

XV. Supply and use tables and input-output

A. Input-output in the System

1. Introduction

- 15.1. The System includes an integrated set of supply and use tables, or matrices, as well as symmetric input-output tables, or matrices. They provide a detailed analysis of the process of production and the use of goods and services (products) and the income generated in that production. The concepts and definitions in the input-output tables of the SNA are the same as in the rest of the System.
- 15.2. The integration of "input-output" in the overall system of national accounts is an important feature of the SNA. Its role in the System is primarily related to the goods and services accounts and to the shortened sequence of accounts for industries. In complement to the full sequence of accounts for institutional sectors, which cover all kinds of accounts in the System, the supply and use tables, and subsequently the symmetric tables, serve to provide a more detailed basis for analysing industries and products in the System through a breakdown of the production account and the generation of income account in the System, and the goods and services account leading to the symmetric input-output table. "Symmetric" means there are the same classifications or units (i.e., same groups of products) which are used in both rows and columns. In the supply and use table, when the number of rows of products and columns of industries happens to be equal, we shall refer to a square (not symmetric) supply and use table. However, supply and use tables are most often rectangular (having more products than industries).
- 15.3. The input-output tables and in particular the supply and use tables serve two purposes: statistical and analytical. They provide 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 etc. The System, and the input-output tables in particular, serves as a coordinating framework for economic statistics, both conceptually for ensuring the consistency of the 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 values of flows of goods and services into prices and volumes for the calculation of an integrated set of price and volume measures. As an analytical tool, input-output data are conveniently integrated into macroeconomic models in order to analyse the link between final demand and industrial output levels. Input-output analysis also serves a number of other analytical purposes or uses.
- 15.4. This chapter has three main parts or stages:
- (a) Goods and services accounts;
 - (b) Supply and use tables;
 - (c) Analytical input-output tables.
- 15.5. A fundamental and extremely important role is played in the System by the goods and services account. In fact, this is the basis from which the supply and use balances are derived. It shows for the economy as a whole and for groups of products the total resources in terms of output and imports, and the uses of goods and services in terms of intermediate consumption, final consumption, gross capital formation and exports. By then incorporating also the production and generation of income accounts of the System, an overall accounting framework is obtained for depicting the production sphere by the construction of integrated supply and use tables.
- 15.6. The symmetric input-output tables are also part of the System, serving as a well-established tool for various analytical purposes related to production. Many analyses require adjustments to the supply and use table, in particular with respect to valuation, treatment of imported products and common classification for rows and columns.
- 15.7. While supply and use tables are data-oriented in nature, the symmetric tables are always constructed from having made certain analytical assumptions, usually from existing supply and use tables. The System 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 importance given to the description of supply and use tables in this chapter, while the more technical description of constructing symmetric input-output tables will mainly be shown in the planned *Handbook on National Accounting: Input-Output Tables*, which is being prepared by the Statistical Division of the United Nations Secretariat.

2. The input-output context

15.8. In national accounting and economic analysis two kinds of input-output tables (or matrices) are referred to:

- (a) Supply and use tables;
- (b) Symmetric input-output tables.

15.9. The supply and use tables are sometimes referred to as rectangular input-output tables, make and use tables, supply and disposition of commodities, etc. In the System, we shall use the term supply and use tables. The symmetric input-output tables are also often termed square (input-output) tables or matrices, Leontief-type input-output tables (matrices), etc. The square symmetrical tables are either product-product or industry-industry (producer-producer). In this chapter we shall be referring to tables rather than matrices, and to product-by-product tables and industry-by-industry tables.

15.10. The concepts and definitions in the supply and use tables are the same as elsewhere in the System. This applies in particular to transaction categories defined in a number of chapters. Most of the contents of chapter VI have direct relevance to this chapter. The same is true for the generation of income account with uses of value added (chapter VII), chapter IX describing final consumption expenditure and actual final consumption, chapter X on gross capital formation, and chapter XIV on exports and imports flows.

15.11. The supply and use and input-output tables also adopt the accounting rules of the System, i.e., the general rules of treatment for transactions and transactors apply to the input-output framework as part of the System. Chapter III contains a number of issues that become crucial in the input-output framework, in particular valuation, and which therefore need further elaboration.

15.12. Other issues of great importance to the input-output framework, dealt with in other chapters as well, include in particular:

- (a) Statistical units (chapter V), in particular establishments grouped in industries serve as a common basis for the production accounts and the supply and use tables, while using institutional units is not recommended for input-output compilation;
- (b) Principal, secondary and ancillary activities (chapter V), the distinction between which plays a key role in the compilation of the symmetric tables;
- (c) Constant-price estimation (chapter XVI), for which an entire set of price and volume measures, including for balancing items defined in the System (value added, gross domestic product (GDP), might be derived by using the supply and use tables as a framework;
- (d) Chapter XX, in which the supply and use table is re-

garded as one social accounting matrix (SAM) building-block;

- (e) Employment measures (chapter XVII), the use of which is important to productivity studies.

3. Statistical units for input-output

15.13. Institutional units may engage in several different kinds of productive activities simultaneously. For the detailed analysis of production, the System, therefore, recommends that they should be partitioned into separate establishments each of which engages in only a single kind of productive activity at a single location. Industries are then defined as groups of establishments engaged in the same kind of productive activities. Ideally, the industries in the System would be composed of establishments that are homogeneous production units.

15.14. A unit of homogeneous production is defined as a producer unit in which only a single (non-ancillary) productive activity is carried out. However, the unit of homogeneous production is not normally observable and is more an abstract or conceptual unit underlying the symmetric (product-by-product) input-output tables.

15.15. To be operational for statistics the establishment needs to be sufficiently distinct as a production unit to supply meaningful information. For the supply and use tables, the System needs a unit which can be observed and for which data can be collected. Furthermore, the choice of units is often dictated by the units being carried forward from the basic statistics.

15.16. When an establishment engages in more than one kind of activity, by reference to a given classification of activities, it is necessary to observe the fundamental distinction between principal and secondary activities on the one hand and ancillary activities on the other:

- (a) The principal activity of an establishment is the activity whose gross value added exceeds that of any other activity carried out within the same unit;
- (b) A secondary activity is an activity carried out within a single establishment in addition to the principal activity;
- (c) An ancillary activity is a supporting activity which is undertaken in order to create the conditions within which the activities of an enterprise can be carried out.

15.17. The establishment unit used for the sequence of accounts for industries may include principal as well as secondary productive activities within it, although secondary activities should be separated as far as practically possible. The further treatment of secondary production is one of the central issues met in the construction of symmetric input-output tables.

15.18. Ancillary activities typically produce outputs of services which are used as inputs into almost all kinds of productive activities, and their values are likely to be small compared with that of the principal and secondary activities of the enterprise.

Consequently, they are treated as integral parts of the principal or secondary activities with which they are associated. In a production account and input-output context, ancillary activities are treated as follows:

- (a) Outputs of ancillary activities are not explicitly recognized and recorded in the System;
- (b) Inputs into ancillary activities are treated as inputs into the principal and secondary activities which they support;
- (c) Value added is not identified separately as it is combined with that of the principal and secondary activities.

However, satellite analysis might try to identify inside the producing units some ancillary activities and their output.

- 15.19. In addition, output of an industry may include more than a single product when two or more products are produced simultaneously by a single productive activity as "joint products" (e.g., molasses linked to the production of sugar, natural gas linked to crude oil). Joint products may be distinguished as the principal product (by largest proportion) and the by-product (or by-products). In practice, by-products are often treated in the same way as secondary products in the input-output framework.

B. Disaggregation of goods and services account

1. Goods and services account

- 15.20. The goods and services account shows, both for groups of products and for the total economy, how the total amount of a product available (supply) is equal to the total amount used. Before additional terms necessary for valuation are introduced, the main items of this basic equation (balance) are as follows:

$$\begin{aligned} \text{Output} + \text{imports} &= \text{total resources} \\ &= \text{intermediate consumption} + \text{exports} + \text{final consumption} \\ &\quad + \text{gross capital formation} (= \text{total uses}). \end{aligned}$$

- 15.21. Goods and services are traced through the economy from their original producers (either resident producers or producers abroad) to their users (either resident users or users abroad).
- 15.22. Compiling detailed flows is traditionally referred to as the commodity-flow method, utilizing basic statistics on goods and services (products) with the additional items required for the proper valuation. The full power of the commodity-flow method is reached when independent estimates could be made for each of the use items, i.e., when specific information establishes the basis of the distribution of the supply of products to the various kinds of uses. Reconciliation of the supply and use side of the equation is necessary. In some cases, the commodity-flow method is necessarily less sophisticated, when one of the uses (e.g., changes in inventories, gross fixed capital formation or even final consumption) has to be derived residually, or the distribution to users—fully or partly—has to be made in fixed proportions without enough direct information on or from users.
- 15.23. The product groups constitute the rows of the disaggregated supply and use table. The product classification scheme recommended for classifying data on goods and services is the Central Product Classification (CPC). It should be applied at a detailed level; the more detailed, the cleaner the view (and the less product mix). The CPC contains more than 1,800 products at its 5-digit level. For application in the national accounts countries lacking the full benefit from the commodity-

flow approach might use the intermediate 3-digit level of the CPC, counting some 300 products. Furthermore, in input-output work it may be necessary to group products according to the activity to which they relate.

- 15.24. In order to keep the tables presented in the SNA within a manageable format, the breakdown of product groups as they appear in the supply and use table mainly refers to the 1-digit CPC classification. Of course, these aggregated product groups are illustrative only.

