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**THE EUROSTAT INPUT-OUTPUT MANUAL IN THE
FRAMEWORK OF THE ESA 95**

Supporting paper submitted by Eurostat

Introduction

1. The 1995 European System of Accounts (ESA) includes an integrated set of supply and use tables as well as symmetric input-output tables. Both types of data sets, together with tables linking the supply and use tables to the sector accounts, form the so called input-output framework as described in Chapter 9 of the ESA 95. For these tables the same concepts and definitions apply as elsewhere in the system. The integration of the supply and use tables in the ESA 95 is one of the new feature of the system. In the former ESA only symmetric input-output tables were part of the system.
2. The tables on the input-output system provide a consistent framework for balancing supply and demand in current and constant prices and offer a more detailed basis for disaggregated economic analysis. With this programme, the input-output system of supply and use tables and symmetric input-output tables has shifted into the center of the compilation of national accounts.

3. As for many other specific fields, the ESA 95 does not provide enough basic information for the compilation of supply and use tables and input-output tables. This is in particular a problem for those countries which have not a sound experience in compiling input-output tables. With the approach of the date for the first data submission of the input-output tables (2002) there was an urgent need for a manual with the aim of:

- describing the best current practices for compilation of the tables;
- proposing harmonised solutions;
- being a complement to the Manual of the United Nations;
- providing a good technical and methodological basis for those countries which have not a sound experience in the compilation of input-output tables.

4. Under the supervision and co-ordination of Eurostat, a manual has been drafted by a task force of experts from the Member States from Austria, Denmark, France, Germany, Netherlands, Spain and United Kingdom. The draft manual has been presented and discussed at the National Accounts Working Party of December 2001 in Luxembourg. The task-force is planning to finalise and to publish the manual by Summer 2002.

Main features of the input –output framework

5. The input-output tables, and in particular the supply and use tables, serve statistical and analytical purposes. They provide firstly a framework for checking the consistency of statistics on flows of goods and services obtained from quite different kinds of statistical sources (industrial surveys, household expenditure inquiries, investment surveys, foreign trade statistics and other statistics). The system serves as a co-ordinating framework for economic statistics, both conceptually for ensuring the consistency of definitions and classifications used and as an accounting framework for ensuring the numerical consistency of data drawn from different sources. The input-output framework is also appropriate for calculating much of the economic data contained in the national accounts and detecting weaknesses. This is particularly important for the decomposition of the flows goods and services into values, prices and volumes with the aim to calculate an integrated set of price and volume measures.

6. As an analytical tool, input-output data are conveniently integrated into macroeconomic models in order to analyse the links between demand and supply, in particular between final demand components and industrial output levels. Input-output analysis also serves a number of other analytical purposes by linking other major statistics (employment, capital, energy, environment) to the system of national accounts. Input-output tables provide in fact the basis for many analyses within the Commission of the European Communities.

7. There are therefore many reasons to have a good input-output system, laid down in a Manual:

The statistical purposes are:

- to identify gaps and inconsistencies in statistics;
- to promote an integrated calculation of economic variables at current and constant prices;
- to assess residually calculated estimates;
- to improve the balancing procedures;
- to enhance the consistency of the account system in general;
- to provide links with the sectoral accounts.

The analytical purposes are:

- to provide valuable information for economic analysis (traditional input-output analysis); and
- to identify analyses that can be carried out on the basis of satellite systems or other extensions to the systems (e.g. capital, labour, energy, pollutants).

8. A fundamental role is played in the system by the goods and services account. It is the basis from which the supply and use tables are derived. It shows for the economy as a whole and for groups of products the total resources in terms of domestic output and imports, and the uses of goods and services in terms of intermediate consumption, final consumption, gross capital formation and exports. By incorporating the income accounts, an overall accounting framework is obtained for the production sphere. All these elements are required to construct an integrated set of supply and use tables.

9. While supply and use tables are data-oriented in nature, the symmetric tables are always constructed on the basis of certain analytical assumptions, usually from existing supply and use tables. The European System of Accounts recommends that the statistical supply and use tables should serve as the foundation from which the analytical input-output tables are constructed. This explains the wide coverage given to the compilation of supply and use tables in the manual.

