors, at least in the central section of an industrial complex sub-matrix.

(*b*) All transportation costs, including those relating to the use of own-transportation means, imputable to the actual consumption of all inputs might be consolidated and accounted for at the bottom of the column vectors relating to the industries covered by each industrial-complex area.

(*c*) The same treatment could be given to indirect taxes and to trade margins paid by the industries covered by the industrial-complex area for their purchased or self-produced inputs; total production of an industry (net, or gross, of intraindustry consumption) should thus be evaluated at factor costs.

TABLE 4B: ITALY, 1961—PERCENTAGE DISTRIBUTION OF PLASTIC MATERIALS CONSUMED IN THE MAJOR USING SECTORS
(*Sectors are ranked according to the percentage distribution of total plastics consumption in 1961*)

Plastic Materials	Using sectors	*Packing materials*	*Electrical, and telecommunications equipment*	*Construction*	*Miscellaneous manufactures*	*Furniture*	*Household utensils*	*Radio, T.V. and household electrical equipment*	*Hygienic and sanitary equipment*	*Transportation means*	*Toys*	*Table cloth, footwear and apparel*	*Agriculture (tubes)*	*Machinery and precision instruments*	*Paper products, glassware, paints, inks, etc.*	*Other chemicals*	*Other sectors*
	Resine termo-indurenti	5·3	25·9	21·9	6·1	55·3	3·5	16·1	91·9	35·1	0·5	62·5	—	23·0	16·1	6·2	—
1	Polveri fenoliche da stampaggio	1·9	19·7		3·6	4·2	0·8	12·3	63·3	9·9	0·5			17·1	13·0		
2	Resine fenoliche per laminati.					25·4											
3	Polveri ureiche da stampaggio	3·3	5·6		2·5	2·1	2·7	3·2	28·6	2·3		35·4		5·9	3·1		
4	Polveri melamminiche da stampaggio					0·6		0·4		0·1							
5	Resine melamminiche per laminati		0·4			22·9											
6	Resine poliestere	0·1	0·2	21·9		0·1		0·2		22·8		27·1				6·2	
	Resine termo-plastiche	8·71	73·7	78·1	74·5	41·3	92·9	83·2	8·1	62·9	99·2	32·5	100·0	60·0	46·4	92·4	95·8
8	Policlorure di vinile	11·5	59·3	77·5	28·8	38·5	1·8	14·7	—	30·3	15·4	27·1	90·5	32·5	23·8	83·4	70·1
9	Poliolefine	61·2	9·4	0·6	33·4	1·0	76·1	9·8	5·3	5·9	34·5	4·0	9·5	17·4	6·6	6·9	18·3
10	Polistirolo	14·4	2·3		12·3	1·8	15·0	51·4	2·8	9·6	49·3	1·4		10·1	16·0	2·1	7·4
11	Resine metacriliche		1·3					2·0		13·5							
12	Resine poliammidiche		1·2					4·0		1·1							
13	Acetato e aceto butirrato per cellulosa		0·2					1·3		2·5							
7, 14	*Altre*	7·6	0·4	—	19·4	3·4	3·6	0·7	—	2·0	0·3	5·0	—	17·0	37·5	1·4	4·2
	Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
	Percentage distribution of total plastics consumption	15·0	13·4	11·4	7·5	7·2	6·8	6·1	5·1	4·1	3·8	3·5	1·6	1·4	1·4	1·3	10·4

TABLE 5: ITALY—A SIMPLIFIED SCHEME OF THE INPUT-OUTPUT RELATIONSHIPS WITHIN THE PETROLEUM-DERIVATIVES INDUSTRY

	Products	*Processes*	*1* *Desalter*	*2* *Atmospheric distillation (topping)*	*3* *Vacuum distillation*	*4* *Thermal and catalytic reforming*	*5* *Thermal and catalytic cracking*	*6* *Vis-breaking*	*7* *Coking*	*8* *Desulphurization*	*9* *Merox*	*10* *Aromatic extraction*	*11* *Refinery gases*	*12* *Alkylation*	*13* *Lube oil processing*	*14* *Liquified petroleum gas blending*	*15* *Gasolines blending*	*16* *Petroleum, diesel and fuel oil blending*	*17* *Steam electricity production*	*18* *Other basic utilities*	*The rest of the economy*
	Exogenous basic inputs	Crude oils	X	X					X												
		Natural gasolines				X											X				
		Ethyl fluid															X				
		Other additives															X	X			
1	*Desalter*	Desalted oil		X					X												
2	*Atmospheric distillation (topping)*	Gas											X								
		Gasolines				X					X	X					X				
		Kerosene								X								X			
		Medium oils					X			X								X			
		Residuum			X		X	X	X									X			
3	*Vacuum distillation*	Fuel oil																X			
		Lubricant oil													X						X
		Asphalt																			X
4	*Thermal and catalytic reforming*	Gas											X								
		Reformed gasolines										X					X				
5	*Thermal and catalytic cracking*	Gas											X								
		Cracked gasolines									X						X				
		Cracked oils																X			
6	*Vis-breaking*	Gas											X								
		Gasolines									X						X				
		Lower viscosity oils																X			
7	*Coking*	Gas											X								
		Gasoline															X				
		Coke																	X		X
8	*Desulphurization*	Gas											X								
		Desulphurized products					X											X			
9	*Merox*	Liquified petroleum gas														X					
		Gasolines				X											X				
10	*Aromatic extraction*	Benzene																			X
		Toluene																			X
		Xylenes																			X
		Aromatic gasolines															X				
11	*Refinery gases*	Hydrogen				X				X											X
		Fuel gas		X	X	X	X	X	X	X	X								X		X
		Liquified petroleum gas												X							X
		Pentane														X	X				
12	*Alkylation*	Gas											X								
		Alkylated gasolines															X				
13	*Lube oil processing*	Lube oils																			X
		Waxes																			X
		Heavy aromatics																X			
14	*Liquified petroleum gas blending*	Liquified petroleum gas															X				X
15	*Gasoline blending*	Aviation gasoline																			X
		Premium motor fuel																			X
		Regular motor fuel																			X
16	*Petroleum, diesel, fuel oil blending*	Jet fuels																			X
		Petroleum																			X
		Diesel																			X
		Fuel oil		X	X	X	X	X	X	X		X							X		X
17	*Steam and electricity production*	Steam	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X
		Electricity (self-production)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
18	*Other basic utilities*		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
	Other exogenous inputs		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

THE HIERARCHICAL STRUCTURE OF INTERINDUSTRIAL TRANSACTIONS

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Simple models of the production structure often show a strictly hierarchical order of the producing sectors. The flow of goods begins with a sector where raw material is produced; it is followed by a sector of manufacturing, and the last stage produces the final goods for consumption or investment.

Input-output models of the economic structure are much more complicated. There exists a multiplicity of transactions among numerous sectors, for practically every sector delivers to and receives from every sector. The idea of a hierarchical order does not seem to have any chance of application in such a model. But if we accept some plausible definitions we are able to bring the sectors even of an enlarged input-output model into a well defined hierarchical order.

This order is the result of the triangulation of a transactions matrix. Triangulation itself means to arrange the sectors in such a way that the sum of all transactions on one side of the main diagonal of the transactions matrix is maximized and the sum of the transactions on the other side is minimized.

What is the purpose of ascertaining the sector hierarchy by triangulation? First of all we want to know the peculiar structural properties of the interindustrial transactions: the mutual dependence or independence of the single sectors and groups.[1] By the triangulation of transactions matrices we find in fact that transactions flow mainly in one direction; mutual transactions are relatively weak. In other words interindustrial transactions show a strong linearity instead of an expected circularity.

The triangulation of transactions matrices provides a basis for the definition of some ratios which are useful for intercountry comparisons. One such ratio is the "degree of linearity", which has the same value in all industrial countries.

Another purpose of triangulation is to facilitate the delimitation of transaction blocs. Such a bloc is characterized by the specially high degree of linearity of the transactions between the sectors which form it.

The characteristics of interindustrial transactions revealed by triangulation may also be useful in actual planning, especially while plans are in their experimental stage. It is easier to estimate the effects of a planned activity when one realizes that a relatively strong one-way interdependence exists among sectors.

The hierarchy of industries is also of great importance in dynamic problems. The static solution of an open Leontief-model gives only the values of production which are compatible with a certain final demand vector; but, if we examine a process of expansion with structural changes of the final demand vector—as in the case of developing economies—we have to explain how the expansion of the single sectors would progress period by period. Some sectors must initiate the structural change and others have to follow suit in order to avoid idle production capacities.

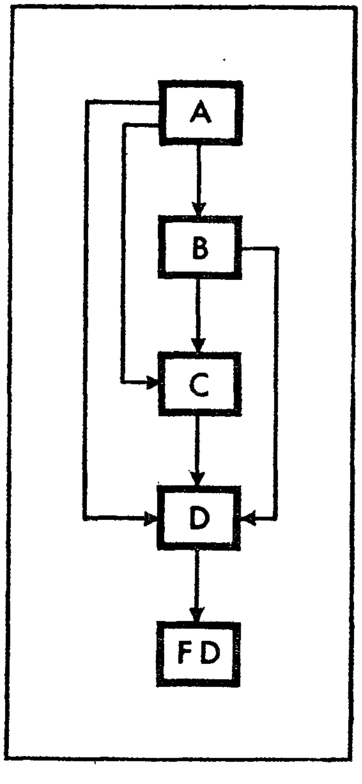
This article gives (I) a short description of the method of triangulation, and (II) defines some useful measures for structural analysis. The basic findings of empirical research work are then presented (III), and conclusions are drawn for further investigations and applications (IV).

I. Method of triangulation

(a) *Basic ideas*

If sectors of an economy did not contain any mutual transaction relations—like those shown in figure I—the triangulation would not cause any difficulty and the

Figure I.



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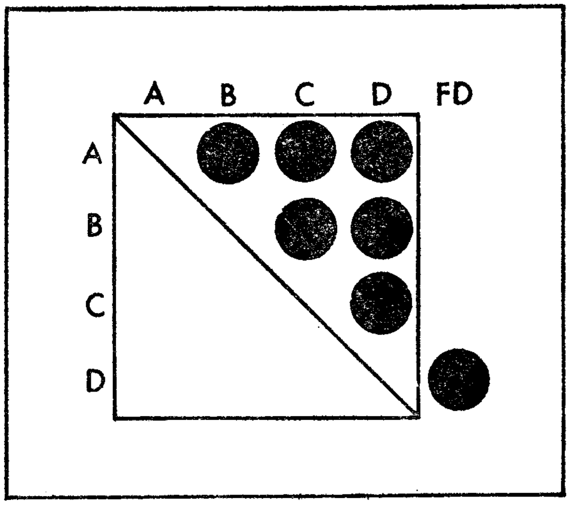
[1] See W. Leontief, *Input-output Economics* (New York, Oxford University Press, 1966), p. 48.

triangulated transactions matrix of that flow diagram would be as shown in figure II. The matrix is perfectly triangular and there exists only one direction of flows. Because there is no mutual or circular flow one can speak of a strict linearity of the production structure.

FIGURE II.



Empirical transactions matrices contain mutual deliveries between sectors, even if in a relatively weak measure. From this single fact arises the difficulty of triangulation. The basic criterion for triangulation thus consists in assigning an appropriate directional weight to mutual flows between sectors.

H. Aujac suggests a criterion of "better customer".[2] According to this criterion sector A is considered a better customer than sector B if the delivery from A to B (X_{AB}) in relation to the total output of A (X_A) is smaller than the delivery from B to A (X_{BA}) in relation to the total output of B (X_B) :

$$\frac{X_{AB}}{X_A} < \frac{X_{BA}}{X_B} \rightarrow \text{"}A\text{ is a better customer than }B\text{".} \quad (1)$$

In figure II the sectors below or on the right-hand side of a given sector are all better customers of this sector. The better customer criterion in this case would permit triangulation of the transactions matrix.

As both Aujac[3] and Masson[4] point out, the better customer criterion is not sufficient to triangulate actual interindustrial matrices: further aspects must be taken into consideration.

Chenery and Watanabe[5] suggest starting the triangulation with a provisional arrangement of sectors. Sectors at relatively primary stages will generally show a relatively small share of inputs from other sectors and of outputs to final demand. Final stage sectors on the other hand will have a large share of inputs from other industries and of final demand output. Arranging sectors according to these shares is only the first step. Chenery and Watanabe suggest that a further arrangement of sectors should then be made so as to maximize the sum of entries on one side of the transactions matrix. But they give no further explanation as to how to do this.

In a recently published article Simpson and Tsukui[6] triangulate transactions matrices directly by maximizing the sum of transactions under the principal diagonal. This is the procedure that has been described in detail elsewhere by the present author.[7]

The maximization of a sum of flows is the consequence of a criterion for arranging single sectors and groups. Let us consider two sectors, A and B, which deliver to each other. In general the two flows have different amounts

$$X_{AB} \neq X_{BA}. \quad (2)$$

All we need to do is to accept the definition that the sector making the larger amount of delivery should be taken as the primary-stage sector relative to the other sector. From this principle follows the triangulation of the transactions matrix by maximization of the flow sum above (or below) the principal diagonal.

If $X_{AB} > X_{BA}$ we regard A as being at a primary stage relative to B. This means that B on the output side of A is more important than on the input side, and vice versa that A is more important on the input side of B than on the output side. We can say that A with respect to B plays the role of a relative supplying sector, and that B with respect to A plays the role of a relative demanding sector. The underlying criterion can be called the relative supplying-demanding criterion.

By accepting this criterion we can use it for the arrangement not only of single sectors but also of groups of sectors. If we arrange single sectors and all possible groups according to the relative supplying-demanding criterion in such a way that we allocate relative primary-stage sectors and sector groups above or on the left-hand side of the corresponding demanding sectors and sector groups we automatically maximize the sum of the transactions above the principal diagonal.

If empirical transactions matrices have certain properties which in all practical cases can be taken as

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[2] H. Aujac, "La hiérarchie des industries dans un tableau des échanges interindustriels et ses conséquences sur la mise en oeuvre d'un plan national décentralisé", in *Revue économique*, Vol. 11, no. 2, 1960, pp. 169–238.

[3] *Op. cit.*

[4] D. Masson, "Méthode de triangulation du tableau européen des échanges interindustriels", in *Revue économique*, vol. 11, no. 2, 1960, pp. 239–265.

[5] H. B. Chenery and T. Watenabe, "International Comparisons of the Structure of Production", in *Econometrica*, vol. 26, 1958, pp. 487–521.

[6] D. Simpson and J. Tsukui, "The Fundamental Structure of Input-Output Tables: An International Comparison", in *Review of Economics and Statistics*, vol. 47, 1965, pp. 434–446.

[7] E. Helmstädter, "Produktionsstruktur und Wachstum", in *Jahrbücher für Nationalökonomie und Statistik*, vol. 169, 1957, pp. 173–212 and 427–449; "Die geordnete Input-Output-Struktur", in *Jahrbücher für Nationalökonomie und Statistik*, vol. 174, 1962 in pp. 322–361; and "Die Dreiecksform der Input-Output-Matrix und ihre möglichen Wandlungen im Wachstumsprozess", in F. Neumark (ed.), *Strukturwandlungen einer wachsenden Wirtschaft, Schriften des Vereins für Sozialpolitik* NF 30/II, Berlin 1964, pp. 1005–1063.

given there exists only one arrangement of the sectors which maximizes the sum of the above diagonal entries. This well-defined arrangement forms the sectoral hierarchy.

(b) *Mathematical formulation*

Let X be a square matrix of order n with the following elements:

$$X_{ik} \geq 0 \quad ; \quad i, k = 1, 2, \dots, n \quad . \tag{3}$$

The n rows and columns of X are fixed by ordinal numbers[8] ($i.$=1., 2., . . ., $n.$) beginning at the left end of the main diagonal of X. Instead of speaking of the $i.$ row or column we speak of the $i.$ stage. The task of triangulation is to arrange the staging of sectors in such a way that the sum of the above-diagonal entries is maximized:

$$\sum_{\substack{i=1 \\ k>i}}^{(n-1)} X_{i.k.} = \max \quad . \tag{4}$$

The same arrangement minimizes the sum of the below-diagonal entries and maximizes the sum of the above-diagonal entries in the difference matrix Δ. We denote the elements of this matrix as follows:

$$d_{i.k.} = X_{i.k.} - X_{k.i.} \quad . \tag{5}$$

Then the arrangement is intended to give

$$\sum_{\substack{i=1 \\ k>i}}^{(n-1)} d_{i.k.} = \max \quad . \tag{6}$$

The staging of sectors has to be done in a systematic way. Our first step consists in satisfying the following conditions:

$$\sum_{k=(i+1)}^{m} d_{i.k.} > 0 \quad ; \quad m = (i+1), \dots, n \quad ; \tag{7}$$

$$\sum_{k=m}^{(i-1)} d_{k.i.} > 0 \quad ; \quad m = 1, \dots, (i-1) \quad . \tag{8}$$

Inequality (7) states that all the row sub-sums in the difference matrix △, which can be obtained from the diagonal to the right, have to be positive; (8) concerns the column sub-sums to be obtained from the diagonal upwards. They also must be positive.