2. Valuation and appropriate treatment of taxes and margins

Valuation concepts and their interrelationships

- 15.25. Before moving into the format of the supply and use table, the basic valuation concepts of the System and their interrelationships need to be spelt out.
- 15.26. The components of the price paid by the purchaser of a product that are recognized in the System are the following:
- Basic price of the product as output
 - Taxes on the product
 - Less subsidies on the product
 - Trade and transport margins in delivering the product to the purchaser.
- 15.27. Some of these four components could be subdivided, for example to treat trade and transport margins in a more decomposed way, including to split the margins into separate wholesale and retail components, or to specify the value added tax (VAT) as a separate component. However, the input-output framework of the System needs as a minimum the specification of the four components. Two clarifications should be made:
- (a) Trade and transport margins also bear taxes less subsidies on the product linked to the trade and transport margins;

- (b) Trade and transport margins are also services which have a basic price.
- 15.28. The three central price concepts of the System—the purchaser's price, the producer's price and the basic price—have been defined in chapter VI, but are repeated here for the sake of convenience in the development of the chapter:
- (a) The purchaser's price is the amount paid by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place;
 - (b) The producer's price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any VAT, or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the producer;
 - (c) The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer.
- 15.29. There are definitional relationships between these three price concepts which have a central role in the input-output framework:
- (a) Purchaser's price (which includes non-deductible VAT)—trade and transport margins (including taxes other than invoiced VAT less subsidies on product payable/receivable by wholesalers and retailers)—non-deductible VAT-type taxes = producer's price (which excludes non-deductible VAT);
 - (b) Producer's price—taxes (other than VAT) less subsidies on products payable/receivable by their producers = basic price.
- 15.30. Higher price after storage might be due to additional output volume during storage (e.g., improvement in quality) or to holding gains (for further discussion, see chapter VI).
- 15.31. Producers' and purchasers' prices must in general—apart from any non-deductible VAT—coincide for services, as services are supplied directly from the producer to the user. If, in fact, retailers exist in the services' area (like travel agencies in tourism), the price equality still holds, since the System by convention treats these retailers as producing services other than trade services. When goods are purchased directly from their original producers, the two prices will also tend to coincide in many cases, but there could be cases of transport margins as well. At any rate, the distinction between the purchaser's price and the producer's price is mainly relevant for goods which pass through the chains of wholesale and retail distribution.
- Valuation of product flows
- 15.32. Chapter VI includes a comprehensive description of the valuation and the measurement of output, so it is sufficient here to refer to the main points that are very important in the input-output framework. The System recognizes two kinds of prices for output, both defined to exclude any VAT or similar deductible tax invoiced on the output sold:
- Basic prices
 - Producers' prices.
- 15.33. The preferred method of valuation is at basic prices. Producers' prices may be used when valuation at basic prices is not feasible. The preference for basic prices over producers' prices is based on several considerations, of which the following may be emphasized:
- (a) Basic prices provide the most homogeneous valuation along the rows;
 - (b) Basic prices are found most useful when a system of VAT or similar deductible tax is in operation;
 - (c) Basic prices record the amounts available to the producer.
- 15.34. Uses of goods and services—both intermediate consumption and final uses—are recorded at purchasers' prices (i.e., including the margins and taxes less subsidies on products except deductible taxes).
- 15.35. For exports and imports, the System adopts analogous price concepts: the free on board (f.o.b.) price for exports and total imports and the cost, insurance and freight (c.i.f.) price for detailed imports. The difference between the f.o.b. price and the c.i.f. price represents the costs of transportation and insurance between the frontier of the exporting country and the frontier of the importing country. The definition of the c.i.f. price is as follows:
- The c.i.f. price is the price of a good delivered at the frontier of the importing country, or the price of a service delivered to a resident, before the payment of any import duties or other taxes on imports or trade and transport margins within the country.
- 15.36. The f.o.b. price is considered to be a special purchaser's price applied to flows of exports. As explained in chapter XIV, the f.o.b. price can be regarded as the purchaser's price that would be paid by an importer taking delivery of the goods at the exporter's frontier after loading on to a carrier and after payment of any export taxes or the receipt of any tax rebates. The c.i.f. price is considered to be a basic price applied to flows of imports, equivalent to the basic price of a good or service produced by resident producers. The valuation of an imported

good or service which is equivalent to the producer's price of a good or service produced by resident producers is the total of the c.i.f. price and any import duty and excise duty or special tax payable on the import at the frontier (sometimes referred to as the ex-customs price). This equivalence holds as well between producer's price excluding invoiced VAT and the c.i.f. price plus taxes and duties on imports, excluding VAT.

- 15.37. The implicit valuation of value added depends on the valuation of the two flows from which it is derived, output and intermediate consumption. While intermediate consumption is always valued at purchasers' prices (in total, excluding deductible VAT), two alternative valuations are used for output leading to two alternative measures of gross value added:

- (a) Gross value added at basic prices defined as output valued at basic prices less intermediate consumption valued at purchasers' prices;
- (b) Gross value added at producers' prices defined as output valued at producers' prices less intermediate consumption valued at purchasers' prices.

- 15.38. The measure recommended throughout the System and reflected in the supply and use table, is gross value added at basic prices. In order to arrive at GDP at market prices, taxes less subsidies on products—not being allocated to industries—must be added to total gross value added at basic prices. If output and thus value added were at producers' prices, non-allocated VAT and taxes less subsidies on imports must be added to arrive at GDP at market prices (see chapter VI, paragraph 6.235 and 6.236).

- 15.39. Gross value added at factor cost is not a concept used explicitly in the System. Nevertheless, it could be derived from gross value added at basic prices by subtracting other taxes less subsidies on production. However, this item is not recommended as a measure of value added in the System, since there are no observable prices such that output minus intermediate consumption equals gross value added directly in this case. Other taxes less subsidies on production, by definition, are in fact taxes or subsidies that cannot be eliminated from the prices of outputs and inputs. Therefore, gross value added at factor cost is essentially a measure of income and not output. In the input-output framework, it means that neither the output entries in the supply table nor the values added in the use table are given at factor cost.

Trade and transport margins

- 15.40. As explained in chapter VI paragraph 6.110 and 6.111, the output of wholesale and retail trade is measured by the value of the trade and transport margins realized on the goods they sell. Goods resold are not included either in the output or the inputs of wholesale and retail trade. The trade and transport margins include trade margins plus any transport charges paid separately by the purchaser in taking delivery at the required time and place.

- 15.41. As indicated in chapter VI, input-output analysis—and the commodity flow method—may find it convenient to compare the price paid by the final purchaser of a good after it has passed through the wholesale and retail distribution chains with the price received by its original producer. Differences between price concepts were explained in paragraphs 15.25 to 15.31 above. The trade margins may be defined at basic as well as producers' prices, as the first, or the first and second, of the following components:

- (a) The basic trade margins on the product; i.e., the cumulative wholesale and retail trade margins before taxes are added and subsidies subtracted;
- (b) Taxes (except invoiced VAT) less subsidies on the product payable by wholesale and retail traders.

- 15.42. The full cost of transporting a good from the place where it is manufactured to the place where the purchaser takes delivery of it may be included in a number of items. If the producer transports the good, or arranges for it to be transported without extra cost to the purchaser, these transportation costs will be included in the basic price. If the producer transports the goods himself this represents an ancillary activity and the individual costs will be included but not identifiable as transportation costs. If the producer pays a third party to transport the goods then transportation will appear as one of the intermediate costs to the producer. Similarly, wholesale and retail traders may arrange for goods to be moved from where they take delivery of them to where another purchaser takes delivery. As in the case of producers, these costs will be included in the trade margin if no separate charge is made for transportation to the purchaser. Again, as with producers, these costs may represent ancillary activity of wholesale and retail traders or the purchase of an intermediate service, thus entering trade margins. Finally, when transport is arranged in such a way that the purchaser has to pay for the transport costs even when done by the producer or the wholesale or retail trader, these are separately identified as transport margins. The full component of transport services in the trade and transport margins—composed of the transport margins themselves and the transport services included in the trade margins—may be analysed separately in a more analytical version of the supply and use table.

- 15.43. In order to fit in with the input-output framework, data on margins should have the format of products by uses as in table 15.2. These data might have been originally compiled at some industry level of wholesale and retail trade, from which the conversion to the appropriate format has to be made. Trade margins by products are obtained by adding across the various use categories of the product rows of the supporting table.

- 15.44. In the supply table, output of goods is at basic prices; output of the associated trade services and transport services are given at basic prices in their respective columns and rows. This means that taxes (except invoiced VAT) on the product payable by wholesalers and retailers are pooled with the other

taxes (except invoiced VAT) on products and total non-deductible VAT to form the additional column of taxes on products in the supply table, and correspondingly the additional column of subsidies on products. Trade and transport margins are additionally distributed by products in the additional column of trade and transport margins of the supply table. In that column, negative entries appear on the rows for trade and transport services in order to have the total of that column equal to zero. In purchasers' prices, total supply of trade services does not include trade margins, nor does total supply of transport services include transport margins; both of these having been allocated to the goods to which they relate.

Taxes and subsidies on products

15.45. Different valuation concepts in the input-output framework are to a large extent consequences of treatments of taxes and subsidies. As already seen above, taxes less subsidies on products make up part of the difference between the purchaser's price and the basic price.

15.46. The taxes that appear in the input-output framework are all taxes on production and imports. These are taxes levied on goods and services at the time they are produced, sold or imported, or possibly on other occasions, together with taxes which become due as a consequence of engaging in production. Taxes on production and imports are subdivided into two main groups (see chapter VII, paragraph 7.49):

- (a) Taxes on products;
- (b) Other taxes on production.

15.47. The separation of taxes on products from other taxes on production is very important in varying valuations of product flows. Taxes on products are defined as follows (with the four constituent sub-categories):

A tax on a product is a tax that is payable per unit of some good or service, either as a specified amount of money per unit of quantity or as a specified percentage of the price per unit or value of the good or service transacted.

- (a) A value added type tax is a tax on goods or services collected in stages by enterprises;
- (b) Taxes and duties on imports, excluding VAT, consist of taxes on goods and services that become payable at the moment when the goods cross the national or customs frontiers of the economic territory or when the services are delivered by non-resident producers to resident institutional units;
- (c) Export taxes consist of taxes on goods and services that become payable when the goods leave the economic territory or when the services are delivered to non-residents;

- (d) Taxes on products, excluding VAT, and import and export taxes consist of taxes on goods and services that become payable as a result of the production, sale, transfer, leasing or delivery of those goods and services, or as a result of their use for own consumption or own capital formation.

15.48. Value added type taxes in the System include VAT proper and taxes which are deductible in a way similar to VAT and are treated in the same way as VAT. They are defined and described as follows (see also chapter VI):

VAT is a tax on products collected in stages by enterprises. There exist in some countries taxes that are narrower in scope than VAT but may also be deductible by producers. They are treated in the System in the same way as VAT. Producers are required to charge certain percentage rates of VAT on the goods or services they sell. The VAT is shown separately on the sellers' invoices so that purchasers know the amounts they have paid. However, producers are not required to pay to the government the full amounts of the VAT invoiced to their customers because they are usually permitted to deduct the VAT that they themselves have paid on goods and services purchased for their own intermediate consumption or gross fixed capital formation. Producers are obliged to pay only the difference between the VAT on their sales and the VAT on their purchases for intermediate consumption or capital formation — hence the expression value added tax. VAT is not usually charged on sales to non-residents—i.e., exports. The percentage rate of VAT is also liable to vary between different categories of goods and services and also according to the type of purchaser.

15.49. The System recommends the use of the so-called net system of recording VAT. In this net treatment, output even at producers' prices is valued excluding VAT invoiced by the producer; imports also are valued excluding invoiced VAT. For intermediate and final uses the purchases of goods and services are recorded including non-deductible VAT only.

15.50. VAT may be deductible, non-deductible or just not applicable as follows:

Deductible VAT:

- Most of intermediate consumption
- Most of gross fixed capital formation
- Part of changes in inventories.

Non-deductible VAT:

- Final consumption expenditure
- Part of gross fixed capital formation
- Part of changes in inventories

Part of intermediate consumption.

VAT not applicable:

Exports

Any goods or services subject to a zero rate of VAT regardless of their use

Any producers exempted from VAT registration (small businesses or the like).

15.51. Depending on the tax regimes in countries, the contents of the tax column in the supply table would be as follows:

Absence of VAT:

When output is at basic prices, the taxes column will contain all taxes on products (i.e. taxes and duties on imports, export taxes, and taxes on products excluding import and export taxes).

When output is at producers' prices, it will include just taxes and duties on imports.

Presence of VAT (net treatment):

When output is at basic prices, the taxes column will contain total non-deductible VAT on products, taxes and duties on imports excluding VAT, export taxes, and taxes on products excluding VAT and import and export taxes.