Outline of the manual

10. The manual is organised in two parts: The first, and largest part, will cover the practical problems, especially on the compilation of supply and use tables. The second part will deal with extensions to the input-output system and applications. Satellite systems will be of real use for the departments of the Commission and other Institutions. It will discuss various methods to update input-output tables not only to cover the gap between the sequence of five-yearly Eurostat input-output tables but also to close the gap between the last submitted input-output table and the most recent set of macroeconomic data. Included are the main applications of input-output analysis: traditional input-output models, dynamic input-output models, linear optimisation models, impact

analysis, applications used by the Commission and an outlook on the use of input-output data in econometric models and general equilibrium models.

11. While the first part of the manual is essential, both in helping countries to compile their accounts and provide the required consistency in the accounts, the second part is also important since input-output data are used for a variety of analysis in connection with Community policies.

Part A : compilation

- Supply and use tables and input-output tables in the ESA 1995;
- Compilation principles and methods;
- The role of supply and use tables as an integral part of the compilation of national accounts;
- The supply table;
- The use table;
- Valuation matrices;
- Import matrices;
- Balancing of supply and use;
- Supply and use tables at constant prices;
- Tables linking the supply and use tables to the sector institutional accounts;
- Transformation of supply and use tables to symmetric input-output tables;
- Supplementary information and disaggregation of expenditure.

Part B : extensions and applications

- Extended input-output tables as part of satellite systems;
- Updating;
- Applications.

Main issues of compilation

12. The input-output framework of the ESA 1995 consists of three types of tables:

- Supply and use tables;
- Symmetric input-output tables.
- Tables linking the supply and use tables to the sector accounts.

Supply and use tables

13. Supply and use tables provide a detailed picture of the supply of goods and services, by domestic production and imports, and the use of goods and services, for purposes of intermediate

consumption and for final use (consumption, gross capital formation and exports). Supply and use tables show also the value added and its components generated by industries. Thus, supply and use tables provide a detailed analysis of the process of production, the use of goods and services and the income generated by that production. The supply and use framework serve for analysing industries and products through a breakdown of the production account, the goods and services account and the generation of income account. The supply and use tables also form the basis for the derivation of symmetric input-output tables by applying certain assumptions on the relations between output and related inputs. Symmetric input-output tables are the basis for input-output analysis.

14. The *methodological advantages* of supply and use tables as an integral part of national accounts are:

- Integration of GDP calculation;
- Consistency of detailed commodity level;
- Efficient confrontation of different primary sources;
- Identification of gaps in primary sources;
- Ideal framework for different value concepts (basic prices, purchaser prices);
- Best framework for calculation of variables at constant prices.

15. The *practical advantages* of supply and use tables as an integral part of national accounts are:

- Extreme exploitation of information in primary sources;
- Open for incorporation of any other basic statistics;
- Good foundation for making reliable estimates (supply equals use);
- Possible to use „common sense“ more efficiently;
- Current production of statistical data requires relatively few resources;
- Linkages to symmetric input-output tables;
- Linkages to preliminary and quarterly accounts systems;
- Linkages with satellite systems.

16. The supply and use tables of the ESA 95 comprise 60 products and 60 industries. The classification used for the industries is the ‘General Industrial Classification of Economic Activities within the European Communities (NACE rev. 1) and the classification employed for products is the Classification of Products by Activity (CPA). These classifications are fully aligned to each other. At each level of aggregation, the CPA shows the principal products of the industries according to the NACE rev. 1.

17. A *use table* shows the use of goods and services by product and by type of use, i.e. as intermediate consumption by industry, final consumption, gross capital formation or exports.

Furthermore the table shows the components of value added, i.e. compensation of employees, other taxes less subsidies on production, consumption of fixed capital and net operating surplus.

18. A *supply table* shows the supply of goods and services by product and by type of supplier, distinguishing output by domestic industries and imports. In the transmission programme of data for the Members of the European Union the supply table is given at basic prices (Table 1) including a transformation into purchasers' prices. The supply table contains three important matrices : the production matrix (make matrix), the import matrix and the valuation adjustment matrix.