If (7) or (8) is not satisfied we can always rearrange the sectors. Given a contradiction to (7):

$$\sum_{k=(i+1)}^{m} d_{i.k.} = -c < 0 \quad ,$$

because of the skew symmetry of the difference matrix Δ we have:

$$\sum_{k=(i+1)}^{m} d_{k.i.} = c > 0 \quad .$$

Let sector A be at the $i.$ stage. If we move this sector to the $m.$ stage and move the sectors which were at stages from $(i+1).$ to $m.$ to stages from $i.$ to $(m-1).$, then the row sub-sum $(-c)$ disappears from the above-diagonal side of Δ and the column sub-sum (c) comes in. This is in accordance with (8) and so after the rearrangement we have:

$$\sum_{k=i}^{(m-1)} d_{k.m.} = c > 0 \quad .$$

In the same way contradictions to (8) are eliminated.

Each contradiction to (7) and (8) can be removed by taking one sector only out of the sequence of sectors and putting it in another position. If a contradiction to (7) exists, we may have the following sequence of sectors

$$\cdot \to \cdot \to \cdot \to A \to B \,.\,.\to .\,.\, C \to \cdot \to \cdot \to \cdot \quad ,$$

where the sector A holds the $i.$ stage and C the $m.$ stage according to the notation in the sum of the left-hand side of inequality (7). After the necessary rearrangement the new sector sequence is

$$\cdot \to \cdot \to \cdot \to B \,.\,.\to .\,.\, C \to A \to \cdot \to \cdot \to \cdot$$

with A on the $m.$, B on the $i.$ and C on the $(m-1).$ stage. In the case of a contradiction to (8) we may first have the sequence

$$\cdot \to \cdot \to \cdot \to B \,.\,.\to .\,.\, C \to A \to \cdot \to \cdot \to \cdot \quad ,$$

where A holds the $i.$, B the $m.$ and C the $(i-1).$ stage. After the necessary rearrangement we have the sequence

$$\cdot \to \cdot \to \cdot \to A \to B \,.\,.\to .\,.\, C \to \cdot \to \cdot \to \cdot \quad ,$$

where A holds the $m.$, B the $(m+1).$ and C the $i.$ stage.

The rearrangement, which lets the contradictions to (7) and (8) disappear, changes only the position of a single sector A relative to a certain number of neighbouring sectors such as B and C. Those other sectors, which are marked by three dots on the left-hand and right-hand ends of the sequence in the above examples, do not change their stages.

Each such rearrangement lets disappear from the above-diagonal side of the Δ matrix any given negative sub-sum $(-c)$ and brings in the positive sub-sum (c). Through such a rearrangement the sum of all above-diagonal entries of the Δ matrix increases. It is obvious that any process of rearrangement must somewhere come to an end because the maximum sum of the above-diagonal entries is limited.

We now call the above procedure "simple rearrangement". This simple rearrangement can fulfill conditions (7) and (8), which are only necessary, but not sufficient, conditions for the maximizing arrangement of sectors. The second step is to form "rearrangement chains" by which two or more sectors or groups of sectors change their relative positions simultaneously. Theoretically there are a number of possible rearrangement chains. But fortunately the triangulation of actual transactions

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[8] In this formulation a point following a number indicates that the number is ordinal: e.g. $i.$ means i-th.

matrices requires the application of rearrangement chains only infrequently.[9]

II. Structural Ratios

Some ratios are useful for an analysis of triangulated transactions matrices. "Degree of linearity" $\bar{\lambda}$ is defined as the percentage ratio of the sum of above-diagonal entries $V_{\max}$ to the total sum of interindustrial transactions T:

$$\lambda = 100 \frac{V_{max}}{T} \quad . \tag{9}$$

The successfulness of triangulation may be measured with reference to an absolute degree of linearity $\bar{\lambda}$, which itself is independent of the triangulation. We sum up the absolute values of the above (or below) diagonal entries in the Δ matrix:

$$D = \sum_{\substack{i=1 \\ k>i}}^{n-1} \left| d_{i.k.} \right| \tag{10}$$

Sum D is the highest limit which could ever be reached by triangulation, which satisfies (6). Now, using D, we define the absolute maximum sum of above-diagonal entries $\bar{V}$ that could be attained by triangulation:

$$\bar{V} = D + \frac{T-D}{2} = \frac{T+D}{2} \quad . \tag{11}$$

The absolute degree of linearity $\bar{\lambda}$ will then be obtained as:

$$\bar{\lambda} = 100 \frac{\bar{V}}{T}. \tag{12}$$

It always holds that:

$$\lambda \leq \bar{\lambda} \quad . \tag{13}$$

The difference between these two values:

$$\delta = \bar{\lambda} - \lambda \tag{14}$$

shows how close the actually performed triangulation is to its thinkable target.

With D, we can calculate a "spread ratio" s for a transactions matrix:

$$s = 100 \frac{D}{T} \quad . \tag{15}$$

Substituting D/T from (11) and (12) we obtain:

$$\bar{\lambda} = \frac{100 + s}{2} \quad . \tag{16}$$

λ, $\bar{\lambda}$ and s indicate over-all characteristics of a transactions matrix. But similar ratios can also be used for individual sectors. We define the partial degree of linearity of sector i as:

$$\lambda_i = 100 \frac{V_{i\,max}}{T_i} \quad , \tag{17}$$

where

$$V_{i\ max} = \sum_{k=1}^{(i-1)} X_{k.i.} + \sum_{k=(i+1)}^{n} X_{i.k.} \tag{18}$$

and

$$T_i = \sum_{k \neq i} X_{k.i.} + \sum_{k \neq i} X_{k.i.} \quad . \tag{19}$$

The absolute partial degree of linearity is:

$$\bar{\lambda}_i = 100 \frac{\bar{V}_i}{T_i} \quad , \tag{20}$$

where

$$\bar{V}_i = \frac{T_i + D_i}{2} \tag{21}$$

and

$$D_i = \sum_{k=1}^{n} \left| d_{i.k.} \right| \quad . \tag{22}$$

The partial spread ratio is given by:

$$s_i = 100 \frac{D_i}{T_i} \quad . \tag{23}$$

III. Empirical Findings

Table 1 contains the ratios λ, $\bar{\lambda}$ and s for 36 triangulated transactions matrices obtained from 16 countries. The number of sectors varies from 6 to 38. The degree of linearity λ of the triangulated transactions matrices averages 82·9 per cent—that is, the sum of above-diagonal entries is 4·8 times greater than the sum of below-diagonal entries. There exists in general a strong linearity in the structure of transactions, and the differences in this ratio among various countries are generally small. In the matrices of the United Kingdom, the Netherlands and Israel the values of λ are appreciably lower than in others. Cyprus (No. 29) has the highest λ.

One would expect the degree of linearity to be negatively correlated with the degree of aggregation. This is in fact the case with the matrices of the United States for 1939 (Nos. 14, 17 and 36). The 1953 matrices of Italy (Nos. 13 and 34) and the 1954 matrices of the United Arab Republic (Nos. 12, 26 and 27) however contradict that expectation.

The data in table 1 leave unanswered the question of whether there exists a systematic relation between λ and the level of industrialization. A high λ is shown by the following relatively less industrialized countries: Italy (Nos. 2 and 34, but not No. 13); the United Arab Republic (Nos. 12, 26 and 27) and Cyprus (Nos. 29 and 30). Two relatively highly-industrialized countries have a low λ: the United Kingdom (Nos. 6 and 20-23) and the

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[9] For a more detailed description of the rearrangement chains, see E. Helmstädter, "Dreiecksform der Input-Output-Matrix und hire möglichen Wandlungen im Wachstumsprozess", *op. cit.*, pp. 341–356.

TABLE 1 : STRUCTURAL RATIOS OF TRIANGULATED INTERINDUSTRIAL TRANSACTIONS MATRICES

No.	*Country*	*Year*	*Number of sectors*	λ	$\bar{\lambda}$	s
1	Japan	1951	29	83·4	88·4	76·7
2	Italy	1950	29	93·8	94·8	89·5
3	Norway	1950	28	83·8	87·2	74·3
4	United States	1947	29	83·3	86·3	72·6
5	Federal Republic of Germany	1953	23	83·9	88·7	77·3
6	United Kingdom	1954	23	76·0	78·7	57·3
7	Netherlands	1957	25	79·0	84·0	67·9
8	Denmark	1949	19	82·6	83·1	66·1
9	France	1956	15	87·7	89·3	78·6
10	OEEC member countries	1953	26	86·6	89·1	78·2
11	Poland	1957	20	82·6	85·4	70·7
12	United Arab Republic	1954	28	93·0	94·6	89·2
13	Italy	1953	26	79·4	84·2	68·3
14	United States	1939	10	67·3	74·6	49·4
15	„ „	1919	13	82·2	86·8	73·5
16	„ „	1929	13	81·7	86·2	72·4
17	„ „	1939	13	82·3	87·3	74·5
18	Federal Republic of Germany	1953	8	81·2	83·2	66·4
19	„ „ „ „	1960	35	80·6	82·7	65·4
20	United Kingdom	1935	11	71·6	76·6	53·1
21	„ „	1948	9	76·2	77·6	55·1
22	„ „	1950	9	73·6	75·0	50·0
23	„ „	1954	10	72·8	73·7	47·3
24	Poland	1957	7	82·4	83·8	67·5
25	India	1960	10	84·0	86·2	72·3
26	United Arab Republic	1954	7	91·0	91·1	82·2
27	„ „ „	1954	33	92·8	95·2	90·5
28	Israel	1958	6	74·4	75·3	50·5
29	Cyprus	1954	14	97·4	97·8	95·6
30	„	1957	14	96·9	97·4	94·7
31	Federal Republic of Germany	1953	17	85·7	88·8	77·7
32	Belgium	1953	17	85·0	88·6	77·2
33	France	1956	15	81·3	85·7	71·4
34	Italy	1953	16	88·6	89·9	79·9
35	Netherlands	1956	16	75·8	80·0	60·0
36	United States	1939	38	84·2	91·1	82·1
	Unweighted arithmetic mean			82·9	85·8	71·5

Note: For source of the untriangulated transactions matrices see Helmstädter, "Die Dreiecksform der Input-Output-Matrix und ihre möglichen Wandlungen im Wachstumsprozess", *op. cit.*

Netherlands (Nos. 7 and 35). But this is certainly not sufficient in itself to establish a meaningful hypothesis about the relationship between λ and the degree of industrialization.

At the present stage of research it is not possible to point out specific facts which might account for the variation of the value of λ among different countries. We have to be satisfied here with the statement that the linearity of transactions is generally strong and differs from country to country more or less insignificantly.

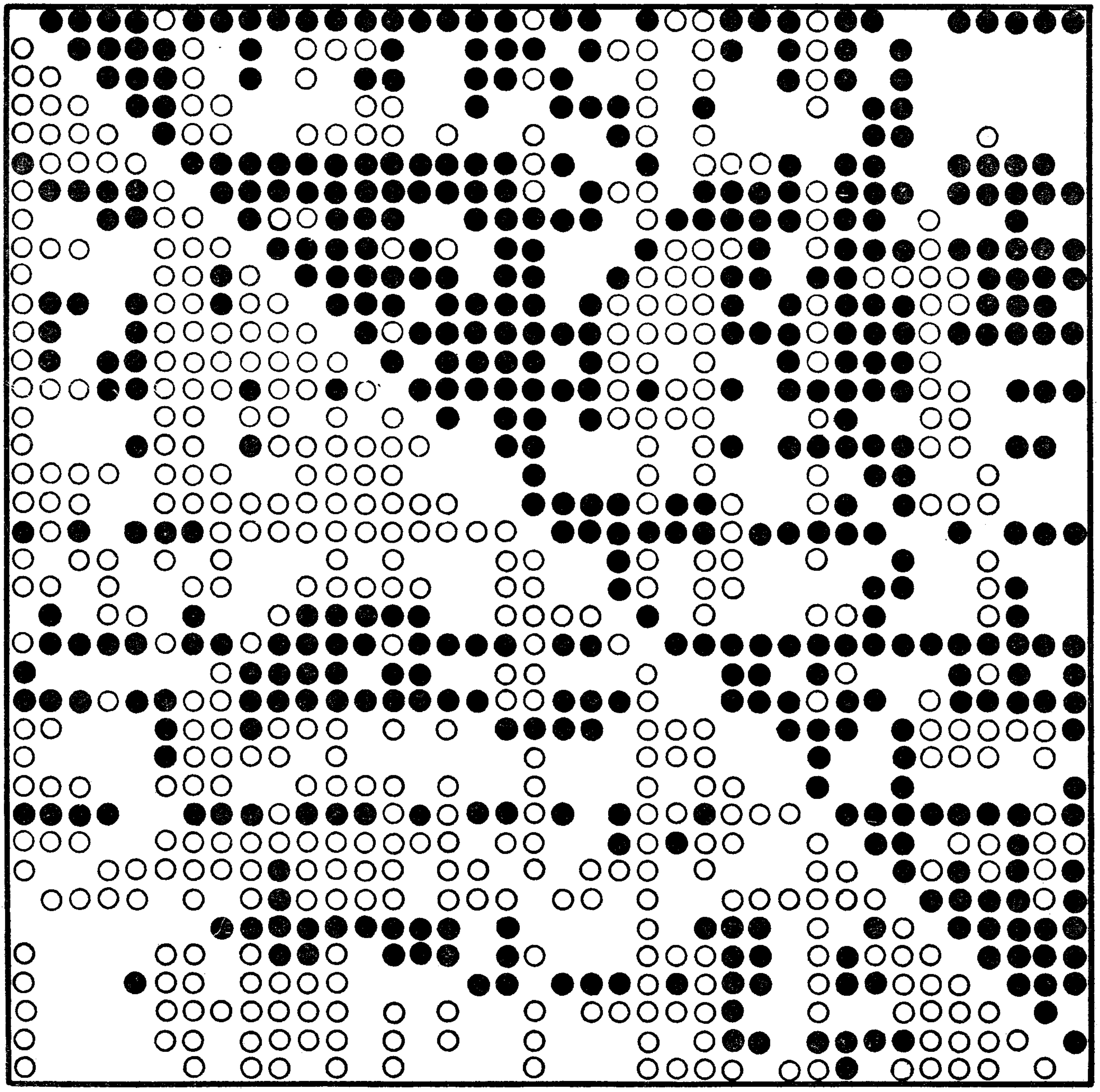
Let us now compare the actual degree of linearity λ with the absolute degree of linearity $\bar{\lambda}$, both shown in table 1. This last ratio averages 85·8 per cent. Its difference from λ amounts to only 2·9 per cent. If the above-diagonal sum reached the absolute maximum of $\overline{V}$ we could gain only a slightly better triangulation. The highest possible gain amounts to 7·3 and 6·9 per cent (United States, Nos. 14 and 36). But in all these cases one can easily show that the absolute maximum of the above-diagonal sum $\overline{V}$ cannot actually be reached by a further rearrangement of sectors.

Triangulated transactions matrices for three different countries at three different dates are illustrated in figures III, IV and V. These figures show the difference matrices Δ of three transactions matrices with more than 30 sectors. Solid circles show the positive differences of mutual transactions and open circles the negative differences. If the triangulation could realize the absolute degree of linearity ($\bar{\lambda}$) all solid circles would be allocated above the principal diagonal and all open circles below it.