When output is at producers' prices, the taxes column will include taxes and duties on imports (excluding VAT), plus total non-deductible VAT on those products.

15.52. Subsidies are treated as if they were negative taxes on products or negative taxes on production. In the System, subsidies are current unrequited payments that government units make to enterprises on the basis of the levels of their production activities or the quantities or values of goods and services which they produce, sell or import. They are classified in the same way as taxes:

(a) Subsidies on products;

(b) Other subsidies on production.

15.53. The separation of subsidies on products from other subsidies on production, as in the case of taxes, is fundamental to the valuation of product flows. Subsidies on products are defined as follows:

A subsidy on a product is a subsidy payable per unit of a good or service produced, either as a specific amount of money per unit of quantity of a good or service or as a specified percentage of the price per unit. It may also be calculated as the difference between a specified target price and the market price actually paid by a buyer.

C. Supply and use table

1. Format of the supply and use tables

15.54. The recommended supply and use tables of the System are presented in table 15.1. An early reference is given to the supply and use tables in chapter II, using a reduced format in order to introduce the overall structure of the supply and use tables. It is not a simplified version of the latter.

15.55. As emphasized already, the level of details in the rows and columns of the supply and use and input-output tables should be reasonably disaggregated; the tables presented in this chapter are very aggregated merely in order to keep to a manageable format. That applies to the breakdown of products, of industries, of final uses as well as uses of value added. In this sense, the tables of the chapter are both recommended tables and illustrative tables.

15.56. The supply and use tables show the following information.

(a) Table 15.1 S shows the supply of products;

(b) Table 15.1 U shows:

(i) The use of products along the rows; and

(ii) The production and generation of income accounts of industries down the columns.

15.57. The main part of the supply table is at basic prices, but there

are columns added so as to arrive at total supply at purchasers' prices in order to balance with the use table at purchasers' prices. In general, when preparing supply and use tables and making the proper balancing between the two sides, there is always a choice of emphasis between two opposite lines of adjusting statistical data:

(a) Supply of each product at basic prices could be adjusted to a purchasers' prices valuation to allow balancing with uses at purchasers' prices;

(b) Each of the uses at purchasers' prices could be adjusted to a basic prices' valuation to match with supply at basic prices.

15.58. In practice, both types of balances may be needed in the process of building up a supply and use table. Both alternatives deal with or require similar kinds of adjustments, i.e., for taxes less subsidies on products and trade and transport margins by products. In fact, the first alternative is not possible without the second, since it is usually not possible to know the columns of taxes on products, subsidies on products and trade and transport margins broken down by products in the supply table unless the distribution among uses of the individual products are known from table 15.2.

Table 15.1. Supply of products at basic prices and use of products at purchasers' prices

						Output of industries (by ISIC categories)			
						Market			

Own final use										Other non-market				
Wholesale, retail trade, repair motor vehicles, household goods, hotels and restaurants					Financial intermediation, real estate, other business services					Public admin., defence, compulsory security, other public services				
Transport, storage, communication					Education, health, social services					Education, health, social services				
(G+H) (F) (9)	(I) (10)	(11)	(J+K) (12)	(M+N+O) (13)	(14)	(A+B) (15)	(F) (16)	(K+P) (17)	Sub-total own final use (18)	(M+N+O) (19)	(L) (20)	(21)		
0	0	0	0	0	78	9	0	0	9	0	0	0		
0	1	0	0	0	41	0	0	0	0	0	0	0		
0	0	0	0	0	154	0	0	0	0	0	0	0		
6	16	8	7	2	1 707	2	5	0	7	0	0	0		
201	0	5	0	0	213	0	31	0	31	0	0	0		
1	149	7	0	0	165	0	0	0	0	0	0	0		
0	21	75	0	0	96	0	0	0	0	0	0	0		
0	2	3	370	0	474	0	0	95	95	0	0	0		
0	2	2	1	143	149	0	0	5	5	212	0	212		
0	0	0	0	0	0	0	0	0	0	0	168	168		
208	191	100	378	243	3 077	11	36	100	147	212	168	380		
205	191	100	378	243	3 051	2	0	0	2	3	1	4		
3					26	9	36	100	145	209	167	376		

(by ISIC categories)

Own final use										Other non-market					Own final use					Other non-market																																																																																																			
Wholesale, retail trade, repair motor vehicles, household goods, hotels and restaurants					Financial intermediation, real estate, other business services					Education, health, social services					Transport, storage, communication					Agriculture, hunting, forestry, fishing					Construction (F)					Real estate, private household services (K+P)					Education, health, social services (M+N+O)					Public administration, defence, compulsory security, other public services (L)					Sub-total for other non-market																																																																										
Construction (F) (9)					(J+K) (12)					(M+N+O) (13)					(A+B) (15)					(F) (16)					(K+P) (17)					(18)					(19)					(20)					(21)					(22)					Total economy					Exports Goods					Services					Sub-total final consumption expenditure					Households					Individual					Sub-total					Collective					Individual					Sub-total					Gross fixed capital formation					Changes in inventories					Acquisition less disposals of valuables				
(G+H) (10)	(I) (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)																																																																																														
0	3	1	5	0	82	1	0	1	3	2	5	88	7	30	28	0	2	0	2	0	2	3	2	1																																																																																															
0	0	0	1	0	96	0	0	0	0	0	0	96	6	2	2	0	0	0	0	0	0	-1	0	-1																																																																																															
0	0	0	4	1	114	0	0	0	5	4	0	123	1	36	36	0	0	0	0	0	0	0	0	0																																																																																															
63	36	21	35	16	880	5	17	10	42	38	80	992	422	570	567	0	3	0	3	0	3	176	161	0																																																																																															
5	2	1	3	1	22	0	0	0	11	7	18	40	6	3	3	0	0	0	0	0	0	213	190	23																																																																																															
1	9	6	4	0	57	0	0	0	2	2	4	61	0	37	37	0	0	0	0	0	0	0	0	0																																																																																															
3	19	12	5	0	71	0	0	0	3	4	7	78	0	14	14	0	0	0	0	0	0	0	0	0																																																																																															
16	25	15	44	6	227	0	7	17	33	32	65	309	0	8	250	250	0	0	0	0	23	23	0	0																																																																																															
1	1	1	11	23	45	0	0	0	21	29	50	95	0	4	276	58	14	204	0	0	204	0	0	0																																																																																															
0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	167	6	2	159	156	3	0	0	0	0																																																																																															
90	100	60	112	47	1 594	6	24	20	50	121	118	1 883	20	9	43	43	16	368	156	212	414	376	28	10																																																																																															
90	100	60	112	47	1 594	6	24	20	50	121	118	1 883	462	78	-29	-29	1 015	0	15	2	13	353	318	25	10																																																																																														
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118	91	40	266	196	1 483	5	12	80	97	91	141	1 721	1 854	0	376	7	16	353	154	199	61	58	3	0																																																																																															
46	44	16	54	123	641	0	12	0	12	70	109	762	762	0	110	110	0	15	2	13	353	318	25	10																																																																																															
5	0	-6	12	3	56	0	0	0	0	1	2	58	191	0	0	0	0	353	154	199	61	58	3	0																																																																																															
5	0	-6	12	3	56	0	0	0	0	1	2	58	191	0	0	0	0	353	154	199	61	58	3	0																																																																																															
35	36	3	99	18	432	0	0	0	0	0	0	432	432	0	0	0	0	15	2	13	353	318	25	10																																																																																															
21	-4	12	67	47	184	3	0	60	63	39	109	762	762	0	0	0	0	15	2	13	353	318	25	10																																																																																															
11	15	15	34	5	170	2	2	20	22	10	30	222	222	0	0	0	0	15	2	13	353	318	25	10																																																																																															
36	36	7	99	19	440	2	0	0	2	10	30	222	222	0	0	0	0	15	2	13	353	318	25	10																																																																																															
31	11	23	101	51	346	3	0	80	83	20	30	459	459	0	0	0	0	15	2	13	353	318	25	10																																																																																															
208	191	100	378	243	3 077	11	36	100	147	212	380	3 604	3 604	0	0	0	0	15	2	13	353	318	25	10																																																																																															
4 244	7 078	2 032	3 700	1 904	53 072	218	780	0	998	7 299	8 000	69 369	69 369	0	0	0	0	15	2	13	353	318	25	10																																																																																															
8	20	39	20	5	225	1	1	124	126	13	25	376	376	0	0	0	0	15	2	13	353	318	25	10																																																																																															
143	298	572	409	86	3 528	17	17	1 851	1 885	201	169	5 783	5 783	0	0	0	0	15	2	13	353	318	25	10																																																																																															

1 Transport services on imports rendered by residents and non-residents.
2 Insurance services on imports rendered by residents and non-residents.
3 Transport and insurance services on imports rendered by residents and non-residents.
4 Including transport services on imports rendered by non-residents.
5 Including insurance services on imports rendered by non-residents.
6 Imports of individual goods are valued c.i.f. With global f.o.b./c.i.f. adjustments, total value of imports of goods is valued f.o.b.
7 Total supply of trade services (136) does not include trade margins (68). Trade margins which are included in output of wholesale and retail trade in basic prices are allocated to products in column 2.
8 Total supply of transport services does not include transport margins (10). Transport margins which are included in output of transport in basic prices are allocated to products in column 2. Total supply of transport services also excludes transport services on imports (6) rendered by residents and non-residents which are included in imports of products valued c.i.f.

9 Total supply of business services including insurance services does not cover insurance services on imports (4) rendered by residents and non-residents which are included in imports by products valued c.i.f.
10 This column may be broken down into gross fixed capital formation by institutional sectors or industries.

15.59. Thus, three tables are involved in the balancing between supply and use of products:

- (a) Table 15.1: the supply and use table, showing the final results of balancing totals of supply and totals of use by products at purchasers' prices;
- (b) Table 15.2: a supporting table in the same format as the intermediate use and final use quadrants of the use table;
- (c) Table 15.3: an alternative use table at basic prices, in which the elements of the supporting table just mentioned are deducted and reorganized from the elements of the initial use table (for presentation, see section D.2 below).

2. The supply table

Introduction

15.60. The supply table of the System (table 15.1 S) gives information about the resources of goods and services. For pedagogical reasons, its layout is arranged in the same way as in the use table (15.1 U), i.e., showing products in rows and industries in columns. In the rows, the various types of products are presented according to CPC classification groups. Additional rows for two adjustment items are required, one for the c.i.f./f.o.b. adjustment on imports and one for direct purchases abroad by residents. In the columns, three different sets of information are set out:

- (a) Output, by industries according to the activity classification in International Standard Industrial Classification (ISIC), Rev.3, and broken down to distinguish between market output, output produced for own final use and other non-market output and showing the product breakdown of industries' output by CPC sections, also showing the same three-way split for total product of each industry;
- (b) Imports, broken down into goods and services respectively;
- (c) Adjustment items, i.e., one additional column for trade and transport margins and one each for taxes and subsidies on products, plus one additional column for the c.i.f./f.o.b. adjustment.