19. Between supply and use tables, two types of identities hold: in the supply table and in the use table the column totals of industries (output at basic prices) and the row totals for products for total supply (supply at purchasers' prices) are equal. The balancing process should not be limited to the supply and use tables at current prices. The compilation of supply and use tables at current and constant prices for two or more years will help to balance the changes in volumes, values and prices. Compared to the integration of supply and use tables for a single year, this is a major improvement of the effectiveness of the input-output framework.

Symmetric input-output tables

20. A symmetric input-output table is a product by product or industry by industry matrix describing the domestic production processes and the transactions in products of the national economy in great detail. A symmetric input-output table rearranges both supply and use in a single table. There is one major conceptual difference between a symmetric input-output table and a combined supply and use table, the statistics relate products to industries, while in the symmetric input-output table the statistics relate products to products (production activities) or industries to industries. So, in a symmetric input-output table either a product or an industry classification is employed for both rows and columns.

21. The derivation of symmetric input-output tables from the system of supply and use tables will reveal inconsistencies and weaknesses in the supply and use tables. In this respect, there is also a feedback from the symmetric input-output tables to the supply and use tables and vice versa.

22. For the transformation into symmetric input-output tables various assumptions can be made and certain derivation steps are needed. The format of symmetric input-output tables can either be industry by industry or product by product. The product by product table is the most preferred one. The transformation procedure converts the industry by product and product by industry system of the supply and use tables into a product by product system. The relations between output and input are now relations between products necessary to produce products.

23. The two types of identities in the supply and use system are now reduced to one type of identity only, namely:

$$\text{Total supply by product} = \text{totals use by product}$$

24. The figures of total supply and total use by product are still the same as in the supply and use tables. The industry based structures are transformed into product based structures. In this transformation the final use data are left unchanged. The transformation only rearranges on the basis of the output table and the assumption applied the columns of the intermediate consumption table.

25. The two assumptions that can be applied are the industry and the product technology assumption. The industry technology assumed that each industry has its specific technology (in terms of inputs), irrespective of the product mix of that industry. The product technology assumption assumes that each product has its specific technology, irrespective which industry is producing that product. A mixture of both assumptions can also be applied (hybrid technologies). From theoretical considerations it can be shown that the product technology is the preferred one compared to the industry technology assumption.

26. *Another important element of the ESA 95 input-output system* is the fact that the input-output tables contain supplementary information for each sector on gross fixed capital formation, capital stock (buildings, machinery, transport equipment) and labour inputs (wage and salary earners, self-employed). Consequently the columns of the input-output table reflect for each sector all inputs of the production function for intermediates and primary inputs (capital, labour, land).

Requirements of the ESA 95 for the input – output framework data

27. In the ESA 95, the product by product input-output table is the most important symmetric input-output table. Therefore, it has been decided that the symmetric product by product input-output tables with 60 products is transmitted every five years. Imports and exports should be subdivided into intra-EU deliveries and imports and exports with other countries.

28. The Council Regulation of 1996 defines the Program of National accounts data delivery within the framework of the ESA 95. The transmission program lays out for each table, aggregate and variable, the deadlines and frequency of transmission as well as the date of first data delivery.

29. The classifications are totally compatible with those used within the framework of the United Nations. During the transition period, which will run up to January 2005, derogations from the base program have been accepted for certain Member states concerning the details and forms of transmissions. Certain exemptions were made for the submission of tables and single variables and individual branches. The full programme will be implemented in all 15 member countries in 2005 at the latest.

30. The transmission programme for the input-output framework is shown in Table 1.

Table 1

Date of first delivery	Time difference t + months	Transmission for years	Content of tables
2002	36	95-99	Detailed supply table at basic prices, including transformation into purchasers' prices, A60 x P60
2002	36	95-99	Detailed use table at purchasers' prices, A60 x P60
2002	36	95 (*)	Symmetric input-output table at basic prices, A60 x P60, five-yearly
2002	36	95 (*)	Symmetric input-output table for domestic output at basic prices, A60 x P60, five-yearly
2002	36	95-99	Import matrix at basic prices, A60 x P60, five-yearly

31. Actually, the whole transmission program of ESA 95 is under revision. Concerning the input – output framework it is envisaged to allow some flexibility for the transmission of the symmetric input – output tables product by product (as requested in the transmission program) or industry by industry (this solution should depend on the statistical units used in the countries for compiling the tables).