Although not all solid circles are situated above the diagonal, in the case of figure III (the United States, 1939) 71 per cent of them are. In figure IV (Federal Republic of Germany, 1960) the percentage is 78 per cent and in figure △ (United Arab Republic, 1954) it is 87 per cent. These percentages are in a certain relation to the degrees of linearity of the transactions matrices

FIGURE III. THE DIFFERENCE MATRIX OF THE TRIANGULATED[a] TRANSACTIONS MATRIX, UNITED STATES, 1939

Stage No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Sector No.	36	4	12	7	10	35	19	16	11	25	17	22	3	15	23	24	6	14	32	9	5	33	18	21	20	31	26	13	38	8	1	37	34	27	30	2	29	28



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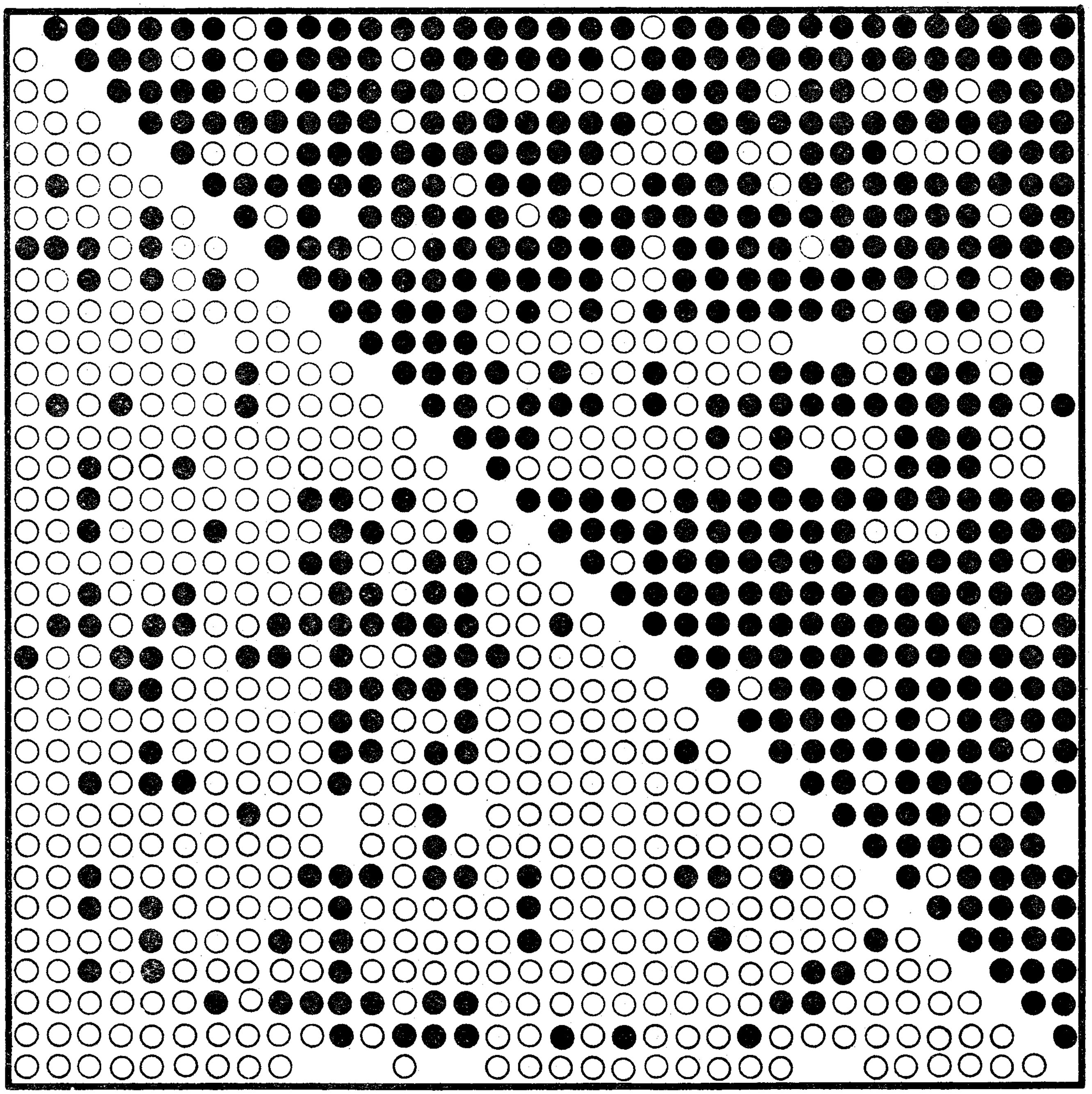
[a] For source of the untriangulated transactions matrix see table 2, below.

FIGURE IV. THE DIFFERENCE MATRIX OF THE TRIANGULATED[a] TRANSACTIONS MATRIX, FEDERAL REPUBLIC OF GERMANY, 1960

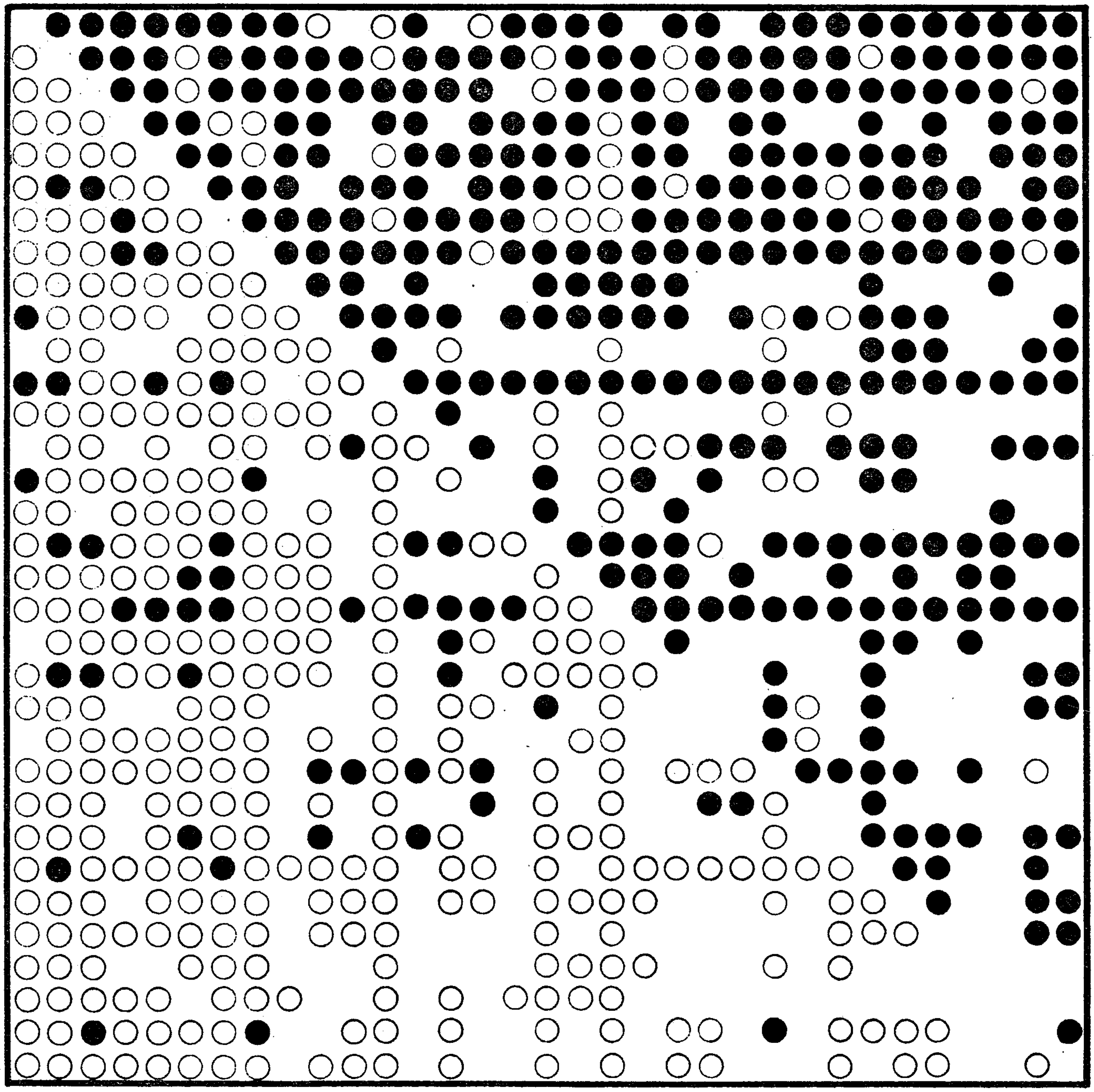
Stage No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Sector No.	32	5	2	29	3	28	15	16	30	6	4	21	18	19	22	20	1	11	14	10	17	7	8	9	24	13	26	12	23	25	27	33	35	34



Source of the untriangulated transactions matrix: Statistical Office of the European Communities, *Input-Output-Tabellen für die Länder der Europäischen Wirtschaftsgemeinschaft,* Brussels, 1964.

FIGURE V. THE DIFFERENCE MATRIX OF THE TRIANGULATED[a] TRANSACTIONS MATRIX, UNITED ARAB REPUBLIC, 1954

Stage No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Sector No.	22	33	32	2	7	3	27	31	4	9	17	10	25	1	14	6	26	5	8	24	11	12	20	19	21	16	18	13	15	23	28	29	30



Source of the untriangulated transactions matrix: Gamal El Eleish, "The Input-output Model in a Developing Economy", in T. Barna (ed.), *Structural Interdependence and Economic Development*, London 1963, p. 199, table 1.

of the three countries, which amount to 84·2 per cent in the United States, 80·6 per cent in the Federal Republic of Germany and 92·8 per cent in the United Arab Republic as can be seen from table 1 (Nos. 36, 19 and 27).

These three figures visualize the general character of triangulated matrices. A comparison between the three tables brings to light some interesting facts. First the difference matrices have zero elements (absence of either solid or open circle) in different measures. The matrices of figures III and V contain 30 per cent of zero elements, that of figure IV only 2 per cent. The triangular character of the matrices of figures IV and V is much more pronounced than that of figure III. The clearest triangularity is given by figure V. In figure IV triangularity is clear too, but there exists a bloc of five sectors (which are basic material sectors) with relatively high inputs from sectors at the end of the sector hierarchy. The matrix of figure III also shows some blocs, but in that of figure V solid circles and open circles are distributed in such a way that we are not inclined to isolate blocs of several sectors.

As an example of further structural analysis the triangulated transactions matrix of the United States for 1939 with 38 sectors is reproduced in table 2. In this table we have $\lambda = 84{\cdot}2$ per cent. The above-diagonal sum is 5·3 times larger than the sum below the diagonal.

Triangulation brings the sectors into a hierarchical order. The raw material sectors are located at lower stages and the final producers at higher ones, as shown by the industry column on the left-hand side of the matrix in table 2.

Table 3 shows the partial degrees of linearity for the 38 sectors in the 1939 United States matrix. In general, differences between λ_i and $\bar{\lambda}_i$ are a little larger at lower stages than at higher stages. The relatively final stages seem to fit somewhat better on the whole into the hierarchical arrangement than the relatively primary stages.

Considering the entries x_{ik} larger than $10 million in table 2 alone, we find 255 entries above the diagonal and 130 below it, i.e. only 66·3 per cent lie above the diagonal. But if we pick out only the entries larger than $100 million we have 88 entries (81·5 per cent) above the diagonal and 20 below. In terms of values of these entries the above-diagonal sum is 89·1 per cent of the total sum of these entries. The large-value entries in the matrix are more strongly triangulated (89·1 per cent) than the entries as a whole ($\lambda = 84{\cdot}2$ per cent). This is the reason for the relatively high number of solid circles below the diagonal in figure III. These solid circles are related to generally small entries in the transactions matrix.

The stages 7 to 21 form a bloc of relatively strong triangularity with respect to their mutual deliveries. Above the diagonal there are 90 (or 93·8 per cent) positive entries while there are only six below it. Equally strong triangularity holds for the little bloc formed by stages 1 to 6.

So far we have considered only a few ratios for structural analysis of this kind. Other ratios may well be of interest, too. For example, one could draw some parallels both above and below the main diagonal, and compare the sum of the entries between the first parallel and the diagonal, between the first and the second parallels, and so on, but this is not the place to go into this kind of structural analysis.

IV. CONCLUSIONS

This article has tried to give an outline of the possibilities of structural analysis by the method of triangulation. This method has revealed the hierarchy of industries or the relatively high degree of linearity of the inter-industrial transactions.

If one accepts the basic "relative supplying-demanding criterion", then triangulation means to arrange the sectors so that the sum of flows on one side of the principal diagonal of the transactions matrix is maximized. A well-defined sectoral hierarchy is the result of this triangulation criterion.

Intercountry studies in structural analysis are based mainly on comparisons of structural properties, and they require the formulation of structural characteristics. The triangulation of transactions matrices gives a broad basis for definitions of structural ratios which can be used for purposes of comparison. The special viewpoint of this method concerns the over-all characteristics of matrices rather than regarding isolated transactions within such a matrix.

The triangulation approach is useful not only for the comparison of structural characteristics of different countries but also for planning structural activities; and, especially with dynamic problems, it is advantageous to realize that a remarkably strong sector hierarchy exists.

FIGURE VI.

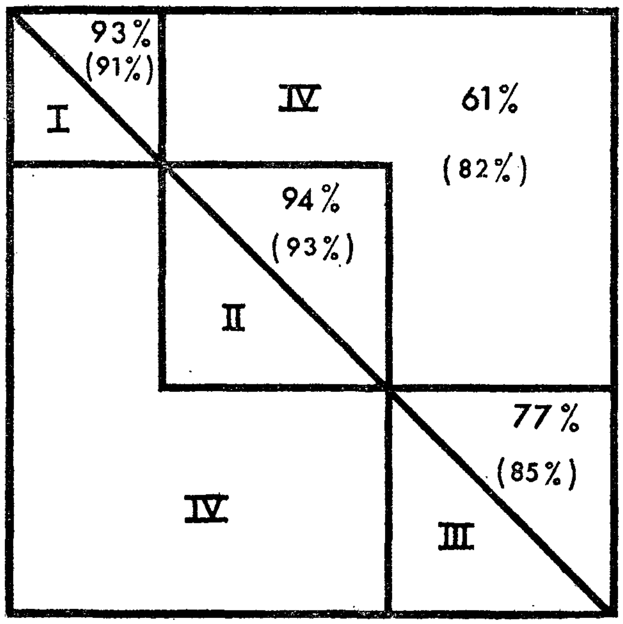


TABLE 2: TRIANGULATED INTERINDUSTRY TRANSACTIONS MATRIX OF THE UNITED STATES, 1939
(*Millions of dollars*)