15.61. The supply table cannot be compiled independently, since table 15.2 has to be prepared before completing table 15.1 S. Before adding in additional columns for trade and transport margins and taxes and subsidies on products, total supply is shown at basic prices. When including the additional columns—which have to be calculated from the use format as given by table 15.2—total supply is shown at purchasers' prices.

Output of market, own account and other non-market producers

15.62. The format of the table, industries by products, is usually (but not necessarily) rectangular, with more rows (products) than columns (industries).

15.63. The level of industry detail should also be reasonably disaggregated. The ISIC Rev.3 is recommended, while the degree of detail for the industry breakdown is up to the countries to decide. One possibility might be an intermediate level of ISIC Rev.3 (for example the 2-digit level).

15.64. A distinction is made in the System between market output, output produced for own final use and other non-market output, which also is carried over into the supply and use table.

15.65. Outputs from own-account producers and other non-market producers are broken down by products in the same way as for outputs of market producers, thereby making possible an integrated exposition of product data in the System. For instance, it makes it possible to add together outputs of health services or education services from both market and other non-market producers to arrive at output totals for these groups of services.

15.66. The valuation of other non-market goods and services is special, as there are either no prices, or no economically significant prices, for the non-market output of government and non-profit institutions serving households (NPISHs). By convention, the value which is assigned to the output from non-market production of government units and NPISHs is equal to the sum of costs incurred in producing that output:

Intermediate consumption
Compensation of employees
Consumption of fixed capital
Other taxes less subsidies on production.

15.67. For output produced for own final consumption or own gross fixed capital formation, the valuation in terms of total costs should not apply in principle, though it might be a second best procedure in practice. When produced for own final use, the goods and services should be valued at the basic prices at which they could be sold if offered for sale on the market, and it is only when reliable market prices cannot be obtained that the procedure of valuing output equal to the sum of the costs of production might apply. Services of owner-occupied dwellings should also be valued using the prices of the same kinds of services sold on the market. On the other hand, most often the valuation of output of own-account construction has to be based on costs. For services produced when households employ paid domestic staff, output is valued by the compensation of employees paid.

Imports recorded c.i.f. and f.o.b.

15.68. In the System, total imports are valued f.o.b. However, data on detailed flows of imports from foreign trade statistics are most usually valued at c.i.f. prices. To reconcile the different valu-

ation used for total imports and the product components of imports, a global c.i.f./f.o.b. adjustment on imports is added.

15.69. The recording in the supply table of imports and the c.i.f./f.o.b. adjustment item is as follows:

- (a) Imports of goods detailed by products are valued c.i.f.;
- (b) All transport and insurance services on imports, provided by both resident and non-resident producers, which are included in the c.i.f. value of imports by products, are globally deducted (see column for imports of goods and row for the c.i.f./f.o.b. adjustment on imports). Thus, the total of imports of goods in the System is always recorded f.o.b. in the table;
- (c) Those transport and insurance services on imports that are provided by non-resident producers, are recorded under imports of services (part of the entries on rows for transport services and business services in the imports of services column);
- (d) Those transport and insurance services on imports that are provided by resident producers, are included in the output of transport and insurance services for the relevant industries (part of the entries on rows for transport services and business services in the output columns of the respective industries);
- (e) The supply by resident producers and imported supply of transport and insurance services on imports—i.e., (c) and (d) above—is not conveyed to users as transport and insurance services because the value of these services on imports is already included in the c.i.f. value of imports of goods and, therefore, not to be included in total supply of transport and insurance services. Thus, transport and insurance services on imports provided by resident and non-resident producers must be deducted from the total supply of such services in the supply table (in the column of the c.i.f./f.o.b. adjustment on imports on the rows for transport services and business services);
- (f) These services are recorded on the c.i.f./f.o.b. adjustment row, making row and column totals of the adjustment item equal to zero.

15.70. The parallel treatment to producers' prices would be to record details of imports at c.i.f. prices plus taxes and duties on imports, excluding VAT. These prices—referred to as ex-customs prices—may be useful for certain types of analysis. The System does, however, not recommend such parallel treatment at ex-customs prices, not even in the circumstance of recording flows of output of resident producers at producers' prices.

3. The use table

Introduction

15.71. The use table of the System (table 15.1 U) gives information on the uses of goods and services, and also on cost structures of the industries. It is convenient to refer separately to three quadrants of the use table (the fourth "quadrant" in this presentation being empty):

- (a) The intermediate use quadrant (I);
- (b) The final use quadrant (II);
- (c) The uses of value added quadrant (III).

15.72. The intermediate use quadrant shows intermediate consumption at purchasers' prices by industries in the columns and by products on the rows. The total row shows intermediate consumption by industries at purchasers' prices. No separate entries of trade and transport margins, taxes or subsidies on products would be needed in this quadrant due to the valuation of products at purchasers' prices in which they are embodied. As explained elsewhere, the purchasers' prices are net of deductible VAT, but may include some non-deductible VAT. Non-deductible VAT is included in each of the elements (where applicable) in the intermediate use quadrant. As regards the format (number of industries and products) of the intermediate use quadrant, it is identical to other formats within the supply and use table:

To the format of the output part of the supply table in terms of products and industries

To the format of quadrant II in terms of products

To the format of quadrant III in terms of industries.

15.73. The final use quadrant shows exports, final consumption expenditure and gross capital formation at purchasers' prices—with some further subdivision of final uses in the columns—each classified by products on the rows. The total row shows final use by use categories at purchasers' prices, including non-deductible VAT. Non-deductible VAT is included in each of the elements (where applicable) in the final use quadrant. The purchasers' prices are the observable market prices for the entries of the final use quadrant. Exports f.o.b. are considered equivalent to purchasers' prices.

15.74. The uses of value added quadrant shows those production costs of producers other than intermediate consumption, which is shown in quadrant I. The main uses of value added are the following:

- (a) Compensation of employees;
- (b) Taxes less subsidies on production and imports broken down into taxes on products, subsidies on products and other taxes less subsidies on production;
- (c) Consumption of fixed capital;
- (d) Net mixed income and net operating surplus.

15.75. The sequence of accounts for industries is readily recognized. For each industry its output (by products) appears in the supply table; then intermediate consumption (by products), and finally, gross value added and the uses of value added can be seen in the use table. The column for the total economy records the corresponding information at that aggregate level. In this column, rows for taxes and subsidies on products also bring together the non-allocated part from the respective columns of taxes and subsidies on products. Thus, it is possible to find GDP directly in the use table, as the entry on the row for total gross value added/GDP in the column for total economy.

15.76. Consumption of fixed capital may be difficult to calculate by industry. The value added quadrant therefore shows, as an alternative, gross operating surplus and gross mixed income.

15.77. Appended to the uses of value added quadrant—not considered part of it, but rather as conveniently located there—three rows provide additional information on industries' inputs:

- Gross fixed capital formation
- Stocks of fixed assets
- Labour inputs (usually hours worked).

Breakdown of uses

15.78. Intermediate consumption is broken down by the same industries as for output (see paragraph 15.60 above).

15.79. In the final use quadrant, some breakdowns of the main headings have already been introduced (while further breakdowns can of course readily be introduced if required):

- (a) Two sub-groups—goods and services—for exports (as for imports);
- (b) Two sub-groups of government final consumption expenditure: collective consumption expenditure and individual consumption expenditure;
- (c) Three sub-groups of gross capital formation: gross fixed capital formation, changes in inventories and acquisitions less disposals of valuables.

15.80. For exports (and imports) the countries may establish reasonably detailed sub-classifications (in columns). As in the supply table, for direct purchases abroad adjustment rows are added to the product details in the final use quadrant (although a breakdown by products might be provided if data were to be available):

- (a) Direct purchases abroad by residents added in total in the column for final consumption expenditure by households;
- (b) Direct purchases in the domestic market by non-residents added in exports of goods and exports of services and deducted from final consumption expenditure by households.

15.81. Final consumption expenditure is attributed to the sectors that

bear the costs: households, NPISHs, government. Government final consumption expenditure is further subdivided between expenditure incurred by general government on individual consumption goods and services and on collective consumption services.

15.82. Actual final consumption is the other basic consumption concept in the System, defined in terms of acquisitions rather than expenditures. Actual final consumption of general government is simply equal to its collective consumption expenditure. Actual final consumption of households is not shown explicitly in the final use quadrant, but can be derived simply by adding together three columns presented there:

- (a) Households' final consumption expenditures (including any expenditures by households on goods and services from government and NPISHs supplied at prices that are not economically significant);
- (b) The final consumption expenditures incurred by NPISHs (all considered individual);
- (c) The individual consumption expenditure of government.

15.83. Final consumption expenditures by general government and NPISHs include not only government and NPISH non-market output (valued by costs and deducting values of any receipts from sales), but also direct purchases of goods and services by government and NPISHs that are not channelled through intermediate consumption because they are distributed to the population without any processing. The latter are goods and services which are produced by market producers and delivered directly to households but paid for by government or NPISHs.

15.84. There are three main kinds of gross capital formation in the System and input-output framework:

- Gross fixed capital formation
- Changes in inventories
- Acquisitions less disposals of valuables.

15.85. The main description of these items is given in chapter X. In the input-output framework, these items are separate use categories appearing in different columns and classified by products. Included in the column of gross fixed capital formation are acquisitions less disposals of both tangible and intangible fixed assets, such as mineral exploration, computer software or originals—and improvements to non-produced assets (e.g., improvements to land). Included in the column of changes in inventories are changes in inventories of materials and supplies, of finished goods, of goods for resale, and work-in-progress. The third category, valuables, consists of precious stones and metals (gold, diamonds, etc.), jewellery fashioned out of precious stones and metals, and paintings, sculptures etc., recognized as works of art, that are acquired as "stores of value" and not for production or consumption.

Table 15.2. Supply and use: trade and transport margins, taxes and subsidies on intermediate and final use of products

[illegible]

Other non-market															
Education, health, social services (M+N+O) (19)	Public admin., defence, soc. security, other public services (L) (20)	Sub- total other non- market (21)	Total industry (22)	Final consumption expenditure								Gross capital formation			
				Exports		Sub- total (25)	House- holds (26)	NPISHs Individual (27)	General government			Sub- total (31)	Gross fixed capital forma- tion (32)	Changes in inven- tories (33)	Acquisi- tion less disposals of valuables (34)
				Goods (23)	Services (24)				Sub- total (28)	Collec- tive (29)	Indivi- dual (30)				
0	0	0	1	0		1	1	0	0	0	0	0	0	0	
0	0	0	0	0		5	5	0	0	0	0	0	0	0	
0	0	0	0	0		-3	-3								
0	0	0	2	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	0	0	0		0	
	0	0	4	0		1	1	0	0	0	0	0		0	
0	4	4	30	14		17	17	0	0	0	0	3	3	0	0
0	0	0	5	2		3	3	0	0	0	0	0	0	0	0
0	1	1	32	10		48	48	0	0	0	0	4	4	0	0
0	0	0	0	0		-5	-5								
0	0	0	0	0		0	0	0	0	0	0	17	17	0	
0	0	0	1	0		2	2	0	0	0	0	0		0	
0	0	0	4		0	1	1	0	0	0	0	0		0	
0	0	0	5		1	2	2	0	0	0	0	0	0	0	
0	0	0	0		0	4	4	0	0	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	0	0	0		0	
0	4	4	33	14	0	18	18	0	0	0	0	3	3	0	0
0	0	0	5	2	0	3	3	0	0	0	0	0	0	0	0
0	1	1	46	10	1	63	63	0	0	0	0	21	21	0	0
0	0	0	0	0		-8	-8	0	0	0	0	0	0	0	0

- 15.86. All three categories of gross capital formation are measured by acquisitions less disposals:

Gross fixed capital formation measured by the value of acquisitions less disposals of new or existing fixed assets

Changes in inventories by the value of entries to inventories less the value of goods leaving inventories during the accounting period including the value of any recurrent losses of goods held in inventories

Acquisitions less disposals of valuables.

- 15.87. Fixed assets—most important of the three—consist of tangible or intangible assets that have been produced as outputs and are themselves used repeatedly or continuously in other processes of production over long periods of time exceeding at least one year. The time at which gross fixed capital formation is recorded is when the ownership of the fixed assets is transferred to the units that intend to use them in production. This time is generally later than the time when they are produced, and not necessarily the time at which they are actually put to use.

- 15.88. When fixed assets are purchased in instalments or under a financial lease, legal ownership may not change until some time after the goods have actually been used in production, but in the System the user is treated as acquiring the rights of ownership at the time he takes physical possession of the goods. Gross fixed capital formation is therefore recorded at this point. This treatment leads to a more homogeneous registration of the use of fixed capital and localization of value added in the input-output framework.

- 15.89. An existing fixed asset can be sold and its ownership passes from its original owner to another. The value of an existing fixed asset has already been included in gross fixed capital formation—or in final consumption expenditure in some instances—of at least one user at some earlier point of time. When ownership of an existing fixed asset is transferred, it is recorded as a positive acquisition for the new owner and as a negative acquisition (a disposal) for the previous owner. Two movements should be distinguished in the supply and use tables:

- a) Along the row of that type of capital asset (product) in the final use quadrant:
 - (i) From gross fixed capital formation of one producer to gross fixed capital formation of another producer the two transactions cancel out;
 - (ii) From gross fixed capital formation of a producer to final consumption of a consumer;
 - (iii) From gross fixed capital formation of a resident-producer to a non-resident as exports;
 - (iv) From final consumption of a consumer to gross-

fixed capital formation of a producer (less likely, -e.g., car);

- (b) Along the row for gross fixed capital formation by owner (industry) below the uses of value added quadrant (see paragraph 15.77 above):

- (i) Gross fixed capital formation from one producer to another, i.e., recorded as negative gross fixed capital formation by the former and positive gross fixed capital formation by the latter.

- 15.90. There are often transfer costs associated with the acquisition and disposal of fixed assets. A full description of these transfer costs is given in the annex to chapter X. In the supply and use table, the value of the asset without the transfer costs is shown under gross fixed capital formation on the product row appropriate to that asset, while the transfer costs are shown under gross fixed capital formation on the row of business services.

Uses of value added

- 15.91. The supply and use table adds to the balance between the supply and use of products a quadrant which contain the industry breakdown of the balancing item of the production account (gross value added/GDP) and the industry breakdown of the items in the generation of income account (the uses of value added). Some further breakdown of the standard transaction categories might be useful.

- 15.92. Compensation of employees could be subdivided into:

Wages and salaries

Employers' social contributions, with a breakdown between actual contributions and imputed contributions.

- 15.93. Taxes less subsidies might further distinguish value added type taxes, taxes and duties on imports (excluding VAT) and import subsidies, export taxes and export subsidies, and taxes on products, excluding VAT, import and export taxes, and other subsidies on products. Since taxes and subsidies on products are non-allocated items when output is valued at basic prices, a breakdown by industries would only be needed for other taxes less subsidies on production. This latter item might also be split into one part for taxes and another for subsidies.

- 15.94. Consumption of fixed capital might be classified by type of fixed assets as for gross fixed capital formation.

- 15.95. Mixed income and operating surplus, however, are balancing items which do not call for further breakdown. Mixed income is the term reserved for the balancing item of the generation of income account in respect of production by the household sector (unincorporated enterprises) other than owner-occupiers as producers of housing services.

Industry breakdown of gross fixed capital formation, stocks of fixed assets and labour inputs

- 15.96. The production account, the generation of income account and

the supply and use tables include the sequence of accounts for industries from output down to net mixed income/net operating surplus. In addition, the industry breakdown is particularly of interest for gross fixed capital formation, stocks of fixed assets and labour inputs, since these data would provide a basis for productivity studies and other kinds of analysis at the industry level.

15.97. In the input-output framework, two sets of entries for gross fixed capital formation are introduced:

- (a) Column of gross fixed capital formation in the final use quadrant of the use table broken down by products (several columns if total is also broken down by type of fixed assets);
- (b) Row of gross fixed capital formation appended to the uses of value added quadrant broken down by industries of ownership.

15.98. As to the chosen format of this industry breakdown, two kinds of clarifications should be made:

- (a) The appended row for gross fixed capital formation by industry (and the other two rows) are not part of the uses of value added quadrant of the use table. It is an additional table that—as a matter of convenience—has been aligned to the other rows of the supply and use tables which give an industry breakdown;
- (b) Alternatively—as stated in a footnote to the supply and use table—the column of gross fixed capital formation by product might be broken down by industries (or also by institutional sectors).

15.99. Below the row for gross fixed capital formation by industry is another row of the use table showing stocks of fixed assets by industries.

15.100. The categories of fixed assets to be included are the following:

- (a) Tangible fixed assets: dwellings, other buildings and structures, machinery and equipment, and cultivated fixed assets (livestock for breeding, dairy, draught, etc., and vineyards, orchards and other plantations of trees yielding repeat products);
- (b) Intangible fixed assets: mineral exploration, computer software, entertainment, literary or artistic originals, and other intangible fixed assets.

15.101. The so-called “perpetual inventory method” is usually employed to obtain estimates of the current values of the gross and net stocks needed for the analysis of production and productivity growth and for balance sheet purposes. In the central framework of national accounts, the stock data should be valued by writing down the current market prices of these assets by the cumulative consumption of fixed capital valued at current replacement costs which has occurred since the time they were acquired for purposes of production. The net basis (i.e.,

stocks of fixed assets, net) would be consistent with the concepts used in the balance sheet of the institutional sectors. However, in order to obtain productivity measures—to match similar data on labour inputs—data on gross stocks of fixed assets by industries are useful as well.

15.102. Chapter XVII deals with labour input data, which are required in order to analyse productivity. Several concepts of employment are introduced, in particular the following three measures:

- (a) Jobs, which are contracts (explicit or implicit) between a person and an institutional unit to perform work in return for compensation (or mixed income) for a defined period or until further notice;
- (b) Total hours worked, which are the aggregate number of hours actually worked during the period in employee and self-employment jobs;
- (c) Full-time equivalent jobs, which are total hours worked divided by average annual hours worked in full-time jobs.

15.103. The choice of labour concept for the input-output framework should be the one that best reflects labour input for the purpose of productivity. Total hours worked is therefore the preferred measure of labour inputs in the System. The concept of full-time equivalent jobs may treat part-time work inadequately.

15.104. Not all countries may be able to implement the concept of total hours worked in the national accounts context. In view of this, the following recommendations are made:

- (a) For countries providing data on total hours worked: a row broken down by industries for total hours worked in jobs, with a breakdown between employee jobs and self-employed jobs;
- (b) For countries not providing data on total hours worked: a row broken down by industries for the number of jobs, with a breakdown between employee jobs and self-employed jobs.

15.105. If even (b) is impossible to work out, an average number of persons employed might be considered as a second-best proxy, based on as many head counts as possible during the period under consideration, with a breakdown between numbers of employees and self-employed.

Cross-classification of uses of value added by institutional sectors and industries

15.106. Both the production account and the generation of income account are provided for in the System by sector and by industry. The definitions and valuations of the aggregates are the same.

15.107. As an establishment always belongs to an institutional unit it is possible to link the production activities of industries and institutional sectors. Output of an institutional unit is equal to

Table 15.3. Cross classification of production account items by industries and institutional sectors [cont.]

Industries (by SIC categories)																	
Market										Own final use				Other non-market			
	Agric., forestry, fishing (A+B) (6)	Mining and quarry- ing (C) (7)	Manufac- turing, electri- city (D+E) (8)	Construc- tion (F) (9)	Wholesale, retail trade, repair motor vehicles, and hotels and restaurants (G+H) (10)	Transport, storage, and communi- cation (I) (11)	Financial interme- diation, real est., other bus. services (J+K) (12)	Edu- cation social services (M+N+O) (13)	Sub- total market (14)	Agric., hunting, forestry, fishing (A+B) (15)	Construc- tion (F) (16)	Real estate, house- hold services (K+P) (17)	Sub- total own use (18)	Edu- cation health, social services (M+N+O) (19)	Public admin., soc. sec., other public services (L) (20)	Sub- total other non- market (21)	Total industri- al market (22)
4. Non-profit institutions serving households																	
Output																	
Market																	
Own final use																	
Other non-market																	
Intermediate consumption																	
Value added gross																	
Compensation of employees																	
Other taxes less subsidies on production																	
Operating surplus, net																	
Consumption of fixed capital																	
Operating surplus, gross																	
Households																	
Output																	
Market																	
Own final use																	
Other non-market																	
Intermediate consumption																	
Value added gross																	
Compensation of employees																	
Other taxes less subsidies on production																	
Mixed income, net																	
Operating surplus, net																	
Consumption of fixed capital																	
Mixed income, gross																	
Operating surplus, gross																	
Total economy																	
Output																	
Market																	
Own final use																	
Other non-market																	
Intermediate consumption																	
Value added gross/GDP																	
Compensation of employees																	
Other taxes less subsidies on production																	
Mixed income, net																	
Operating surplus, net																	
Consumption of fixed capital																	
Mixed income, gross																	
Operating surplus, gross																	

the sum of the outputs of the individual establishments of which the institutional unit is composed, thus including deliveries between establishments within the institutional unit (i.e., inter-establishment flows). To clarify relationships and contents of industries and sectors, the System calls for the cross-classification of value added and its uses (and if possible also for output and intermediate consumption) by both industry and sector.

15.108. The table of value added and its uses cross-classified by industries and sectors is essentially the uses of value added quadrant of the use table broken down also by sectors to become a three-dimensional table.

15.109. The illustrated figures in table 15.3 indicate which are the entries of the three dimensions that usually or mostly appear together. The chapter has already dealt with the correlation between uses of value added and industries and for some uses also the institutional sectors involved. The most interesting correlation at this point is however that between sector and industry:

- (a) Non-financial corporations: market industries (most ISIC sections);
- (b) Financial corporations: market industries of financial intermediation including insurance and pension funds and activities auxiliary to financial intermediation;
- (c) General government: non-market industries of public administration and defence, compulsory Social Security, education, health and social work, real estate activities, other community and social service activities, etc.; market industries might also occur;
- (d) NPISHs: non-market industries of education, health and social work, other community and social service activities, etc.;
- (e) Households: market industries (various ISIC sections) and own use industries (private households with employed persons, services of owner-occupied dwellings, subsistence production of agriculture etc.).