Stage No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	Total deliveries to other industries	Total output
		Sector No.	36	4	12	7	10	35	19	16	11	25	17	22	3	15	23	24	6	14	32	9	5	33	18	21	20	31	26	13	38	8	1	37	34	27	30	2	29	28		
1.	Trade	36	897	19	27	10	19	—	393	23	297	287	93	800	78	288	154	434	160	583	—	1	3	—	1,535	—	8	550	120	144	—	963	1,446	—	—	600	265	4,048	420	1,908	15,676	16,873
2.	Iron and steel foundry products	4	—	—	7	4	15	47	—	2	57	—	—	—	10	7	—	—	12	10	71	—	9	—	—	—	—	1	—	3	—	126	—	8	—	—	—	—	—	—	389	512
3.	Machine tools	12	—	—	17	4	11	9	—	3	36	—	—	—	25	16	—	—	4	18	—	5	—	—	—	—	—	—	—	3	—	54	—	117	—	—	—	—	—	—	305	484
4.	Engines and turbines	7	—	—	—	3	2	4	—	—	—	1	—	1	—	—	—	—	11	—	1	1	28	2	1	—	8	—	—	—	—	—	1	12	—	—	—	—	—	—	73	147
5.	Transportation equipment, n.e.c.	10	—	—	—	—	—	169	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	4	9	—	—	—	—	—	—	186	285
6.	Steam railroad transportation	35	4	27	3	1	—	138	712	38	19	117	241	205	219	58	168	31	14	18	—	4	—	—	249	—	4	—	—	2	—	88	521	—	—	8	10	285	2	—	3,048	4,448
7.	Coal and coke	19	—	11	1	1	1	209	252	9	10	48	50	75	202	10	6	5	3	7	1	—	1	4	9	—	210	4	2	1	—	12	2	75	—	27	6	49	4	4	1,059	2,365
8.	Non-ferrous metals	16	—	2	3	6	5	—	1	1,323	32	—	3	94	108	52	—	—	6	98	144	21	21	—	1	6	49	51	5	2	—	85	5	157	—	1	—	23	—	—	981	2,959
9.	Industrial and heating equipment	11	43	2	—	—	—	—	9	9	55	31	19	7	5	2	10	3	—	3	420	—	—	—	92	—	8	—	52	—	—	1	30	167	—	65	17	70	12	26	1,103	2,575
10.	Pulp and paper	25	257	—	—	—	—	4	1	6	9	679	46	67	2	9	1	6	—	13	49	—	—	2	—	1	1	23	423	—	47	1	2	43	—	21	5	244	7	18	1,308	427
11.	Non-metallic minerals	17	2	13	4	—	4	13	—	6	10	23	281	128	29	8	—	28	1	31	1,444	—	1	—	6	—	—	8	—	1	2	60	14	65	—	—	5	137	2	—	2,045	2,736
12.	Chemicals	22	—	7	—	1	4	15	13	10	3	33	22	844	36	26	29	8	2	39	343	2	8	—	13	—	—	42	50	3	38	31	357	212	—	260	31	133	28	38	1,837	5,015
13.	Ferrous metals	3	—	45	6	3	22	69	—	43	105	—	—	—	1,188	634	—	64	55	49	592	—	36	—	—	—	—	—	—	10	1	374	24	166	—	—	—	—	—	—	2,298	3,886
14.	Iron and steel products, n.e.c.	15	2	2	6	9	14	23	1	—	49	—	—	39	1	32	5	58	17	61	879	4	23	—	43	—	3	11	—	11	27	208	21	71	—	1	—	305	5	6	1,905	2,604
15.	Lumber and timber products	23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	445	183	—	8	799	—	2	—	—	—	—	—	—	—	—	9	46	55	—	—	—	—	—	—	1,102	1,844
16.	Furniture	24	13	—	—	—	5	—	—	—	7	—	—	2	—	6	—	25	—	18	58	—	—	—	2	1	—	6	—	3	107	9	47	18	—	5	—	16	5	—	328	1,647
17.	Agricultural machinery	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	41	—	—	—	—	—	—	—	—	—	—	—	400	70	—	—	—	—	—	—	511	604
18.	Electrical equipment	14	37	—	—	—	—	9	—	—	—	—	—	—	2	2	—	—	—	330	306	1	3	17	—	104	69	—	—	—	9	81	—	114	—	—	—	—	—	—	754	2,759
19.	Construction	32	212	4	4	1	1	598	14	9	11	18	19	21	43	9	12	5	3	7	—	7	5	162	461	165	264	12	9	1	1,401	14	295	—	—	14	4	73	2	8	3,888	11,291
20.	Aircraft	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15	—	28	—	—	—	—	—	—	—	—	—	87	—	—	—	—	—	—	115	285
21.	Shipbuilding	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	69	—	—	—	—	—	—	—	—	7	4	—	—	—	1	—	—	81	441
22.	Miscellaneous transportation	33	—	2	—	—	—	—	15	—	—	—	47	2	45	1	43	—	—	—	—	—	—	—	1,211	—	—	—	—	—	—	—	235	—	—	—	—	16	—	—	1,617	2,677
23.	Petroleum products and refining	18	670	6	2	2	2	85	11	16	14	41	91	72	94	16	30	4	2	14	131	16	2	319	1,861	3	98	14	5	1	74	21	403	442	15	20	13	53	3	12	2,817	8,262
24.	Communications	21	235	—	—	—	—	—	—	—	1	—	2	1	—	1	2	1	—	—	—	—	—	—	—	8	—	2	13	—	186	—	—	—	—	1	—	7	—	3	455	1,524
25.	Manufactured gas and electric power	20	19	11	4	1	1	14	33	40	26	26	46	52	42	18	7	9	3	15	5	1	3	33	11	—	4	27	21	4	1	18	64	—	—	48	11	66	6	16	702	2,876
26.	All other manufacturing	31	55	—	—	—	—	30	—	—	6	10	—	1	—	1	—	—	—	6	17	2	12	—	—	—	—	180	—	2	373	8	2	71	—	13	—	—	—	104	713	2,362
27.	Printing and publishing	26	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	390	—	1,251	—	—	26	—	—	—	—	—	—	1,282	2,775
28.	Merchandise and service machines	13	69	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	53	—	—	43	—	1	—	—	—	3	169	475
29.	Business and personal services	38	451	1	4	2	—	12	2	3	19	8	11	183	13	8	1	17	6	45	3	1	—	32	35	4	2	14	21	6	103	65	551	2	29	15	41	367	14	50	2,038	18,628
30.	Motor vehicles	8	33	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	72	—	1	1	—	—	—	2	1,589	158	242	—	—	—	2	—	—	519	5,101
31.	Agriculture and fishing	1	—	—	—	—	—	—	—	—	—	85	—	175	—	—	98	2	—	—	91	—	—	—	—	—	—	7	—	—	—	—	948	453	—	480	—	4,998	—	103	6,492	12,472
32.	Foreign trade	37	—	—	1	1	1	—	5	331	8	206	63	161	22	8	35	8	2	5	—	—	—	—	40	—	27	61	10	—	—	2	337	—	284	306	196	824	21	54	3,019	3,111
33.	Transoceanic transportation	34	—	—	—	—	—	—	—	36	1	22	7	18	3	1	4	1	—	1	—	—	—	—	5	—	3	7	1	—	—	—	38	101	—	33	21	89	2	6	400	490
34.	Textile mill products	27	8	—	—	—	—	—	—	1	4	25	2	8	—	2	4	48	—	2	2	—	4	—	—	—	—	18	4	—	13	61	51	109	—	643	71	43	15	1,592	2,087	4,419
35.	Rubber	30	20	—	—	—	6	2	—	—	13	1	—	4	—	—	—	—	12	3	4	1	1	30	2	1	—	2	1	1	32	182	54	41	—	1	20	3	22	8	447	1,177
36.	Food processing	2	—	—	—	—	—	—	—	—	—	7	—	47	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	1	—	643	269	—	25	—	1,527	131	—	1,125	18,793
37.	Leather	29	—	—	—	—	—	—	—	—	2	—	—	4	—	—	—	2	—	—	—	—	—	—	—	—	—	2	4	—	15	4	14	27	—	2	—	—	437	13	89	1,835
38.	Clothing	28	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	32	—	—	—	—	—	425	36	5,787
	Total purchases from other industries		2,135	152	72	46	113	1,317	1,210	585	739	989	762	2,168	979	1,183	609	918	313	1,054	5,404	67	162	774	3,716	286	755	864	741	198	3,634	2,478	5,772	3,308	328	1,947	696	11,852	701	3,972	62,999	155,951

Source: W. W. Leontief, *The Structure of American Economy, 1919–1939*, Second Edition, New York, 1953, table 24 (original table).

[a] The above-diagonal elements sum is maximized.

TABLE 3: PARTIAL RATIOS OF THE TRIANGULATED TRANSACTIONS MATRIX, UNITED STATES, 1939

Stage No.	*i*	*Sector*	λ_i	$\bar{\lambda}_i$	s_i
1.	36	Trade	88·0	94·4	88·7
2.	4	Iron and steel foundry products	75·4	91·3	82·6
3.	12	Machine tools	89·9	95·0	89·9
4.	7	Engines and turbines	76·5	95·0	89·9
5.	10	Transportation equipment	77·9	99·7	99·3
6.	35	Steam railroad transportation	74·3	89·2	78·4
7.	19	Coal and coke	85·5	87·4	74·8
8.	16	Non-ferrous metals	66·3	82·2	64·4
9.	11	Industrial and heating equipment	80·9	91·5	83·1
10.	25	Pulp and paper	66·0	80·7	61·4
11.	17	Non-metallic minerals	86·3	99·2	88·4
12.	22	Chemicals	77·6	85·1	70·1
13.	3	Ferrous metals	83·0	93·8	87·7
14.	15	Iron and steel products, other	92·9	96·4	92·4
15.	23	Lumber and timber products	86·2	95·0	90·0
16.	24	Furniture	89·5	94·7	89·4
17.	6	Agricultural machinery	96·6	99·4	98·8
18.	14	Electrical equipment, other	91·8	95·3	90·5
19.	32	Construction	86·6	95·5	91·0
20.	9	Aircraft	88·5	100·0	100·0
21.	5	Shipbuilding	90·9	100·0	100·0
22.	33	Miscellaneous transportation	73·2	86·5	73·0
23.	18	Petroleum products and refining	73·5	79·2	58·4
24.	21	Communications	66·4	99·2	98·4
25.	20	Manufactured gas and electric power	68·9	90·9	81·9
26.	31	All other manufacturing	84·0	89·2	78·6
27.	26	Printing and publishing	97·7	98·5	96·9
28.	13	Merchandising and servicing machines	79·3	89·1	78·2
29.	38	Business and personal services	82·9	97·5	94·9
30.	8	Motor vehicles	87·8	98·5	96·9
31.	1	Agriculture and fishing	87·0	89·0	78·0
32.	37	Foreign trade	69·8	75·7	51·5
33.	34	Transoceanic transportation	65·7	85·4	70·9
34.	27	Textile mill products	90·2	93·5	86·9
35.	30	Rubber	63·8	89·5	79·0
36.	2	Food processing	92·3	92·4	84·7
37.	29	Leather	90·4	94·3	88·6
38.	28	Apparel	99·1	99·2	98·3
		Unweighted arithmetic mean	82·2	92·3	84·4

Another bloc-triangularity is built up by stages 23 to 38: bnt there we have only 74 positive entries (or 77·1 per cent) above the diagonal and 20 below.

Looking at the transactions among these three blocs, we find 164 positive entries (or 61·2 per cent) above the diagonal and 104 below. This part of the matrix shows a relatively weak linearity. This characteristic of the difference matrix is summarized in figure VI. The percentage figures refer to the proportion of the number of positive entries (solid circles) which are found above the diagonal. Those in brackets (which are not very different) refer to the proportion of sum of the values of the above-diagonal entries to the total value sum of entries in the concerned area of the matrix. It is remarkable that the higher values are around the diagonal.

MODIFIABLE RECTANGULAR INPUT-OUTPUT MATRICES

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This paper discusses some characteristics of an input-output system for the province of Quebec now being constructed by the Bureau de la Statistique du Québec with the collaboration of the Laboratoire d'Econométrie de l'Université de Montréal.[1]

What interests us here is the practical application of the proposed system. It may turn out that some of its features are relevant to the points raised in "Parameter-patterns for industrial development", prepared by the Research Division of the Centre for Industrial Development, in April 1965. It must be borne in mind that the system was designed with reference to the particular needs of Quebec and subject to the constraints of data collection possibilities, time, and the resources available for the study. Governmental statistical activities in Canada are conducted at two levels: federal and provincial. In a number of instances the Quebec statistical agencies have to follow federal practices and even rely on federal sources for some of the basic data they need. This often creates rather delicate problems, since an obvious desire to avoid duplication runs against the fact that the requirements of the federal Government and those of the government of Quebec are not the same. Their responsibilities are different: so are the instruments at their disposal. There also exist substantial divergencies in their respective economic philosophies.

Among the special characteristics of the Quebec situation, which have inevitably conditioned the formulation of the proposed system, is that Quebec is a region with high living standards and an economy which has a tendency to run below its full capacity. It forms part of the vast North American economy and the mobilities of capital, goods, and even labour are exceptionally high. It has no independent monetary or commercial policy. The fiscal policies of the federal Government exert much more influence than those of the government of Quebec. In the short run at any rate, the usual problem of the savings/investment equilibrium is totally absent. So is the balance of payments problem.

The limitations of the proposed system will become obvious in the course of our examination, and the last section of this paper spells out what appear to be the major weaknesses and makes some suggestions as to the directions of possible improvements.

MATRICES OF COEFFICIENTS

The system distinguishes productive sectors (industries) and non-productive sectors (final demand categories). This latter group comprises certain activities often treated in earlier systems as industries or parts of industries. Thus all government activities except those whose services are paid for directly by the users, like the post office, are included in final demand; so are all educational, church and similar activities and also hospitals. One of the consequences of this is that part of the Gross Domestic Product is generated outside the productive system. This may be slightly embarrassing if one wants to adhere strictly to national accounts concepts. It was thought preferable however to treat as productive only those sectors whose activity levels appear to be in fact determined by the activity levels of other sectors.

Similarity of input structures and institutional significance in principle determine the grouping of establishments into sectors. The similarity of outputs from the users' viewpoint is irrelevant. In practice the industry definitions imposed by the federal Government could not be cut across. We have no use for the Marshallian concept of industry as a group of firms producing the same product, although this concept still presides over the official statistics.

The input structure of each productive sector is described by a column vector of coefficients representing inputs, at consumer prices and regardless of origin, of the various classes of goods and services per $1 worth of output. It is convenient to partition this vector into two sub-vectors: the upper one corresponding to goods and services produced within the system, called "products", and the lower one corresponding to other goods and non-competitive imports. No one-to-one correspondence is imposed between the products ont he one hand and the productive sectors on the other; in fact the Quebec system contains over 60 productive sectors and nearly 250 classes of products. The columns of coefficients are not fixed: their modifications are described below. At any given moment however, the input structure of the productive sectors may be described by two rectangular matrices:

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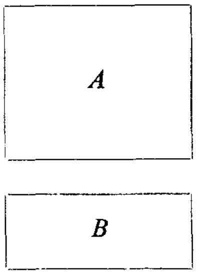
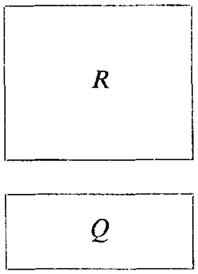
[1] For a description of the fundamental features of the proposed system see T. Matuszewski, "Un système rectangulaire d'échanges inter-industries à rendements non proportionnels", presented at the September 1965 meeting of the Econometric Society in Rome (mimeographed), and for a rather informal discussion of the general approach followed in designing the system see the same author's "Some Remarks on an Econometric Model of a Provincial Economy", in *Canadian Journal of Economics and Political Science*, vol. 31, 1965, pp. 552–558. A brief summary of the former paper, made by the Secretariat of the CID, is printed in annex I, where it is followed by a numerical example given by the author.



The elements of these matrices are non-negative (see below, however). The sums of the corresponding columns of A and B are equal to one. In what follows the elements of the various matrices will be denoted by the corresponding lower case letters.

The structure of the market for each product is described by a column of non-negative coefficients whose sum is equal to one and which represent market shares of the way in which \$1 worth of demand at consumer prices for the product in question is allocated among the sectors which produced the goods and services concerned and which provided the related trade and transportation services. The shares of competitive imports and of indirect taxes are indicated in the lower portion of the column. If the column vectors of market shares (one for each product) are partitioned so that their upper portions correspond to productive sectors and the lower portions to the "leakages" outside the system, and are then written side by side, we get a description of the marketing structure at any given moment given by two rectangular output matrices:



This arrangement eliminates the necessity of tracing the exchanges of every sector with every other sector. All exchanges are channelled through a system of markets represented by the output matrices R. It may be noted that in the Quebec system the classification of products is based on the principal product definitions of the Standard Industrial Classification (SIC). This was chosen in preference to the Standard Commodity Classification developed some time ago by the federal Government. It was thought essential to have a framework which covered all activities and which could be readily related to production statistics.

The rectangular matrices described so far represent nothing more than a particular way of organizing data for the construction of a traditional input-output system. The advantages[2] of keeping separate the descriptions of the production structure and of the marketing structure consist chiefly in offering greater scope for accumulating and transmitting knowledge about interindustry relations. This may be of special importance in the construction of regional tables or of tables intended to span a period of important structural changes. The organization of data into two sets of rectangular matrices may be particularly helpful if use is to be made of information other than that derived from the statistical observation of the actual interindustry flows in some base year.

It is always possible to calculate the product RA so as to get the usual sector-by-sector input-output matrix. Transformations from the products space to the sectors space will then be identity transformations and we shall get a system characterized by a Leontief matrix $(I-RA)$.

COLUMN MODIFICATIONS

The advantages of rectangular matrices may be pursued further to increase the realism and the flexibility of the system. Certain consequences have to be faced however. Column modifications require additional data. Moreover—and this is more fundamental—the nature of the results which the system can supply changes completely.[3] General solutions are no longer possible.

The "Système rectangulaire d'échanges inter-industries à rendements non proportionnels" specifies the types of column modifications applicable to matrices A (expression 8) and R (expression 9). Modifications of the columns of B and Q are given by analogous expressions. All the different types of modifications except one appear in the numerical example given below in annex I. The one left out concerns changes in the columns of R determined by the cumulative level of the total demand for a particular product. It creates no computational difficulties and does not seem to be of great economic importance.

It is easily seen that modifications determined by the product-mix of output and by the sector (of origin) mix of demand could be handled by increasing the number of sectors and of products respectively, and redefining them so that the formal homogeneity of the relevant flows is assured. In addition to increasing the dimensions of the system this would make it necessary to aggregate at each stage of the calculations the results relating to groups of sectors and groups of products. It was thought preferable to avoid this. What is more, the arrangement envisaged here will make it easier to replace in a future version of the model the simple weighting of columns by a more sophisticated representation of the effects of changes in the product-mix of output or the sector-mix of demand.

The main purpose of the modifications of the columns of R triggered by the cumulative levels of the outputs of certain sectors reaching predetermined thresholds is to provide for possible restrictions on production capacity. All the modifications of this type included in the

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[2] See the discussion in the two papers mentioned in footnote 1.

[3] This point is taken up below in the section on the uses of the system, pp. 236–7.

numerical example are in fact capacity restrictions. Now in general the attainment of its capacity by a productive sector will affect the markets for more than one product. Further its effect is felt at the current iteration. A sector refuses to accept more demand than it can handle. To use the symbols of the paper mentioned above, R_k is a function of X_k where the two are related by $X_k = R_k Y_k$. Consequently the corresponding modifications of R are more complicated than the superficially analogous modifications of A determined by the activity levels of production sectors. The third iteration of the numerical example given in annex I illustrates the kind of difficulties which may arise.

It may seem strange that capacity restrictions are handled by the matrices R, the output or (more properly) marketing matrices, instead of by the matrices A describing the production structure. This is so because the Quebec system implicitly assumes that demand is always satisfied. There can be no bottle-necks so far as products are concerned. The elements of X_{k-1} are in fact just production plans or intentions until the corresponding additional inputs are secured. The model however treats them as if they were definite increments in activity levels, on the happy assumption that the inputs needed will always be available. If a supplying sector hits its capacity limit, demand is automatically diverted to other sectors, chiefly to competitive imports. Consuming sectors are never forced to cut back their production for lack of inputs.

Another apparent paradox arises in the treatment of by-products. These are outputs whose production is determined not by demand but by the activity levels of the sectors in which they are produced. In conformity with common practice they are treated as negative inputs. Hence the possibility of negative elements in matrices A. In this way they are given priority when it comes to allocating demand among the various sectors supplying the product in question. This marketing priority turns out to be reflected by the presence of a negative coefficient in the matrix describing the production structure. But one can argue of course that by-products are primarily a production phenomenon.

By-products are not numerous and are to be distinguished from secondary products, which compete with other outputs of a given sector instead of being complementary to it. Secondary products give rise to no special difficulties, although they may cause the product-mix modifications mentioned above. In fact, there being no one-to-one correspondence between products and sectors the concepts of primary and secondary products have no meaning.

It may be expected that data limitations will result in a relatively small number of the columns of A and of R being subject to modifications. In such a case it is useful to have a computation programme able to skip the modification sub-routines when they are not required.

NUMERICAL CALCULATIONS

The paper "Un système rectangulaire d'échanges inter-industries à rendements non proportionnels" discusses the computations necessary to obtain a standard solution of the system consisting in activity levels of production sectors and the levels of total demand for various products corresponding to a given final demand. The auxiliary vectors of total primary input demands and of the levels of the various leakages outside the production system are obtained at the same time.

The problems to which numerical solutions give rise follow in the first place from the very dimensions of the system, whose nature requires that it be highly disaggregated. Secondly, the determination of the matrix R appropriate for a given iteration creates a difficulty of principle. In the particular case of the very simple modifications adopted here this difficulty may be fairly easily overcome. The choice of more complicated functions is likely to necessitate more extensive use of successive approximations.

The Bureau de la Statistique du Québec is at present preparing for a CDC 3400 computer programme which will yield a standard solution of the system. In the meantime the small numerical example given in appendix I will serve as an illustration. Calculations were stopped after the eighth iteration. The example contains no modifications of the columns of R dependent on the cumulative level of product demand. All the other types of column changes are illustrated. There are capacity restrictions on the outputs of three sectors, one of which becomes effective. In designing the example the two rows of the B matrix were thought of as corresponding to labour and capital respectively. The two rows of the Q matrix may be taken to be associated with indirect taxes and with competitive imports respectively.

It will be noted that, column modifications apart, a solution of the system requires a volume of computations of an order comparable to that needed to find a special solution of a Leontief system by expansion in powers of a matrix. The modifications, although tedious to handle with paper and pencil, are on the whole quite straightforward and the information is readily accessible.

With respect to the modification of R in terms of the accumulated activity levels however the example given here may be misleading. As the number of columns subject to this type of modification increases it becomes much more likely that the tentative R fails to be compatible with the accumulated output levels on the first try. This occurred on all except one of the iterations of the example but cannot be expected to happen so often with real systems. What is more, on certain iterations a number of successive modifications of R may be necessary as the accumulated outputs of various sectors hit their respective thresholds.

EMPIRICAL DETERMINATION OF PARAMETERS

Whether distinct input and output matrices are kept only at the model construction stage or their separate existence is maintained right through the applications, one of the main objectives in designing the system is attained. It was to give it such a formulation that the data it requires correspond as closely as possible to the format in which they arise in the normal course of production and exchange. This applies also to the results which constitute the solution. They will be comparable to current routine statistics.

The information needed to specify the various modifications cannot be obtained solely by observing interindustry flows in any given year, except perhaps where these are measured at a level of detail greater than that adopted for the system itself. This information must come from the experience of other regions, from engineering and institutional data and, it may be hoped, from the analysis of establishment statistics. Probably time-series data will be of use only if they are available at a very fine level of detail.

This present article puts a good deal of emphasis on separating the supposedly stable production relations from the supposedly unstable commercial and institutional arrangements. However, this is no more than a particular application of a more fundamental principle. The basic idea is to keep separate on the one hand relations which are permanent or autonomous, and on the other the more or less accidental relations which deal with the way in which the unchangeable components combine in particular situations. The procedure then is to carry out *ad hoc* aggregations for special purposes without distorting the basic data which will be preserved, accumulated and transferred in their original format. Modern equipment and the "software" that has grown around it make this perfectly feasible.

There is no logical reason to consider all commercial and institutional relations as necessarily less fundamental than production relations. Certain commercial arrangements seem remarkably persistent. The steady flow of heavy purchases of business services by Canadian branches from their parent corporations in the United States may serve as an example. Wherever uniform quality and regularity of component deliveries are important we may expect to find rather stable relations with supplies and subcontractors. This is particularly visible in industries where raw materials are responsible for a small part of the total cost and where mass production and/or working to strict deadlines and rigid quality standards are the rule. Some of the Quebec examples one may cite are aircraft manufacture and certain food processing industries.

This tendency may be expected to grow with time as the actual physical content of output becomes less and less important. We have perhaps inherited from the past an undue respect for material goods, although in fact they represented the main constraints, and we may tend to overlook the possibilities and requirements of efficient organization and timing of production activities.

USES OF THE SYSTEM

As has been pointed out the proposed system is not designed to yield general solutions of the kind associated with the inverses of Leontief matrices. Its standard use is intended to be the calculation of activity levels of the production sectors and of total demands for various products together with their auxiliary vectors, corresponding to a given final demand. With minor adjustments to the programme these results may be summarized into the main components of the Gross Domestic Product.

Competitive imports corresponding to a given final demand come out classified by products. It would make a fairly substantial modification of the programme and would slow down computations if competitive imports were to be calculated also by the consuming sector. In general the arrangement whereby exchanges between sectors are channelled through a system of markets cannot be easily reconciled with the concepts of commodity ("product") balance equations.

Non-competitive imports are treated as a primary input. The original programme will compute their total only. It will not be difficult to give in addition their break-down by commodity groups or even by country of origin—although some additional assumptions will have to be made in the latter case.

An option is provided in the programme for recording primary inputs including non-competitive imports by sectors. Because of the non-proportionalities these have to be accumulated step by step. Since they play no role in further calculations the increases of primary inputs by sectors are put on tape at each iteration to be added up later.

The programme is such that it can reconstruct at any iteration the appropriate A and R (and B and Q) matrices according to the expressions (8) and (9) given in "Un système rectangulaire". It is thus not necessary to start always with zero vectors. On the contrary it is intended that most application will consist in calculating the marginal effects of a given increase in final demand. This will require a detailed specification of the initial state of the system. The model however cannot be run backwards: the final demand vectors actually fed in can have no negative elements. Among other things this somewhat complicates the calculation of trade-offs between different final demand categories.

One may regret the absence of general solutions. However, this is the price paid for relaxing some of the more rigid assumptions of the usual input-output models. It is of course possible to collapse the system into a square form, assume fixed coefficients, and thus return to the traditional model.

If the system is to be used to prepare decisions it does not seem possible to adapt it so that some systematic optimization procedure could be applied to it. One will have to follow the simulation practice of working out the probable consequences of a small number of different choices and comparing them subjectively. This is perhaps not so unsatisfactory as it may look. In real situations, when most of the constraints are taken into account, the domain of choice may well turn out to be so restricted that such a procedure will lead into close vicinity of the rigorous optimum.

The autonomy of the various parameters and relations of the system should justify its use for analysis of structural change. Such analysis will be facilitated by its flexibility and in particular by the breakdown of computations into blocks relating to individual sectors and to individual markets. One can change the number of sectors and of markets and also alter the rules of column modifications.

LIMITATIONS OF THE PROPOSED SYSTEM

The system was designed for the particular needs of the government of Quebec. Its emphasis on the propagation of demand and its neglect of possible supply difficulties have already been mentioned. Reference has also been made to rather obvious possible improvements like the replacement of step functions by more sophisticated ones and the incorporation of stochastic elements.

More fundamental objections stem from the ambiguity of the very concept of the input coefficient. The use of rectangular matrices and the abandoning of the proportionality assumption do not go far enough to remove it. Does the use of producers' prices for outputs and consumers' prices for inputs really lead to more stable coefficients? Should calculations be made in constant or in current prices? If the latter, how should these prices be arrived at? Then there is the question of closing the system so that final demand feeds on the incomes created by the productive sectors.

Most of these problems, including that of the proper handling of capacity restrictions and of other supply difficulties, seem to converge around the necessity of introducing a time dimension into the calculations. Even the fundamental relations between inputs and outputs involve lags, planning horizons and rates of change in the levels of activity. It appears that perhaps the most fruitful line to follow will be that of introducing realistic time-phasing into models of the kind discussed here.

ANNEX I

General scheme of computation and numerical example

A. GENERAL SCHEME OF COMPUTATION

Computation starts with an initial projection of either vector $\begin{Bmatrix} Y^0 \\ \cdots \\ Z^0 \end{Bmatrix}$ (final demand arranged in the commodity space; Z designates a vector of primary production factors) or $\begin{Bmatrix} X^0 \\ \cdots \\ U^0 \end{Bmatrix}$ (the same final demand arranged in the activity space; U involves elements such as indirect taxes and competitive imports). In fact X^0 alone can trigger off computation; Y^0, $Z^0$and U^0 are necessary only as the initial terms to be added into the cumulation of iteration results.

Once iterative computation starts it holds at each (k–th) step of iteration that:

$$\begin{Bmatrix} Y^k \\ \cdots \\ Z^k \end{Bmatrix} = \begin{Bmatrix} A^k \\ \cdots \\ B^k \end{Bmatrix} X^{k-1} \qquad (k = 1, 2, \ldots\ldots)$$

or

$$\begin{Bmatrix} X^k \\ \cdots \\ U^k \end{Bmatrix} \quad \begin{Bmatrix} R^k \\ \cdots \\ Q^k \end{Bmatrix} Y^k \qquad (k = 1, 2, \ldots\ldots)$$

where A^k, B^k, R^k and Q^k are matrices of "marginal" coefficients determining the increments of requirements between steps of iteration in the commodity space and in the activity space, respectively. Coefficients may change also within an iteration.

The solution consists of the following summation:

$$\begin{Bmatrix} X \\ \cdots \\ U \end{Bmatrix} = \sum_{k=0}^{\infty} \begin{Bmatrix} X^k \\ \cdots \\ U^k \end{Bmatrix}$$

and

$$\begin{Bmatrix} Y \\ \cdots \\ Z \end{Bmatrix} = \sum_{k=0}^{\infty} \begin{Bmatrix} Y^k \\ \cdots \\ Z^k \end{Bmatrix}$$

Coefficients are subject to modifications in the course of iteration in which cumulative levels of X's increase step by step. The marginal input coefficients at the k-th iteration are generally determined as functions of three arguments:

$$A^k = A\left(\sum_{g=0}^{k-1} X^g \ , \ \sum_{g=0}^{k-1} B^{g+1}\hat{X}^g \ , \ R^{k-1}\hat{Y}^{k-1}\right)$$

B^k are determined according to similar arguments. The marginal coefficients of market share at the k-th iteration are also given by:

$$R^k = R\left(\sum_{g=0}^{k} Y^g \ , \ A^k\hat{X}^{k-1} \ , \ \sum_{g=0}^{k} X^g\right)$$

Q^k is similarly modified in the course of iteration.

B. NUMERICAL EXAMPLE (WITH ARTIFICIAL DATA)

1. *Dimensions*

Vectors:		elements correspond to:
X	5×1	sectors
Y	7×1	products
Z	2×1	primary goods
U	2×1	indirect taxes competitive imports
Matrices:		
A	7×5	
B	2×5	
R	5×7	
Q	2×7	

2. *Input matrices, A and B*

Here, columns of B appear below the corresponding columns of A.

Column 1: changes determined by the cumulative level of X_1, including X_1^{k-1}

Thresholds:

	$0 \leq X_1 \leq 1.0$	$1.0 < X_1 \leq 2.5$	$2.5 < X_1 \leq 4.0$	$4.0 < X_1 \leq 100.0$
1.	·300	·200	·200	·200
2.	·000	·000	·000	·000
3.	·200	·200	·200	·100
4.	·000	·000	·000	·000
5.	·100	·200	·300	·300
6.	·100	·100	·100	·100
7.	·000	·000	·000	·000
1.	·200	·100	·100	·200
2.	·100	·200	·100	·100

Column 2: change determined by the cumulative level of $b_{12}X_2$, including $b_{12}X_2^{k-1}$

Thresholds:

	$0 \le b_{12}X_2 \le .4$	$.4 \le b_{12}X_2 \le 100.0$
1.	·000	·000
2.	·300	·200
3.	·100	·100
4.	·000	·000
5.	·000	·000
6.	·300	·200
7.	·000	·000
1.	·100	·200
2.	·200	·300

Column 3: weighting determined by the product mix

Weights:

	$\frac{r_{3.5}^{k-1} \; Y_5^{k-1}}{D_3^{k-1}}$	$\frac{r_{3.1}^{k-1} \; Y_1^{k-1} \; r_{3.4}^{k-1} \; Y_4^{k-1}}{D_3^{k-1}}$
1.	·100	·000
2.	·000	·000
3.	·300	·200
4.	·200	·300
5.	·000	·000
6.	·000	·000
7.	·200	·200
1.	·100	·200
2.	·100	·100

where D_3^{k-1} is such that the sum of weights = 1.

Column 4: change determined by the cumulative level of X_4, including X_4^{k-1}, and weighting determined by the product mix.

Weights:	$\frac{r_{4.6}^{k-1} \; Y_6^{k-1}}{D_4^{k-1}}$		$\frac{r_{4.3}^{k-1} \; Y_3^{k-1}}{D_4^{k-1}}$	
Thresholds:	$0 \le X_4 \le 5.0$	$5.0 < X_4 \le 100.0$	$0 \le X_4 \le 5.0$	$5.0 < X_4 \le 100.0$
1.	·000	·000	·100	·100
2.	·100	·100	·100	·100
3.	·000	·000	·000	·000
4.	·000	·000	·000	·000
5.	·300	·400	·200	·200
6.	·100	·100	·000	·000
7.	·200	·200	·300	·400
1.	·200	·100	·200	·100
2.	·100	·100	·100	·100

where D_4^{k-1} is such that the sum of weights = 1.

Column 5: no changes; product 2. is a by-product of this sector, hence the corresponding coefficient is negative.