15.110. In order to implement the three-dimensional table, it would be a great advantage to have good register capabilities. Furthermore, it might be necessary to make the similar cross-classifications for output and intermediate consumption as well, especially for countries which in general follow the production approach in estimating the GDP.

4. Illustrations of the supply and use table

15.111. The tables of the input-output framework are all presented with figures for illustration to facilitate the comprehension of their contents. This sub-section of illustrations is meant as a guide to readers who want to make direct references to row and column numbers of the supply and use table.

15.112. The notations used are the following:

- $X_{i,j}$ - Entry of row no. i and column no. j
- $R_{i.(j1+ \dots + jN)}$ - Row no. i , sum of columns 1 to N
- $C_{.(i1+ \dots + iM).j}$ - Column no. j , sum of rows 1 to M

15.113. For example, total output at basic prices is defined in the supply table as:

$$X_{13.22} = R_{13.(14+18+21)} = C_{.(1+ \dots +10).22} = 3,604$$

which means that the intersection of row 13 and column 22 will give total output at basic prices equal to 3,604, alternatively arrived at by taking the sum of columns 14, 18 and 21 on row 13, or the sum of rows 1 through 10 in column 22.

15.114. To illustrate the contents of the supply table 15.1 S, the following aggregates might be defined from the table as shown:

Total output, market industries =

$$X_{13.14} = R_{13.(6+ \dots +13)} = C_{.(1+ \dots +10).14} = 3,077$$

Total output, own use industries =

$$X_{13.18} = R_{13.(15+ \dots +17)} = C_{.(1+ \dots +10).18} = 147$$

Total output, other non-market industries =

$$X_{13.21} = R_{13.(19+20)} = C_{.(1+ \dots +10).21} = 380$$

Total output, basic prices =

$$X_{13.22} = R_{13.(14+18+21)} = C_{.(1+ \dots +10).22} = 3,604$$

Total imports of goods and services =

$$R_{13.(25+26)} = 499$$

Total supply, basic prices =

$$X_{13.5} = R_{13.(22+25+26)} = C_{.(1+ \dots +12).5} = 4,103$$

Total supply, purchasers' price =

$$X_{13.1} = R_{13.(3+4+5)} = C_{.(1+ \dots +12).1} = 4,236$$

15.115. Likewise, to illustrate the contents of the use table 15.1 U, the following aggregates might be defined from the table as shown:

Total intermediate consumption, market industries =

$$X_{13.14} = R_{13.(6+ \dots +13)} = C_{.(1+ \dots +10).14} = 1,594$$

Total intermediate consumption, own use industries =

$$X_{13.18} = R_{13.(15+ \dots +17)} = C_{.(1+ \dots +10).18} = 50$$

Total intermediate consumption, other non-market industries =

$$X_{13.21} = R_{13.(19+20)} = C_{.(1+ \dots +10).21} = 239$$

Total intermediate consumption, total industry =

$$X_{13.22} = R_{13.(14+18+21)} = C_{.(1+ \dots +10).22} = 1,883$$

Total exports of goods and services =

$$R_{13.(24+25)} = 540$$

Total final consumption expenditure, total economy =

$$X_{13.26} = R_{13.(27+28+29)} = C_{.(1+ \dots +12).26} = 1,399$$

Total gross capital formation, total economy =

$$X_{13.32} = R_{13.(33+34+35)} = C_{.(1+ \dots +10).32} = 414$$

Total national final uses, total economy =

$$R_{13.(26+32)} = 1,813$$

Total final uses, total economy =

$$R_{13.(24+25+26+32)} = 2,353$$

Total uses, total economy =

$$X.13.1 = R.13.(22+24+25+26+32) = C.(1+12).1 = 4,236$$

- 15.116. The illustration of industry flows involves both the supply table 15.1 S and the use table 15.1 U. Since the aggregates of output and intermediate consumption already have been illustrated, emphasis is here on value added and GDP, and the uses of value added, to illustrate the industry flows (when both tables are referred to, S indicates the supply table and U the use table):

Total gross value added, market industries =

$$X.17.14 = R.17.(6+13) = C.(S13 - U13).14 = 1,483$$

Total gross value added, own use industries =

$$X.17.18 = R.17.(15+17) = C.(S13 - U13).18 = 97$$

Total gross value added, other non-market industries =

$$X.17.21 = R.17.(19+20) = C.(S13 - U13).21 = 141$$

Total gross value added, industries, basic prices =

$$X.17.22 = R.17.(14+18+21) = C.(S13 - U13).22 = 1,721$$

Gross domestic product (GDP) (production approach) =

$$X.17.23 = R.S13.(3+4+22) - R.U13.22 = 1,854$$

Gross domestic product (GDP) (income approach) =

$$X.17.23 = C.(18+19+23+24+25).23 = 1,854$$

- 15.117. For GDP, in addition to the two illustrations above on the production approach and the income approach, the GDP

using the expenditure approach could also be illustrated from table entries:

Gross domestic product (GDP) (expenditure approach) =

$$X.17.23 = R.U13.(24+25+26+32) - R.S13.(25+26) = 1,854$$

- 15.118. For each product and for the total economy there is the constraint that total supply equals total use. This is shown in table 15.1 (S and U) at purchasers' prices:

Total supply, total economy =

$$R.13.(3+4+22+25+26) = 141-8+3,613+392+107 = 4,236$$

Total uses, total economy =

$$R.13.(22+24+25+26+32) = 1,902+462+78+1,391+412 = 4,236$$

- 15.119. This sets out the basic equation (or balance) of national accounts aggregates reflected in the goods and services account:

Output (3,604)

+ Imports of goods and services (392+107)

+ Taxes, less subsidies, on products (141 - 8)

= Intermediate consumption (1,883)

+ Exports of goods and services (462+78)

+ Final consumption expenditure/actual final consumption (1,399)

+ Gross capital formation (414)

D. Derived and analytical input-output tables

1. Introduction

- 15.120. The remaining part of this chapter relates to making the input-output data even more useful for analysis. While some users might find that in many instances the supply and use table could serve analytical as well as statistical purposes, others traditionally may want to prepare more analytical tables to meet their needs.

- 15.121. Supply and use tables certainly can provide the framework for input-output analysis, including the construction of economic models needed for economic analysis. Indeed, analysts increasingly find that there are advantages in starting off directly from the rectangular input-output tables instead of basing the analysis on symmetric input-output tables (see also discussion of framework in chapter XX).

- 15.122. It should also be noted that the supply and use tables—sometimes referred to as statistical supply and use tables—in fact represent an intermediate stage between the basic statistics and the symmetric tables. Although the supply and use tables may have strong ties to data observations and various basic statistics, it is also the case that a series of imputations, reconciliations and other national accounts requirements in fact usually entail considerable and varied compilation work on basic data to complete and balance the supply and use tables.

- 15.123. The following considerations might be taken into account—starting from supply and use tables—in order to arrive at useful analytical input-output tables:

- Decompose purchasers' prices of uses into basic price, taxes, subsidies, and trade and transport margins, and separately analyse these components;
- Distinguish use of imported products from use of products from resident producers;
- Express rows and columns in the same classification, i.e., direct links (products-to-products or industries-to-industries) rather than indirect (products-to-industries).

- 15.124. In order to respond to these requirements, the System recommends the following set of input-output tables to complement the basic supply and use table (table 15.1) and its supporting table on trade and transport margins and taxes and subsidies on products (table 15.2):

Table 15.4a and 15.4b

Table 15.6

Table 15.6

Table 15.7.

- 15.125. Two important assumptions underlie the static input-output analysis, i.e., the notions of:

Table 15.4a. Supply and use: final and intermediate uses at basic prices, market/non-market distinction and ISIC breakdown

Uses of products		Intermediate consumption of industries (by ISIC categories)											
		Market										Sub-total market (14)	
		Total uses at basic prices (1)	Trade and transport margins (2)	Taxes less subsidies on products (3)..	Agric., hunting, forestry, fishing (A+B) (8)	Mining and quarrying (C) (7)	Manufacturing, electricity (D+E) (8)	Construction (F) (9)	Wholesale, retail trade, repair motor vehicles, hotels and restaurants (G+H) (10)	Transport, storage, communication (I) (11)	Financial intermediation, real est., other business services (J+K) (12)		Educ., health, social services (M+N+O) (13)
<i>Goods and services, (by CPC sections)</i>													
<i>Total uses</i>													
1.	Agriculture, forestry and fishery products (0)	124			2	0	70	0	3	1	5	0	81
2.	Ores and minerals (1)	101			1	3	89	0	0	0	1	0	94
3.	Electricity, gas and water (17-18)	155			2	2	92	1	5	3	4	1	110
4.	Manufacturing (2-4)	1 997			25	7	624	56	36	19	35	16	818
5.	Construction work and construction, land (5)	245			1	2	7	5	2	1	3	1	22
6.	Trade services, restaurant and hotel services (6)	201			3	1	56	4	9	8	4	0	85
7.	Transport, storage and communication services (7)	116			2	1	32	3	17	12	5	0	72
8.	Business services (8)	582			3	1	112	16	25	15	44	6	222
9.	Community, social and pers. serv. exc. pub. adm. (9)	371			1	0	7	1	1	1	11	23	45
10.	Public administration (91)	168			0	0	0	0	0	0	0	0	0
<i>Adjustments:</i>													
11.	Direct purchases abroad by residents	43											
12.	Dir. purchases in domestic market by non-residents	0											
13.	<i>Total uses at basic prices</i>	4 103			40	17	1 089	86	98	60	112	47	1 549
14.	<i>Taxes less subsidies on products</i>	133			1	0	38	4	2	0	0	0	45
16.	<i>Total uses at purchasers' prices</i>	4 236			41	17	1 127	90	100	60	112	47	1 594
17.	<i>Total gross value added/GDP</i>			133	37	18	717	118	91	40	266	196	1 483
18.	Compensation of employees				9	13	336	46	44	16	54	123	641
19.	Taxes less subsidies on production and imports			133	- 2	- 2	46	5	0	- 6	12	3	56
20.	Taxes on products			141									
21.	Subsidies on products			- 8									
22.	Other taxes less subsidies on production				- 2	- 2	46	5	0	- 6	12	3	56
23.	Mixed income, net				14	0	227	35	36	3	99	18	432
24.	Operating surplus, net				7	4	30	21	- 4	12	67	47	184
25.	Consumption of fixed capital				9	3	78	11	15	15	34	5	170
26.	Mixed income, gross				15	0	228	36	36	7	99	19	440
27.	Operating surplus, gross				15	7	107	31	11	23	101	51	346
28.	<i>Total output</i>				78	35	1 844	208	191	100	378	243	3 077

Table 15.4b. Supply and use: final and intermediate uses at basic prices, ISIC breakdown

		Intermediate consumption of industries (by ISIC categories)											
		Total uses at basic prices (1)	Trade and transport margins (2)	Taxes less subsidies on products (3)..	Agric., hunting, forestry, fishing (A+B) (6)	Mining and quarry- ing (C) (7)	Manufac- turing, elec- tricity (D+E) (8)	Construc- tion (F) (9)	Wholesale, retail trade, repair motor vehicles, hotels and restaurants (G+H) (10)	Transport, storage, communi- cation (I) (11)	Financial interme- diation, real est., other business services (J+K) (12)	Educ., health, social, pers. services (M+N+D+P) (13)	Public admin., defence, soc. sec., other public services (L) (14)
Uses of products													
<i>Goods and services, (by CPC sections)</i>													
<i>Total uses</i>													
1.	Agriculture, forestry and fishery products (0)	124			3	0	70	0	3	1	5	3	2
2.	Ores and minerals (1)	101			1	3	89	0	0	0	1	0	0
3.	Electricity, gas and water (17-18)	155			2	2	92	1	5	3	4	6	4
4.	Manufacturing (2-4)	1 997			30	7	624	73	36	19	45	58	33
5.	Construction work and construction, land (5)	245			1	2	7	5	2	1	3	12	7
6.	Trade services, restaurant and hotel services (6)	201			3	1	56	4	9	8	4	2	6
7.	Transport, storage and communication services (7)	116			2	1	32	3	17	12	5	3	4
8.	Business services (8)	582			3	1	112	23	25	15	54	39	32
9.	Community, social and pers. serv. exc. pub. adm. (9)	371			1	0	7	1	1	1	11	44	29
10.	Public administration (91)	168			0	0	0	0	0	0	0	1	0
<i>Adjustments:</i>													
11.	Direct purchases abroad by residents	43											
12.	Dir. purchases in domestic market by non-residents	0											
13.	<i>Total uses at basic prices</i>	4 103			46	17	1 089	110	98	60	132	168	117
14.	<i>Taxes less subsidies on products</i>	133			1	0	38	4	2	0	0	0	1
16.	<i>Total uses at purchasers' prices</i>	4 236			47	17	1 127	114	100	60	132	168	118
17.	<i>Total gross value added/GDP</i>			133	42	18	717	130	91	40	346	287	50
18.	Compensation of employees				9	13	336	58	44	16	54	193	39
19.	Taxes less subsidies on production and imports												
20.	Taxes on products			133	- 2	- 2	46	5	0	- 6	12	4	1
21.	Subsidies on products			141									
22.	Other taxes less subsidies on production			- 8									
23.	Mixed income, net				- 2	- 2	46	5	0	- 6	12	4	1
24.	Operating surplus, net				14	0	227	35	36	3	99	18	0
25.	Consumption of fixed capital				10	4	30	21	- 4	12	127	47	0
26.	Mixed income, gross				11	3	78	11	15	15	54	25	10
27.	Operating surplus, gross				17	0	228	36	36	7	99	19	0
<i>Total output</i>					18	7	107	31	11	23	181	71	10
<i>Total output</i>					89	35	1 844	244	191	100	478	455	168

A single technique of production for each product

A linear fixed-coefficient production function.

15.126. In a modern economy with millions of products and techniques, the first assumption would seem highly abstract as one is rather unlikely to find an aggregation of these to properly represent techniques of production.

15.127. Most analysis requires that transactions between producers and users must be valued as homogeneously as possible. Consequently, the System recommends the use of basic prices in the valuation of both inputs and outputs for input-output analysis. Also valuing final uses at basic prices means that the impact of various uses on the level of output valued at basic prices can be estimated. Thereby, for example, differences between various classes of buyers in the rates of taxation are also avoided.

15.128. The original use tables contain the elements for alternative valuations, i.e., the alternative use table at basic prices can be derived by combining the use table (table 15.1 U) and the supporting table on trade and transport margins and taxes and subsidies on products (table 15.2)—a table showing entries of margins and taxes and subsidies on products embodied in the purchasers' prices of the intermediate use and final use quadrants.

2. The use table at basic prices

15.129. The use table at basic prices is both an alternative statistical use table and a step towards the conversion to analytical input-output table. Against the first interpretation, it may be noted that intermediate and final uses calculated at basic prices are one step further removed from basic statistics.

15.130. Table 15.4a presents the use table at basic prices. In a supply and use table at basic prices, the columns on taxes on products and subsidies on products, as well as the column on trade and transport margins as it is presented in the supply table (table 15.1 S), become irrelevant. However, (non-deductible) taxes less subsidies on products form an additional row in quadrants I and II for intermediate use and final uses, as the total uses continue to be valued at purchasers' prices.

3. Distinction between use of products from resident producers and of imported products

15.131. In the supply and use tables presented so far, imports are shown by products in the supply table, while not distinguished among uses in the use table. In this recording, no information is required on the origin (resident or foreign) of products used by each category of demand. The principal disadvantage of this simple method is that in most analyses the impacts of a certain level of final demand on production of resident producers and on imports need to be assessed separately.

15.132. There are several ways to treat imports in the input-output framework:

(a) Classified by purchasers;

(b) Classified into complementary and competitive imports;

(c) A separate input-output table for imported products.

15.133. The most comprehensive method is to prepare separate input-output tables for imported products and products from resident producers. The statistical requirements are demanding, but the results allow considerable flexibility in the treatment of imports and permit a very clear analysis of the impact of demand on supplies from resident producers and foreign supplies. When it is useful for analytical and economic policy purposes, such an import table may be established even if an analytical symmetric input-output table is not prepared.

15.134. In the System it is recommended in the analytical input-output tables to make a separate input-output table for imported products. Table 15.5 illustrates this method. This table is given in the same format as the subsequent symmetric product-by-product tables, particularly because of its orientation towards products rather than industries. It may be added that the method also permits the separation of technical coefficients into resident and imported components when applied for modelling work.

15.135. The column totals of table 15.5 classify imports by purchasers with no classification of imports by products. Imports are instead shown in a single row entering into each category of demand. The disadvantage of this method is that imports are explicitly shown only as a margin of the input-output framework which conceals the nature of the imports. It is very likely that this method will require more statistical information than it actually reveals.

15.136. Classifying imports only by purchaser might be refined by dividing imports into the two categories of complementary imports and competitive imports. In this case, the effects on production of resident producers and imports can be more accurately assessed. The decisions on classification may however be arbitrary in some cases and may need revision over time if production by resident producers ceases or commences. In practice, actual compilation is usually more complicated than the definitions of the two categories suggest:

(a) Complementary products are those for which no resident industry exists and are available only from imports;

(b) Competitive products are those for which there is a resident industry and which may therefore be produced either by resident producers or imported.

4. Conversion of the supply and use tables into symmetric tables

Kind of amendments to the supply and use table

15.137. There is a change in format to be made when converting the supply and use tables into symmetric tables. The description that follows refers to the product-by-product table, in which the columns of the table refer to inputs into the production of a CPC group. The conversion, or transformation, can be divided into three steps or amendments to the supply and use table:

- (a) Allocation of all products in the supply table to the productive activity in which they are principally (characteristically) produced;
- (b) Rearranging the columns of the use table from inputs into industries to inputs into homogeneous activities (without aggregation of the rows);
- (c) Aggregation of the detailed products (rows) of the new use table to the homogeneous activities recognized in the columns, if appropriate.

15.138. Step (a), in fact, involves transfers of outputs in the form of secondary products in the supply table. Since secondary products appear as ("off-diagonal") entries in the supply table, this kind of transfer would be a comparatively simple matter (merely rearrange products in sequences and "move" to diagonal). These secondary products are treated as additions into the activities for which they are principal and removed from the activities in which they were produced.

15.139. Step (b) is more complicated as the basic data on inputs relate to industries and not to particular products produced in those industries. The kind of conversion to be made here entails the transfer of inputs associated with secondary outputs from the industry in which that secondary output actually takes place to the activity to which they principally (characteristically) belong. In making this transfer, two different approaches might be taken:

By means of supplementary statistical information

By means of mechanical methods.

15.140. Supplementary statistical information should be utilized as much as possible, i.e., specific information on inputs required to produce certain kinds of output, in order to separate out inputs relating to a secondary product. Information of this kind is usually incomplete, however. Ultimately it will be necessary to resort to simple mathematical means for making the transfers. Mathematical methods are briefly described in the next section and will be elaborated in the *Handbook on Input-Output Tables*.

15.141. Step (c) involves the aggregation of the products of the new use table to the activities that generate them according to step (a) and this results in a symmetric input-output table with di-

mensions product-by-product. While these amendments start from data based on establishment units, the resulting entries are brought to conform to those of units of homogeneous production.

15.142. The transfer of secondary products may also include the transfer of by-products. When the product produced as a by-product is the principal product of another activity, it may be transferred to that activity, with the inputs assumed to be attributable to the production of the by-product. Splitting off the production of by-products in this way may not be merely difficult, but also rather artificial if they cannot be separated technologically from the process of production in which they are actually produced.

15.143. In summary, the conversion might be seen as moving from an accounting tool designed primarily to provide a framework within which statistics can be assembled, organized and collated, to an analytical tool which is intended primarily for economic analysis. The two kinds of tool are, however, not so very different from each other; supply and use tables can also be used themselves for various analytical purposes—and they already involve a lot of adjustments and analytical work—while the symmetric tables impose even stronger accounting constraints on the data, since row and column totals of the input-output table in the same classification have to be identical for each product.

Adding analytical assumptions to basic data

15.144. The mathematical methods used when transferring outputs and associated inputs hinge on two types of technology assumptions:

- (a) Industry (producer) technology, assuming that all products produced by an industry are produced with the same input structure;
- (b) Product (commodity) technology, assuming that a product has the same input structure in whichever industry it is produced.

15.145. The importance of the role played by the assumptions depends on the extent of secondary production, which depends not only on how production is organized in the economy, but also on the statistical units and the industry breakdown in the tables. More secondary production will appear with institutional units than with establishments, and more secondary production will inevitably be found in more detailed tables.

15.146. On theoretical grounds, which are spelt out in more detail in the forthcoming *Handbook on National Accounting: Input-Output tables*, which is being prepared by the Statistical Division of the United Nations Secretariat, by referring to certain axioms of desirable properties one may come somewhat closer to a choice between these two technology assumptions. On this basis, the industry technology assumption performs rather poorly, as being:

Table 15.5. Import matrix, basic prices (c.i.f.)