1.	·200
2.	−·100
3.	·000
4.	·200
5.	·000
6.	·200
7.	·100
1.	·300
2.	·100

3. *Output matrices. R and Q*

Here, columns of *Q* appear below the corresponding columns of *R*.

Column 1: change determined by the cumulative level of X_1, including X_1^k

Thresholds:

	$0 \leq X_1 \leq 6.0$	$6.0 < X_1 \leq 100.0$
1.	·500	·000
2.	·000	·000
3.	·200	·300
4.	·000	·000
5.	·100	·100
1.	·100	·200
2.	·100	·400

Column 2: change determined by the cumulative level of X_1, including X_1^k, and weighting determined by sector-mix.

Weights:

	$\frac{a_{2.2}^k \; X_2^{k-1}}{F_2^{k-1}}$		$\frac{a_{2.4}^k \; X_4^{k-1}}{F_2^{k-1}}$	
Thresholds:	$0 \leq X_1 \leq 6.0$	$6.0 < X_1 \leq 100.0$	$0 \leq X_1 \leq 6.0$	$6.0 < X_1 \leq 100.0$
1.	·600	·000	·700	·000
2.	·000	·000	·000	·000
3.	·000	·000	·000	·000
4.	·000	·000	·000	·000
5.	·100	·100	·100	·200
1.	·100	·200	·100	·200
2.	·200	·700	·100	·600

where F_2^{k-1} is such that the sum of weights = 1.

Column 3: changes determined by the cumulative level of X_4, including X_4^k, and by the cumulative level of X_2, including X_2^k.

Thresholds of X_4:	$0 \leq X_4 \leq 10.0$	$0 \leq X_4 \leq 10.0$	$10.0 < X_4 \leq 100.0$	$10.0 < X_4 \leq 100.0$
Thresholds of X_2:	$0 \leq X_2 \leq 7.0$	$7.0 < X_2 \leq 100.0$	$0 \leq X_2 \leq 7.0$	$7.0 < X_2 \leq 100.0$
1.	·000	·000	·000	·000
2.	·500	·000	·600	·000
3.	·000	·000	·000	·000
4.	·200	·400	·000	·000
5.	·200	·200	·200	·200
1.	·100	·100	·100	·200
2.	·000	·300	·100	·600

Column 4: change determined by the cumulative level of X_2 including X_2^k and weighting determined by sector mix.

Weights:

$$\frac{a_{4.3}^k \; X_3^{k-1}}{F_4^{k-1}} \qquad \frac{a_{4.5}^k \; X_5^{k-1}}{F_4^{k-1}}$$

Thresholds:

	$0 \leq X_2 \leq 7.0$	$7.0 < X_2 \leq 100.0$	$0 \leq X_2 \leq 7.0$	$7.0 < X_2 \leq 100.0$
1.	·000	·000	·000	·000
2.	·200	·000	·100	·000
3.		·300	·400	·400
4.	·000	·000	·000	·000
5.	·200	·100	·100	·100
1.	·200	·200	·200	·200
2.	·100	·400	·200	·300

where F_4^{k-1} is such that the sum of weights = 1.

Column 5: no changes.

1.	·000
2.	·000
3.	·500
4.	·000
5.	·100
1.	·100
2.	·300

Column 6: change determined by the cumulative level of X_4 including X_4^k.

Thresholds:

	$0 \leq X_4 \leq 10.0$	$10.0 < X_4 \leq 100.0$
1.	·000	·000
2.	·000	·000
3.	·000	·000
4.	·600	·000
5.	·100	·100
1.	·100	·300
2.	·200	·600

Column 7: change determined by the cumulative level of X_2, including X_2^k.

Thresholds:

	$0 \leq X_2 \leq 7.0$	$7.0 < X_2 \leq 100.0$
1.	·000	·000
2.	·200	·000
3.	·000	·000
4.	·000	·000
5.	·500	·600
1.	·200	·200
2.	·100	·200

4. *Summary of column modifications*

Matrices *A* and *B*:

Column 1: thresholds on $\sum_{g=0}^{k-1} X_1^g$

(capacity constraint $X_1 \leq 6.0$)

Column 2: threshold on $\sum_{g=0}^{k-1} b_{1.2}^{g+1} X_2^g$

(capacity constraint $X_2 \leq 7{\cdot}0$)

Column 3: weighting determined by product-mix

Column 4: threshold on $\sum_{g=0}^{k-1} X_4^g$

(capacity constraint $X_4 \leq 10.0$)

weighting determined by product-mix

Column 5: no changes
(this sector has one by-product).

Matrices R and Q:

Column 1: threshold on $\sum_{g=0}^{k} X_1^g$

Column 2: threshold on $\sum_{g=0}^{k} X_1^g$

weighting determined by sector-mix

Column 3: thresholds on $\sum_{g=0}^{k} X_2^g$ and $\sum_{g=0}^{k} X_2^g$

Column 4: threshold on $\sum_{g=0}^{k} X_4^g$

weighting determined by sector-mix

Column 5: no changes

Column 6: threshold on $\sum_{g=0}^{k} X_4^k$

Column 7: threshold on $\sum_{g=0}^{k} X_2^k$.

5. *Final demand*

	Y_0
1.	2·0
2.	2·0
3.	4·0
4.	4·0
5.	4·0
6.	2·0
7.	2·0

	X_0
1.	2·0
2.	5·0
3.	2·0
4.	4·0
5.	3·0

	Z_0
1.	1·0
2.	·0

	U_0
1.	2·0
2.	2·0

Rows 3 and 4 of R_0—necessary to determine product-mix weights of columns 3 and 4 of A_1

R_0

	1.	2.	3.	4.	5.	6.	7
2.	—	—	—	—	—	—	—
3.	·200	·000	·000	·100	·300	·000	·000
4.	·000	·000	·700	·000	·000	·600	·000
5.	—	—	—	—	—	—	—

6. *Solution*

Accumulation of Y and Z

Iterations

	0.	1.	2.	3.	4.	5.	6.	7.	8.
1.	2·000	3·500	4·323	4·693	4·882	4·969	5·006	5·022	5·029
2.	2·000	3·500	3·714	3·820	3·831	3·823	3·919	3·817	3·816
3.	4·000	5·420	6·199	6·584	6·828	6·791	6·819	6·831	6·836
4.	4·000	5·080	5·804	6·224	6·436	6·541	6·589	6·610	6·619
5.	4·000	5·220	6·206	6·630	6·837	6·922	6·955	6·970	6·976
6.	2·000	4·320	5·268	5·707	5·886	5·958	5·989	6·003	6·009
7.	2·000	3·780	4·612	5·069	5·311	5·424	5·473	5·494	5·503
1.	1·000	3·880	5·353	6·061	6·396	6·542	6·608	6·635	6·647
2.	·000	2·300	3·379	3·893	4·087	4·160	4·192	4·206	4·212

Accumulation of X and U

Iterations

	0.	1.	2.	3.	4.	5.	6.	7.	8.
1.	2·000	3·683	4·232	4·486	4·588	4·626	4·642	4·649	4·651
2.	5·000	6·221	6·882	7·000	7·000	7·000	7·000	7·000	7·000
3.	2·000	3·294	4·209	4·640	4·855	4·952	4·993	5·011	5·018
4.	4·000	5·676	6·401	6·792	6·957	7·025	7·055	7·068	7·074
5.	3·000	4·984	5·958	6·477	6·731	6·846	6·895	6·916	6·925
1.	2·000	3·368	4·054	4·402	4·566	4·640	4·672	4·686	4·692
2.	2·000	3·593	4·390	4·929	5·213	5·339	5·393	5·417	5·427

Accumulation of $b_{1,2}\ X_2$

Iterations

1.	2.	3.	4.	5.	6.	7.	8.
·600	·841	·974	1·001	1·001	1·001	1·001	1·001

0th iteration

X_0, U_0, Y_0, and Z_0 are those of final demand (see above)

Product-mix information:

$r^0_{3.1}Y^0_1$	$r^0_{3.4}Y^0_4$	$r^0_{3.5}Y^0_5$	$r^0_{4.3}Y^0_3$	$r^0_{4.6}Y^0_6$
·400	·400	1·200	2·800	1·200

1st iteration

Y_1 and Z_1		X_1 and U_1	
1.	1·500	1.	1·683
2.	1·500	2.	1·221
3.	1·420	3.	1·294
4.	1·080	4.	1·676
5.	1·220	5.	1·984
6.	2·320		
7.	1·780		
1.	2·880	1.	1·368
2.	2·300	2.	1·593

Sector-mix information:

$a^1_{2.2}X^0_2$	$a^1_{2.4}X^0_4$	$a^1_{4.3}X^0_3$	$a^1_{4.5}X^0_5$
1·400	·400	·480	·600

Product-mix information:

$r^1_{3.1}Y^1_1$	$r^1_{3.4}Y^1_4$	$r^1_{3.5}Y^1_5$	$r^1_{4.3}Y^1_3$	$r^1_{4.6}Y^1_6$
·300	·384	·610	·284	1·392

2nd iteration

	Y_2 and Z_2		X_2 and U_2
1.	·823	1.	·549
2.	·214	2.	·661
3.	·779	3.	·915
4.	·724	4.	·725
5.	·986	5.	·974
6.	·948		
7.	·832		
1.	1·473	1.	·686
2.	1·079	2.	·797

Sector-mix information:

$a^2_{2.2}X^1_2$	$a^2_{2.4}X^1_4$	$a^2_{4.3}X^1_3$	$a^2_{4\cdot5}X^1_5$
·244	·168	·327	·397

Product-mix information:

$r^2_{3.1}Y^2_1$	$r^2_{3.4}Y^2_4$	$r^2_{3\cdot5}Y^2_5$	$r^2_{4\cdot3}Y^2_3$	$r^2_{4\cdot6}Y^2_6$
·165	·257	·493	·156	·569

3rd iteration

1.	·370	1.	·086 + ·168 = ·254
2.	·106	2.	·118 + ·000 = ·118
3.	·385	3.	·146 + ·285 = ·431
4.	·420	4.	·115 + ·276 = ·391
5.	·424	5.	·171 + ·348 = ·519
6.	·439		
7.	·457		
1.	·708	1.	·118 + ·230 = ·348
2.	·514	2.	·127 + ·412 = ·539

Sector-mix information:

$a^3_{2.2}X^2_2$	$a^3_{2.4}X^2_4$	$a^3_{4.3}X^2_3$	$a^3_{4.5}X^2_5$
·132	·072	·225	·195

N.B. X_3 and U_3 are the sum of two vectors, the first being $\frac{R^{*}}{Q^{*}} \times .374\ Y_3$ and the second $\frac{R^{**}}{Q^{**}} \times .626\ Y_3$

Product-mix information:

$r^3_{3.1}Y^3_1$	$r^3_{3.4}Y^3_4$	$r^3_{3.5}Y^3_5$	$r^3_{4.3}Y^3_3$	$r^3_{4.6}Y^3_6$
·025	·049	·072	·026	·089
·049	·096	·140	·102	·174
·074	·145	·212	·128	·263

4th iteration

	Y_4 and Z_4		X_4 and U_4
1.	·189	1.	·102
2.	·011	2.	·000
3.	·144	3.	·215
4.	·212	4.	·165
5.	·207	5.	·254
6.	·179		
7.	·242		
1.	·335	1.	·164
2.	·194	2.	·284

Sector-mix information:

$a^4_{2.2}X^3_2$	$a^4_{2.4}X^3_4$	$a^4_{4.3}X^3_3$	$a^4_{4.5}X^3_5$
·024	·039	·108	·104

Product-mix information:

$r^4_{3.1}Y^4_1$	$r^4_{3.4}Y^4_4$	$r^4_{3.5}Y^4_5$	$r^4_{4.3}Y^4_3$	$r^4_{4.5}Y^4_5$
·037	·074	·104	·058	·107

5th iteration

	Y_5 and Z_5		X_5 and U_5
1.	·087	1.	·038
2.	—·008	2.	·000
3.	·063	3.	·097
4.	·105	4.	·068
5.	·085	5.	·115
6.	·072		
7.	·113		
1.	·146	1.	·074
2.	·073	2.	·126

Sector-mix information:

$a^5_{2.2}X^4_2$	$a^5_{2.4}X^4_4$	$a^5_{4.3}X^4_3$	$a^5_{4.5}X^4_5$
·000	·017	·054	·051

Product-mix information:

$r^5_{3.1}Y^5_1$	$r^5_{3.4}Y^5_4$	$r^5_{3.5}Y^5_5$	$r^5_{4.3}Y^5_3$	$r^5_{4.6}Y^5_6$
·017	·037	·043	·025	·043

6th iteration

	Y_6 and Z_6		X_6 and U_6
1.	·037	1.	·016
2.	—·004	2.	·000
3.	·028	3.	·041
4.	·048	4.	·030
5.	·033	5.	·049
6.	·031		
7.	·049		
1.	·066	1.	·032
2.	·032	2.	·054

Sector-mix information:

$a^6_{2.2}X^5_2$	$a^6_{2.4}X^5_4$	$a^6_{4.3}X^5_3$	$a^6_{4.5}X^5_5$
·000	·007	·025	·023

Product-mix information:

$r^6_{3.1}Y^6_1$	$r^6_{3.4}Y^6_4$	$r^6_{3.5}Y^6_5$	$r^6_{4.3}Y^6_3$	$r^6_{4.6}Y^6_6$
·007	·017	·017	·011	·019

7th iteration

	Y_7 and Z_7		X_7 and U_7
1.	·016	1.	·007
2.	—·002	2.	·000
3.	·012	3.	·018
4.	·021	4.	·013
5.	·015	5.	·021
6.	·014		
7.	·021		
1.	·027	1.	·014
2.	·014	2.	·024

Sector-mix information:

$a^7_{2.2}X^6_2$	$a^7_{2.4}X^6_4$	$a^7_{4.3}X^6_3$	$a^7_{4.5}X^6_5$
·000	·003	·011	·010

Product-mix information:

$r^7_{3.1}Y^7_1$	$r^7_{3.4}Y^7_4$	$r^7_{3.5}Y^7_5$	$r^7_{4.3}Y^7_3$	$r^7_{4.6}Y^7_6$
·003	·007	·008	·005	·008

8th iteration

	Y_8 and Z_8		X_8 and U_8
1.	·007	1.	·002
2.	—·001	2.	·000
3.	·005	3.	·007
4.	·009	4.	·006
5.	·006	5.	·009
6.	·006		
7.	·009		
1.	·012	1.	·006
2.	·006	2.	·010

Sector-mix information:

$a^8_{2.2}X^7_2$	$a^8_{2.4}X^7_4$	$a^8_{4.3}X^7_3$	$a^8_{4.5}X^7_5$
·000	·001	·006	·004

Product-mix information:

$r^8_{3.1}Y^8_1$ $r^8_{3.4}Y^8_4$ $r^8_{3.5}Y^8_5$ $r^8_{4.3}Y^8_3$ $r^8_{4.6}Y^8_6$

ANNEX II

A preview of the national accounts system of Quebec

With the permission of the Ministry of Industry and Trade of the Government of Quebec a small excerpt from the interim results of the 1961 input-output compilation is given in this annex.

Table 1 presents the general scheme of compilation for the national accounts system of Quebec, of which the rectangular input-output table is an integral part. In this table the sign + indicates positive entry and relates to the system of markets or output matrices *R* and *S* mentioned in the text. The sign − indicates negative entry and relates to the input structure of each productive sector (and the structure of expenditures of each final demand sector). When the entry appears in parentheses it is the non-additive type of information and is not included in the numerical total of row and column. A column or row which has no additive entry is therefore non-additive. The sign × indicates that there is no entry by definition.

Quadrant I has nearly 300 row sectors (commodities) coded in accordance with the Canadian SIC, and 59 column sectors (industries). The cross-classification of these sectors in the commodity space and in the industry space is given in table 2.

In table 3 the preliminary estimates of the output vector and of the input vector are shown for each of the seven selected column sectors. These sectors are:

No. 11. Bakery and confectionery (=SIC 1280, 1291)
No. 14. Distillery, brewery, winery (=SIC 1430m 1450, 1470)
No. 15. Tobacco manufacture (=SIC 1510, 1530)
No. 19. Cotton spinning and weaving (=SIC 1830)
No. 24. Furniture and fixtures (=SIC 2610, 2640, 2660, 2680)
No. 29. Iron and steel mills (=SIC 2910)
No. 33. Metal stamping, pressing and coating (=SIC 3040)

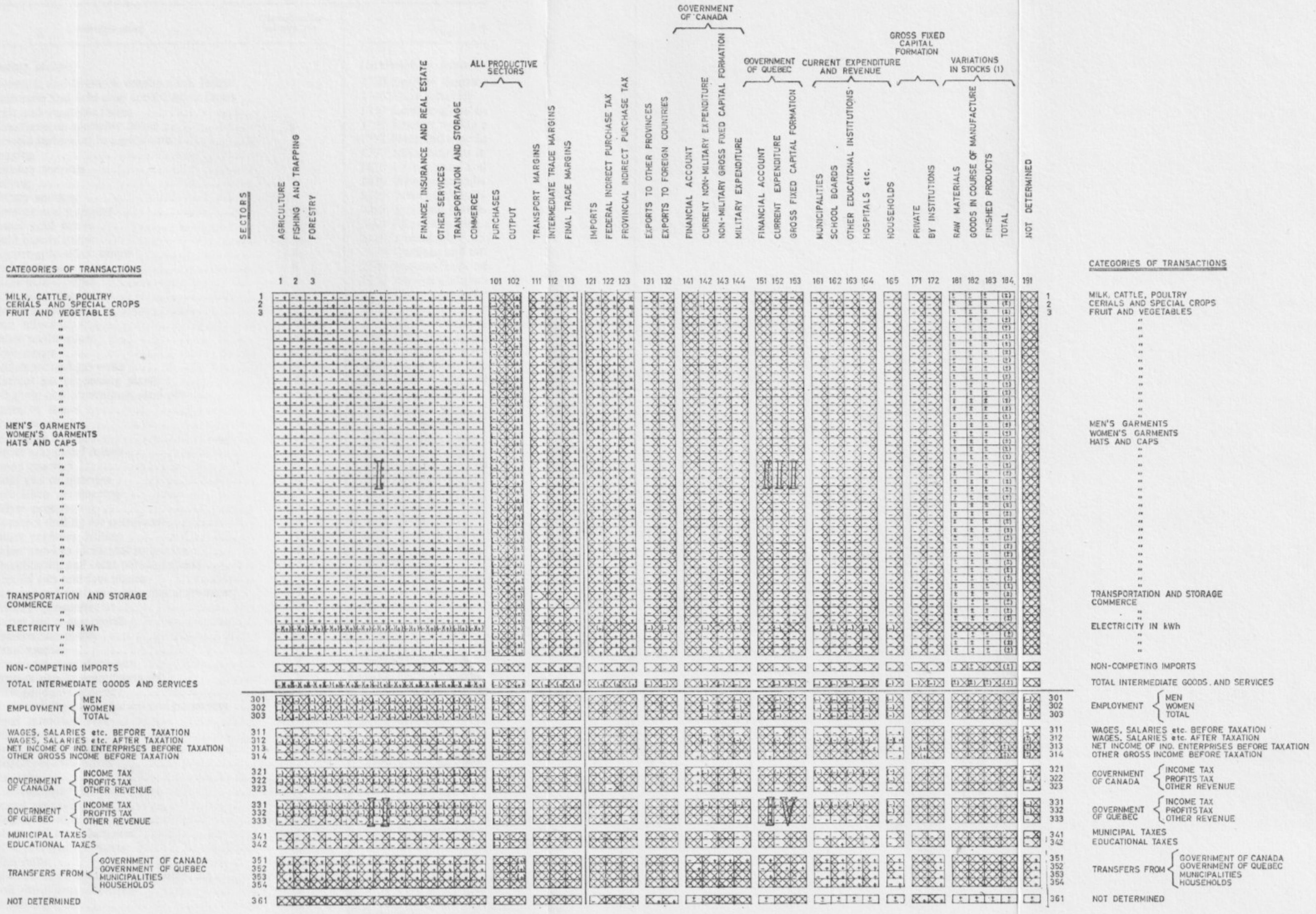
Shipments are valued at f.o.b. at establishments. The costs of transport to purchasers are treated as the purchase of transport services by the latter, so that the inputs from rows 5060 and 5070 appear as non-additive entries at this stage of compilation. Similarly, indirect taxes, even if they are paid by sellers, are charged to purchasers of goods and services. While the estimates shown for these seven sectors are still preliminary, they are among those which are relatively quickly established and any revisions are expected to be of a minor order.

The product-mix of output and the structure of input are shown in table 3 both in terms of values (thousands of Canadian dollars) and in terms of coefficients (6-digit decimal fractions). Primary inputs or elements of value-added are coded by the letters I, W, P, T_1, T_2, S, and R.

ANNEX TABLE 1: ACCOUNTS SYSTEM FOR QUEBEC

ACCOUNTS SYSTEM FOR QUEBEC

PATTERN OF ECONOMIC ACCOUNTS TABLE



+ INDICATES A POSITIVE ITEM — INDICATES A NEGATIVE ITEM ( ) INDICATES THAT THE ITEM THUS MARKED IS NOT PART OF THE TOTAL OF THE LINE AND/OR COLUMN x INDICATES AN ITEM THAT IS IPSO FACTO ZERO

N.B. A LINE (COLUMN) IS NON-ADDITIVE IF IT CONTAINS NO ADDITIVE ITEMS

(1) EXCLUDING STOCKS HELD BY THE TERTIARY AND FINAL DEMAND SECTORS

MINISTRY OF INDUSTRY AND COMMERCE, STATISTICS OFFICE FOR QUEBEC, RESEARCH DIRECTORATE.
ECONOMICS DEPARTMENT, ECONOMETRICS LABORATORY, LAVAL UNIVERSITY

(REVISED JULY 1967)

ANNEX TABLE 2: CLASSIFICATION OF COMMODITIES AND INDUSTRIES FOR RECTANGULAR TABULATION
(*Tentative*)

Commodity space	*Corresponding industry No.*
(*Intermediate sectors*)	
0110 Livestock and livestock combination farms	1
0130 Field crop and field crop combination farms	1
0150 Fruit and vegetable farms	1
0190 Miscellaneous speciality farms	1
0210 Services incidental to agriculture	1
0310 Logging	3
0390 Forestry services	3
0410 Fishing	2
0450 Fishery services	2
0470 Hunting and trapping	2
0510 Placer gold mines	4
0520 Gold quartz mines	4
0530 Copper-gold-silver mines	4
0540 Nickel-copper mines	4
0550 Silver-cobalt mines	4
0560 Silver-lead-zinc mines	4
0570 Uranium mines	4
0580 Iron mines	4
0590 Other metal mines	4
0610 Coal mines	4
0630 Petroleum and gas wells	4
0650 Natural gas processing plants	4
0660 Oil shale and bituminous sand pits	4
0710 Asbestos mines	5
0730 Gypsum mines	5
0770 Salt mines	5
0790 Other non-metal mines	5
0830 Stone quarries	6
0870 Sand pits or quarries	6
0920 Petroleum prospecting	5
0940 Other prospecting	5
0960 Contract drilling for petroleum	5
0980 Other contract drilling	5
0990 Other services incidental to mining	5
1011 Slaughtering and meat-packing plants	7
1012 Animal oils and fats plants	7
1013 Sausage and sausage-casing manufacturers	7
1030 Poultry processors	7
1051 Butter and cheese plants	8
1053 Pasteurizing plants	8
1055 Condenseries	8
1056 Ice cream manufacturers	8
1070 Process cheese manufacturers	8
1110 Fish products industry	12
1120 Fruit and vegetable canners and preservers	9
1230 Feed manufacturers	10
1240 Flour mills	10
1250 Breakfast cereal manufacturers	10
1280 Biscuit manufacturers	11
1291 Bakeries	11
1310 Confectionery manufacturers	12
1330 Sugar refineries	12
1350 Vegetable oil mills	12
1391 Macaroni manufacturers	12
1393 Malt and malt products	12
1394 Rice mills	12
1396 Miscellaneous food manufacturers	12
1410 Soft drink manufacturers	13
1430 Distilleries	14
1450 Breweries	14
1470 Wineries	14
1510 Leaf tobacco processing	15
1530 Tobacco products manufacturers	15
1610 Rubber footwear manufacturers	16
1630 Rubber tire and tube manufacturers	16
1690 Other rubber industries	16
(*Intermediate sectors*)	
1720 Leather tanneries	17
1740 Shoe factories	17
1750 Leather glove factories	17
1791 Leather belting manufacturers	17
1792 Boot and shoe findings manufacturers	17
1799 Miscellaneous leather products manufacturers	17
1830 Cotton yarn and cloth mills	19
1930 Wool yarn mills	22
1970 Wool cloth mills	22
2010 Synthetic textile mills	18
2110 Fibre-preparing mills	22
2120 Thread mills	22
2130 Cordage and twine industry	22
2140 Narrow fabric mills	22
2150 Pressed and punched felt mills	22
2160 Carpet, mat and rug industry	22
2180 Textile dyeing and finishing plants	22
2190 Linoleum and coated fabrics industry	22
2210 Canvas products industry	22
2230 Cotton and jute bag industry	22
2291 Automobile fabric accessory manufacturers	22
2292 Embroidery, pleating and hemstitching manufacturers	22
2299 Miscellaneous textiles industry not elsewhere classified	22
2310 Hosiery mills	20
2390 Other knitting mills	20
2420 Custom tailoring shops	21
2431 Men's clothing factories	21
2432 Men's clothing contractors	21
2441 Women's clothing factories	21
2442 Women's clothing contractors	21
2450 Children's clothing industry	21
2460 Fur goods industry	21
2470 Hat and cap industry	21
2480 Foundation garment industry	21
2491 Fabric glove manufacturers	21
2499 Miscellaneous clothing industry not elsewhere classified	21
2511 Shingle mills	23
2513 Sawmills except shingle mills	23
2520 Veneer and plywood mills	25
2541 Sash and door and planing mills (excluding hardwood flooring)	25
2542 Hardwood flooring	25
2560 Wooden box factories	25
2580 Coffin and casket industry	25
2591 Wood preservation	25
2592 Wood handles and turning	25
2593 Woodenware	25
2594 Cooperage	25
2599 Miscellaneous wood industries not elsewhere classified	25
2610 Household furniture industry	24
2640 Office furniture industry	24
2660 Other furniture industries	24
2680 Electric lamp and shade industry	24
2711 Pulp and paper mills	26
2712 Newsprint	26
2713 Other papers	26
2720 Asphalt roofing manufacturers	27
2731 Folding box and set-up box manufacturers	27
2732 Corrugated box manufacturers	27
2733 Paper bag manufacturers	27
2740 Other paper converters	27
2861 Printing and bookbinding	28

ANNEX TABLE 2: CLASSIFICATION OF COMMODITIES AND INDUSTRIES FOR RECTANGULAR TABULATION (*continued*)
(*Tentative*)

Commodity space	*Corresponding industry No.*
(*Intermediate sectors*)	
2862 Lithographing	28
2871 Engraving and duplicate plates	28
2872 Trade composition or typesetting	28
2880 Publishing only	28
2890 Printing and publishing	28
2910 Iron and steel mills	29
2920 Steel pipe and tube mills	31
2940 Iron foundries	31
2950 Smelting and refining of non-ferrous metals	30
2960 Aluminium rolling, casting and extruding	31
2970 Copper and alloy rolling, casting and extruding	31
2980 Non-ferrous metal rolling, casting and extruding, not elsewhere classified	31
3010 Boiler and plate works	34
3020 Fabricated structural metal industry	32
3030 Ornamental and architectural metal industry	34
3040 Metal stamping, pressing and coating industry	33
3050 Wire and wire-products manufacturers	34
3060 Hardware, tool and cutlery manufacturers	34
3070 Heating equipment manufacturers	34
3080 Machine shops	34
3090 Miscellaneous metal fabricating industries	34
3110 Agricultural implement industry	35
3150 Miscellaneous machinery and equipment manufacturers	35
3160 Commerical refrigeration and air-conditioning equipment manufacturers	35
3180 Office and store machinery manufacturers	35
3210 Aircraft and parts manufacturers	36
3230 Motor vehicle manufacturers	39
3240 Truck body and trailer manufacturers	39
3250 Motor vehicle parts and accessories manufacturers	39
3260 Railroad rolling stock industry	38
3270 Shipbuilding and repair	37
3280 Boatbuilding and repair	37
3290 Miscellaneous vehicle manufacturers	39
3310 Manufacturers of small electrical appliances	40
3320 Manufacturers of major appliances (electric and non-electric)	40
3340 Manufacturers of household radio and television receivers	42
3350 Communications equipment manufacturers	41
3360 Manufacturers of electrical industrial equipment	42
3370 Battery manufacturers	42
3380 Manufacturers of electric wire and cable	41
3390 Manufacturers of miscellaneous electrical products	42
3410 Cement manufacturers	43
3430 Lime manufacturers	43
3450 Gypsum products manufacturers	43
3470 Concrete products manufacturers	43
3480 Ready-mix concrete manufacturers	43
3511 Clay products manufacturers (from domestic clays)	43
3512 Clay products manufacturers (from imported clays)	43
3520 Refractories manufacturers	43
3530 Stone products manufacturers	43
3540 Mineral wool manufacturers	43
3550 Asbestos products manufacturers	44
3561 Glass manufacturers	44
3562 Glass products manufacturers	44
3570 Abrasives manufacturers	44
3590 Other non-metallic mineral products industries	44

Commodity space	*Corresponding industry No.*
(*Intermediate sectors*)	
3651 Petroleum refining	45
3652 Manufacturers of lubricating oils and greases	45
3690 Other petroleum and coal products industries	45
3710 Explosives and ammunition manufacturers	48
3720 Manufacturers of mixed fertilizers	48
3730 Manufacturers of plastics and synthetic resins	47
3740 Manufacturers of pharmaceuticals and medicines	46
3750 Paint and varnish manufacturers	48
3760 Manufacturers of soap and cleaning compounds	46
3770 Manufacturers of toilet preparations	46
3780 Manufacturers of industrial chemicals	48
3791 Manufacturers of printing inks	48
3799 Other chemical industries not elsewhere classified	48
3811 Instrument and related products manufacturers	49
3812 Clock and watch manufacturers	49
3813 Orthopaedic and surgical appliances manufacturers	49
3814 Ophthalmic goods manufacturers	49
3815 Dental laboratories	49
3820 Jewellery and silverware manufacturers	49
3830 Broom, brush and mop industry	49
3840 Venetian blind manufacturers	49
3850 Plastic fabricators not elsewhere classified	49
3931 Sporting goods industry	49
3932 Toys and games industry	49
3950 Fur dressing and dyeing industry	49
3970 Signs and displays industry	49
3981 Button, buckle and fastener industry	49
3982 Candle manufacturers	49
3983 Hair goods manufacturers	49
3984 Artificial flowers and feathers manufacturers	49
3985 Model and pattern manufacturers	49
3986 Musical instruments industry	49
3987 Sound recording industry	49
3988 Typewriter supplies manufacturers	49
3989 Fountain pen and pencil manufacturers	49
3993 Smokers' supplies manufacturers	49
3995 Stamp and stencil (rubber and metal) manufacturers	49
3996 Statuary, art goods, regalia and novelty manufacturers	49
3997 Umbrella manufacturers	49
3998 Artificial ice manufacturers	49
3999 Other miscellaneous industries	49
4040 Building construction	50
4060 Highway, bridge and street construction	51
4090 Other construction	51
4210 Special-trade contractors transportation, communication and other utilities	50
5010 Air transport	53
5020 Services incidental to air transport	53
5040 Water transport	53
5050 Services incidental to water transport	53
5060 Railway transport	53
5070 Truck transport	53
5080 Bus transport, interurban and rural	53
5090 Urban transit systems	53
5120 Taxicab operations	53
5150 Pipeline transport	53
5160 Highway and bridge maintenance	53
5170 Other services incidental to transport	53
5190 Other transportation	53
5240 Grain elevators	53
5270 Other storage and warehousing	53

ANNEX TABLE 2: CLASSIFICATION OF COMMODITIES AND INDUSTRIES FOR RECTANGULAR TABULATION *(continued)*
(Tentative)

Commodity space	*Corresponding industry No.*
(Intermediate sectors)	
5430 Radio and television broadcasting	55
5440 Telephone systems	55
5450 Telegraph and cable systems	55
5480 Post office	55
5720 Electric power	56
5720 Electric power in kilowatt hours	56
5740 Gas distribution	57
5760 Water systems	57
5790 Other utilities	57
6000 Commerce	52
6580 Repairs of motor vehicles at retail shops	52
7020 Savings and credit institutions	58
7040 Investment companies and security dealers	58
7310 Insurance carriers	58
7350 Insurance and real estate agencies	58
7370 Real estate operators	58
8010 Elementary and secondary schools	59
8030 Vocational schools	59
8050 Universities and colleges	59
8070 Libraries, museums and other repositories	59
8090 Education and related services not elsewhere classified	59
8210 Hospitals	59
8230 Offices of physicians	59
8250 Offices of dentists	59
8270 Other health services	59
8280 Welfare organizations	59
8310 Religious organizations	59
8510 Motion picture theatres and film exchanges	59
8530 Bowling alleys and billiard parlours	59
8590 Other recreational services	59
8610 Accountancy service	59
8620 Advertising service	59
8640 Engineering and scientific service	59
(Intermediate sectors)	
8660 Legal service	59
8690 Other services to business management	59
8710 Shoe repair shops	59
8720 Barber and beauty shops	59
8730 Private households	59
8740 Laundries, cleaners and pressers	59
8750 Hotels, restaurants and taverns	59
8760 Lodging houses and residential clubs	59
8770 Funeral directors	59
8780 Dressmaking	59
8790 Other personal services	59
8910 Labour organizations and trade associations	59
8930 Photography	59
8940 Blacksmithing and welding shops	59
8960 Miscellaneous repair shops	59
8970 Services to buildings and dwellings	59
8990 Other miscellaneous services	59
9020 Defence services	59
9090 Other federal administration	59
9310 Provincial administration	59
9510 Local administration	59
9910 Other government offices	59
9990 Unallocated	—
9999 Non-competitive imports	—
I Intermediate goods and sevices, total	—
(Value added)	
W Wages and salaries before taxes	—
P Other incomes before taxes	—
T_1 Indirect taxes, Government of Canada	—
T_2 Other fiscal receipts, Government of Canada	—
S Other fiscal receipts, government of Quebec	—
R Municipal taxes	—

ANNEX TABLE 3: OUTPUTS AND INPUTS FOR SEVEN SELECTED SECTORS, QUEBEC, 1961
(*Value data in thousands of Canadian dollars*)

Code	*Value*	*Coefficient*
11. *Bakery and confectionery*		
Outputs:		
1120	29	202
1280	33,437	233,289
1291	108,960	760,209
1310	606	4,228
1391	134	935
1396	86	600
3150	49	342
4040	28	195
Total	143,329	1,000,000
Inputs:		
0110	262	1,828
0150	1,029[a]	7,179
0190	32	223
0610	138	963
0630	1,114	7,772
0650	55	384
0770	121	844
1011	1,420	9,907
1012	6,031	42,078
1051	428	2,986
1053	192	1,340
1055	608	4,242
1120	1,819	12,691
1240	22,823	159,235
1250	1,161	8,100
1280	61	426
1291	197	1,374
1310	2,061	14,380
1330	5,562	38,806
1350	495	3,454
1393	178	1,242
1396	5,652	39,434
1799	21	147
2230	10	70
2431	163	1,137
2441	12	84
2513	6	42
2731	3,728	26,010
2732	3,344	23,331
2733	1,570	10,954
2740	6,653	46,418
2861	475	3,314
2910	7	49
3010	9	63
3030	51	356
3040	17	119
3050	3	21
3060	176	1,228
3080	990	6,907
3090	7	49
3110	60	419
3150	1,036	7,228
3160	38	265
3240	13	91
3360	10	70
3390	3	21
3561	7	49
3651	1,478	10,312
3652	2	14
3750	4	28
3760	112	781
3780	9	63
3811	4	28
3998	1	7
4040	331	2,309
11. *Bakery and Confectionery—continued*		
Inputs:—*continued*		
4210	26	181
5010	52	363
5040	1	7
5060	(519)[b]	—
5070	(506)[b]	—
5120	7	49
5190	275	1,919
5440	366	2,553
5480	61	426
5720	622	4,340
5720Q	(62,106)[c]	—
5760	124	865
5790	27	188
7310	521	3,635
7370	1,021	7,123
8610	188	1,312
8620	1,462	10,200
8640	132	921
8740	270	1,884
8750	178	1,242
8970	1,113	7,765
8990	1,114	7,772
I	*79,349*	*553,617*
W	40,839	284,932
P	22,054	153,867
T_1	(136)[b]	—
S	199	1,388
R	888	6,196
14. Distillery, brewery and winery		
Outputs:		
1230	1,505	12,996
1396	275	2,375
1430	55,551	479,694
1450	56,438	487,354
1470	392	3,385
2731	283	2,444
3561	2	17
3760	800	6,908
3770	317	2,737
3780	49	423
3799	193	1,667
TOTAL	115,805	1,000,000
Inputs:		
0130	3,582[d]	30,931
0210	4	35
0610	20	172
0630	1	9
0650	1	9
0730	4	35
1120	70	604
1250	212	1,831
1330	688	5,941
1393	7,466	64,470
1396	204	1,762
1430	3,350	28,928
1450	701	6,053
1470	59	509
2431	53	458
2560	43	371
2594	635	5,483
2599	14	121
2720	97	838
2731	2,499	21,579
2740	527	4,551

ANNEX TABLE 3: OUTPUTS AND INPUTS FOR SEVEN SELECTED SECTORS, QUEBEC, 1961 (*continued*)
(*Value data in thousands of Canadian dollars*)

Code	*Value*	*Coefficient*
14. Distillery, brewery and winery—continued		
Inputs:—*continued*		
2861	1,037	8,955
3040	4,310	37,218
3070	1	9
3080	1,652	14,265
3090	147	1,269
3150	882	7,616
3360	46	397
3561	2,926	25,267
3562	49	423
3651	977	8,436
3750	15	130
3760	16	138
3780	812	7,011
3811	33	285
4040	556	4,801
4090	230	1,986
5010	84	725
5040	2	17
5050	21	181
5120	11	95
5160	3	26
5190	448	3,869
5440	227	1,960
5480	33	285
5720	460	3,972
5720 Q	(77,511)[c]	—
5760	463	3,998
5790	300	2,591
6580	27	233
7310	284	2,452
7370	66	570
8610	113	976
8620	4,971	42,926
8640	242	2,090
8740	25	216
8750	290	2,504
8990	135	1,166
I	*42,124*	*363,748*
W	23,639	204,128
P	2,425	20,942
T_2	45,803	395,518
S	247	2,133
R	1,567	13,531
15. Tobacco manufacture		
Outputs:		
1510	6,922	35,703
1530	186,860	963,807
3150	94	485
4040	1	5
TOTAL	193,877	1,000,000
Inputs:		
0130	76,523	394,699
0610	10	52
0630	22	113
0650	6	31
1330	683	3,523
1530	240	1,238
1690	1	5
1799	10	52
2299	4	21
2431	15	77
2513	1	5
2560	80	413
2660	1	5
15. Tobacco Manufacture—continued		
Inputs:—*continued*		
2713	2,346	12,100
2731	8,336	42,996
2732	17	88
2740	7,492	38,643
2861	183	944
2970	5,503	28,384
3040	1,764	9,099
3050	6	31
3060	62	320
3080	1,039	5,359
3090	7	36
3150	269	1,387
3180	1	5
3230	1	5
3310	1	5
3360	33	170
3390	2	10
3651	194	1,001
3652	1	5
3750	1	5
3760	27	139
3770	17	88
3780	194	1,001
3799	1	5
3811	2	10
3850	158	815
4040	909	4,689
4210	586	3,023
5010	89	459
5040	2	10
5060	(719)[b]	—
5070	(697)[b]	—
5120	12	62
5190	474	2,445
5440	183	944
5480	47	242
5720	326	1,681
5720Q	(30,986)[c]	—
5760	51	263
5790	48	248
7310	342	1,764
7370	550	2,837
8610	239	1,233
8620	9,117	47,025
8640	534	2,754
8740	69	356
8750	307	1,583
8990	266	1,372
9090	1	5
I	*119,405*	*615,880*
W	27,132	139,944
P	46,622	240,474
T_1	(312,734)[f]	—
T_2	3	15
S	161	830
R	554	2,857
19. Cotton spinning and weaving		
Outputs:		
1830	162,207	915,028
2010	1,263	7,125
2110	2,099	11,841
2130	3,654	20,612
2299	8,047	45,394
TOTAL	177,270	1,000,000

ANNEX TABLE 3: OUTPUTS AND INPUTS FOR SEVEN SELECTED SECTORS, QUEBEC, 1961 (*continued*)

(*Value data in thousands of Canadian dollars*)

Code	*Value*	*Coefficient*
19. Cotton spinning and weaving—continued		
Inputs:		
0110		23
0130	33,600[e]	189,541
0610	1,023	5,771
0650	44	248
1396	1,107	6,245
1830	51,148	288,532
2010	1,745	9,844
2110	1,476	8,326
2120	21	119
2230	81	457
2560	10	56
2731	122	688
2732	861	4,857
2733	35	197
2740	648	3,655
2861	395	2,228
3040	73	412
3080	2,567	14,481
3150	5,007	28,245
3651	408	2,302
3652	91	513
3780	4,964	28,002
4040	1,042	5,878
5010	37	209
5040	1	6
5060	(479)[b]	—
5070	(641)[b]	—
5120	5	28
5190	199	1,123
5440	152	857
5480	49	276
5720	1,852	10,447
5720Q	(295,108)[c]	—
5760	286	1,613
5790	16	90
7310	150	846
7370	310	1,749
8610	85	479
8620	480	2,708
8640	37	209
8740	33	186
8750	128	722
8990	149	841
I	*110,441*	*623,009*
W	38,004	214,385
P	26,917	151,843
S	39	220
R	1,869	10,543
24. Furniture		
Outputs:		
1690	1	8
2299	603	4,834
2513	739	5,924
2520	196	1,571
2541	64	513
2610	74,857	600,085
2640	8,232	65,991
2660	32,733	262,402
2680	5,970	47,858
2740	25	201
3030	755	6,052
3050	382	3,062
3562	112	898
3799	75	601
TOTAL	124,744	1,000,000

Code	*Value*	*Coefficient*
24. Furniture—continued		
Inputs:		
0310	33	265
0610	68	545
0630	22	176
0650	6	48
1690	1,122	8,994
1720	182	1,459
1830	166	1,330
2120	81	649
2130	18	144
2150	18	144
2190	1,990	15,953
2230	10	80
2299	10,452	83,788
2513	9,914	79,475
2520	8,041	64,460
2541	85	681
2560	103	826
2610	2,920	23,408
2640	24	192
2660	,925	15,432
2680	8	64
2731	915	7,335
2732	1,839	14,742
2733	152	1,219
2740	526	4,216
2861	588	4,714
2910	551	4,417
2920	478	3,832
2960	1,661	13,315
3040	8,020	64,292
3050	3,335	26,735
3060	189	1,515
3080	347	2,782
3090	1,184	9,491
3150	834	6,686
3390	69	553
3562	1,536	12,313
3570	822	6,590
3651	465	3,728
3652	8	64
3750	2,683	21,508
3760	12	96
3799	802	6,429
3811	6	48
3931	3,097	24,827
3985	26	208
4040	791	6,341
5010	51	408
5040	1	8
5060	(127)[b]	—
5070	(114)[b]	—
5190	275	2,205
5440	482	3,864
5480	182	1,459
5720	762	6,109
5720Q	(49,913)[c]	—
5760	48	385
5790	6	48
7310	400	3,207
7370	657	5,267
8610	374	2,998
8620	1,362	10,918
8640	818	6,557
8740	31	249
8750	178	1,427
8990	256	2,052
I	*74,007*	*593,270*

ANNEX TABLE 3: OUTPUTS AND INPUTS FOR SEVEN SELECTED SECTORS, QUEBEC, 1961 (*continued*)
(*Value data in thousands of Canadian dollars*)

Code	*Value*	*Coefficient*
24. *Furniture—continued*		
Inputs—*continued*		
W	43,220	346,470
P	6,848	54,897
T_1	(1,671)[b]	—
S	38	305
R	631	5,058
29. *Iron and steel mills*		
Outputs:		
2910	44,942	1,000,000
TOTAL	44,942	1,000,000
Inputs:		
0310	3	67
0580	10	223
0590	429f	9,546
0610	703	15,642
0630	183	4,072
0790	276	6,141
0830	13	289
1350	37	823
1630	3	67
2230	3	67
2513	146	3,249
2560	240	5,340
2713	94	2,092
2731	13	289
2732	199	4,428
2733	9	200
2740	112	2,492
2910	13,107	291,643
2920	15	334
2960	34	756
2970	1	22
2980	143	3,182
3040	24	534
3050	2,187	48,663
3060	93	2,069
3080	1,952	43,434
3150	509	11,326
3430	108	2,403
3511	129	2,870
3520	537	11,949
3570	83	1,847
3590	262	5,830
3651	667	14,841
3690	311	6,920
3780	190	4,228
3799	253	5,629
4040	448	9,968
4210	791	17,600
5010	21	467
5060	(25)[b]	—
5070	(20)[b]	—
5120	3	67
5190	114	2,537
5440	127	2,826
5480	20	445
5720	2,145	47,728
5720 Q	(534,574)[c]	—
5760	202	4,495
5790	5	111
7310	94	2,091
7370	4	89
8610	40	890
8620	208	4,628
29. *Iron and steel Mills—continued*		
Inputs—*continued*		
8640	87	1,936
8740	3	67
8750	74	1,647
8990	124	2,759
I	*27,588*	*613,858*
W	12,626	280,940
P	4,176	92,920
S	552	12,282
33. *Metal stamping, pressing and coating*		
Outputs:		
2660	195	2,029
2910	226	2,352
2960	143	1,488
2970	194	2,019
2980	145	1,509
3030	7,292	75,888
3040	84,701	881,485
3060	667	6,942
3070	443	4,610
3090	654	6,806
3390	125	1,301
3840	1,304	13,571
TOTAL	96,089	1.000.000
Inputs:		
0310	13	135
0540	148	1,540
0560	569	5,921
0610	9	94
0630	141	1,467
0650	37	385
1750	6	62
2110	7	73
2230	5	52
2513	200	2,081
2560	52	541
2599	855	8,898
2640	1	10
2731	129	1,343
2732	830	8,638
2733	190	1,977
2740	194	2,019
2861	356	3,705
2910	28,170	293,165
2920	313	3,257
2950	10	104
2960	4,861	50,588
2970	596	6,203
2980	566	5,890
3040	8,858	92,185
3050	211	2,196
3060	584	6,078
3080	878	9,137
3090	2	20
3150	1,586	16,506
3250	550	5,724
3360	350	3,642
3562	648	6,744
3651	446	4,642
3652	3	31
3690	6	62
3750	1,446	15,049
3780	454	4,725
3799	1,215	12,645

ANNEX TABLE 3: OUTPUTS AND INPUTS FOR SEVEN SELECTED SECTORS, QUEBEC, 1961 (*continued*)
(*Value data in thousands of Canadian dollars*)

Code	*Value*	*Coefficient*
33. Metal stamping, pressing and coating—continued		
Inputs:—*continued*		
3998	1	10
4040	209	2,175
5010	77	801
5040	2	21
5060	(87)[b]	—
5070	(68)[b]	—
5120	10	104
5190	411	4,277
5440	434	4,517
5480	58	604
5720	490	5,099
5720Q	(50,324)[c]	—
5760	96	999
5790	35	364
7310	226	2,352
7370	189	1,967
8610	182	1,894
8620	479	4,985
8640	84	874
8740	51	531
8750	266	2,769
8990	197	2,050
I	*58,992*	*613,927*
W	25,733	267,804
P	10,292	107,113
T_1	(104)[b]	—
S	57	593
R	1,015	10,563

I—Intermediate goods and services, total; W—Wages and salaries before taxes; P—Other incomes before taxes; T_1—Indirect taxes, Government of Canada; T_2—Other fiscal receipts, Government of Canada; S—Other financial receipts, government of Quebec; R—Municipal taxes.

[a] Of which 890 is nuts.
[c] In kilowatt hours.
[e] Raw cotton.

[b] Distribution costs, not included in total:
[d] Of which 638 is hops.
[f] Manganese.

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Printed in Ireland
68-594 — March 1969 — 3,600

Price : $U.S. 3.50
(or equivalent in other currencies)

United Nations Publication
Sales No. E.68.II.B.14

ID/SER.E/2