Uses of products	Intermediate consumption Homogeneous units of production										
	Agric., fishery, forestry products (0)	Ores and minerals (1)	Elec., gas, water (17-18) (3)	Manufac- turing (2-4) (4)	Construc- tion work, construc- tion, land (5) (5)	Trade services, restaurants, hotels (6) (6)	Transport, storage, communi- cation services (7) (7)	Business services (8) (8)	Community, social, personal services (9) (9)	Public admin., defence, other public services (91) (10)	Total industry (11) (11)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>Goods and services, (by CPC sections)</i>											
<i>Total uses</i>											
1. Agriculture, forestry and fishery products (0)	0	0	0	27	0	0	0	0	0	0	27
2. Ores and minerals (1)	0	0	0	60	0	0	0	0	0	0	60
3. Electricity, gas and water (17-18)	0	0	0	1	0	0	0	0	0	0	1
4. Manufacturing (2-4)	0	0	10	85	5	0	0	0	0	0	100
5. Construction work and construction, land (5)	0	0	0	0	0	0	0	0	0	0	0
6. Trade services, restaurant and hotel services (6)	0	0	0	15	0	3	3	0	0	0	21
7. Transport, storage and communication services (7)	0	0	0	10	0	5	0	1	0	0	16
8. Business services (8)	0	0	0	5	5	2	0	5	0	0	17
9. Community, social and pers. serv. exc. pub. adm. (9)	0	0	0	0	0	0	0	0	0	0	0
10. Public administration (91)	0	0	0	0	0	0	0	0	0	0	0
<i>Adjustments:</i>											
11. Direct purchases abroad by residents											
12. C.i.f./f.o.b. adjustment											
13. <i>Total imports</i>	0	0	10	203	10	10	3	6	0	0	242

Final consumption expenditure						Gross capital formation							
Sub-total (12)	House-holds (13)	NPISHs Individual (14)	General government			Sub-total (18)	Gross fixed capital forma- tion (19)	Changes in inven- tories (20)	Acquisition less disposals of valuables (21)	C.i.f./ f.o.b. adjust- ment (22)	Imports		
			Sub- total (16)	Collec- tive (16)	Indivi- dual (17)						Goods (23)	Services (24)	
10	10	0	0	0	0	0	0	0				37	
0	0	0	0	0	0	0		0				60	
0	0	0	0	0	0	0		0				1	
100	100	0	0	0	0	83	73	0	10			283	
0	0	0	0	0	0	1	1	0				1	
15	15	0	0	0	0	0	0	0	0				36
10	10	0	0	0	0	0	0	0	0				26
0	0	0	0	0	0	0	0	0					17
5	5	0	0	0	0	0	0	0					5
0	0	0	0	0	0	0		0					0
43	43											20	23
										- 10		- 10	
183	183	0	0	0	0	84	74	0	10	- 10		392	107

- (a) Highly implausible;
 - (b) Not price invariant, which means that values at current prices are affected;
 - (c) Not scale invariant, due to its fixed market share property, which means that the coefficients that follow may vary without change in technique;
 - (d) Not maintaining financial balance, which means that the axiom of revenue being equal to cost plus value added for each commodity is not met;
 - (e) The Leontief material balance (total output = input-output coefficients * total output + final demand) is however met.
- 15.147. From the same theoretical point of view, the product (commodity) technology model seems to meet the most desirable properties, i.e., the axioms of material balance, financial balance, scale invariance and price invariance. It also appeals to common sense and is found a priori more plausible than the industry technology assumption. While the product technology assumption thus is favoured from a theoretical and a common sense viewpoint, it may need some kind of adjustment in practice. The automatic application of this method has often shown results that are unacceptable, insofar as input-output coefficients sometimes appear as extremely improbable or even impossible. There are even numerous examples of the method leading to negative coefficients which are clearly nonsensical from an economic point of view. Improbable coefficients may partly be due to errors in measurement and partly to heterogeneity (product-mix) in the industry of which the transferred product is the principal product. Heterogeneity results from working on aggregated data with a high occurrence of non-characteristic products. This might be overcome by making adjustments based on supplementary information or exploiting informed judgement to the fullest extent possible.
- 15.148. Further improvement of the input-output tables can be made in the following ways:
- (a) Make proper adjustments to the basic data so as to obtain a supply and use table of good quality, since this will in fact mean more to the quality of the symmetric tables than the choice of technology assumption;
 - (b) Introduce other models like mixed technology models whenever modifications of the basic input-output model are to be made, however complicated to implement.
- 15.149. Finally, it must be said that the question of technology assumption should be viewed against the background of the kind of aggregated data dealt with in the input-output framework. Since input-output tables contain only highly aggregated macro data, it is in fact difficult to relate them to micro assumptions of a certain production technology.

5. Symmetric input-output tables

Format of the recommended tables

- 15.150. Symmetric means having the same dimensions, either product-by-product or industry-by-industry. The product-by-product table shows which products are used in the production of which other products; the industry-by-industry table shows which industry uses the output of which other industry. Since the product-by-product table will often prove most useful, only this table is actually described in detail in this manual. It is shown in two versions:
- (a) Product-by-product input-output table, i.e., table 15.6;
 - (b) Product-by-product input-output table separating out the part of the product flows produced by resident producers from the part imported, i.e., table 15.7.
- 15.151. The format of the product-by-product table is the familiar one consisting of three quadrants:
- (a) The upper-left part, quadrant I on intermediate use, gives the name to the table, as it is shown in the form of product-by-product (i.e., rows were products already, while columns change, actually referring to homogeneous activities);
 - (b) The upper-right part, quadrant II on final use, has a format close to the corresponding use table, except for imports (see below);
 - (c) The lower-left part, quadrant III on uses of value added, also has a format close to that of the use table in that the rows are the same, but the columns reflect homogeneous activities, while the appended rows of the use table have been deleted.
- 15.152. The symmetric tables 15.6 and 15.7, on their rows of quadrants I and II, have kept the same items as of the supply and use table 15.1, i.e., an illustrative product breakdown of 10 groups, plus the three adjustment row items presented before. By the nature of the table, the same 10 product groups now appear as columns in quadrant I. The separation of market products from other products in intermediate use is, however, not introduced. The columns of exports, final consumption expenditure and gross capital formation in the use table and in the product-by-product table all have more or less the same format. The rows of uses of value added are almost identical with the use table. Taxes and subsidies on products are not considered uses of value added of homogeneous activities (in columns), but are instead introduced as a single entry in order to get GDP at market prices.
- 15.153. The GDP can be seen as follows:
- (a) GDP from the production approach = the sum of gross value added by products (homogeneous activities) at basic prices + single item of taxes less subsidies on products, all on row for total gross value added;

- (b) GDP from the expenditure approach = the sum of the final uses categories at purchasers' prices (imports counted as negative), on the row for total uses;
- (c) GDP from the income approach = the sum of the uses of gross value added, in the column for the total economy.
- 15.154. In the first version (table 15.6), imports are deducted in the final use quadrant as negative elements by products (at c.i.f. prices and with a c.i.f./f.o.b. adjustment item to arrive at imports f.o.b.). Product output is thus the grand total for each row and column.
- 15.155. In the second version (table 15.7), the import table (table 15.5) has been deducted from the intermediate use and final use quadrants of table 15.6, so that they now show only uses of output of resident producers (by product). The imported component is shown as a separate row at the bottom of that part of the table. This allows studies of the impact of economic events on production of resident producers and on imports separately. In fact, the imports table 15.5, actually makes it possible to show every cell in quadrants I and II separated into output of resident producers and imported products, rather than just treating imports globally for each activity and final use category on a separate row.
- Illustrations of the product-by-product table
- 15.156. To illustrate the contents of the product-by-product tables the same method of illustration is used as for the supply and use tables earlier in the chapter. In this case, first, entries of the composite manufacturing product as an example of individual product flows and then some of the aggregates are illustrated, for each of the two tables.
- 15.157. Illustrations of table 15.6:
- | | |
|--|---------|
| Total product output, basic prices = | |
| $X.28.11 = R.28.(1+ +10) = C.(16+17).11$ | = 3,604 |
| Manufacturing product output, basic prices = | |
| $X.4.27 = X.28.4$ | = 1,714 |
| Total imports = | |
| $- X.14.(24 + 25)$ | = 499 |
| Imported manufacturing product = | |
| $- X.4.24$ | = 283 |
| Total resources, basic prices = | |
| $R.14.(- 24 - 25+27)$ | = 4,103 |
| Supply of manufacturing product = | |
| $R.4.(- 24 - 25+27)$ | = 1,997 |
| Total resources, purchasers' prices = | |
| $R.16.(- 24 - 25+27)$ | = 4,236 |
| Total intermediate consumption, basic prices = | |
| $X.14.11 = R.14.(1+ +10)$ | = 1,837 |
| Manufacturing product for intermediate consumption, basic prices = | |
- $R.4.11 = 925$
- Total intermediate consumption, purchasers' prices =
- $X.16.11 = R.16.(1+ +10) = C.(14+15).11 = 1,883$
- Intermediate consumption, manufacturing, purchasers' prices =
- $X.16.4 = 1,043$
- Total gross value added, basic prices =
- $X.17.11 = R.17.(1+ +10) = C.(18+ +25).11 = 1,721$
- Gross value added, manufacturing =
- $X.17.4 = 671$
- Gross domestic product =
- $X.17.29 = R.17.(11+28) = C.(18+ +25).29 = 1,854$
- Total national final uses, basic prices =
- $R.14.(12+18) = 1,737$
- Total final uses, basic prices =
- $R.14.(12+18+22+23) = 2,266$
- Manufacturing product for final use, basic prices =
- $R.4.(12+18+22) = 1,072$
- Total uses, basic prices =
- $R.14.(11+12+18+22+23) = 4,103$
- Manufacturing product for total use, basic prices =
- $R.4.(11+12+18+22) = 1,997$
- Total national final uses, purchasers' prices =
- $R.16.(12+18) = 1,813$
- Total final uses, purchasers' prices =
- $R.16.(12+18+22+23) = 2,353$
- Total uses, purchasers' prices =
- $R.16.(11+12+18+22+23) = 4,236$
- 15.158. Illustrations of table 15.7 (not repeating items which are similar in both tables):
- | | |
|--|---------|
| Total resources, basic prices = | |
| $X.13.27 = C.(1+ +12).27$ | = 4,103 |
| Total resources, purchasers' prices = | |
| $X.15.27 = C.(13+14).27$ | = 4,236 |
| Output of manufacturing product by resident producers for intermediate consumption, basic prices = | |
| $R.4.11 = 825$ | |
| Output of manufacturing product by resident producers for final use = | |
| $R.4.(12+18+22)$ | = 889 |
| Total uses, basic prices = | |
| $X.13.27 = R.13.(11+12+18+22+23)$ | = 4,103 |
| Output of manufacturing product by resident producers for total use = | |
| $R.4.(11+12+18+22)$ | = 1,714 |
| Total uses, purchasers' prices = | |
| $X.15.27 = R.15.(11+12+18+22+23)$ | = 4,236 |

Table 15.6. Input-output symmetric table, basic prices—product by product

		Intermediate consumption Homogeneous units of production										
		Agric., fishery, forestry products (0) (1)	Ores and minerals (1) (2)	Elec., gas, water (17-18) (3)	Manufac- turing (2-4) (4)	Construc- tion work, construc- tion, land (5) (5)	Trade services, restaurants, hotels (6) (6)	Transport, storage, communi- cation services (7) (7)	Business services (8) (8)	Comm., social, personal services (9) (9)	Public admin., defence, other public services (91) (10)	Total industry (11)
Uses of products												
<i>Goods and services, (by CPC sections)</i>												
<i>Total uses</i>												
1.	Agriculture, forestry and fishery products (0)	3	0	6	64	0	3	1	6	2	2	87
2.	Ores and minerals (1)	1	3	8	81	0	0	0	1	0	0	94
3.	Electricity, gas and water (17-18)	2	2	8	84	1	5	3	5	5	4	119
4.	Manufacturing (2-4)	28	10	51	574	73	32	18	59	47	33	925
5.	Construction work and construction, land (5)	1	2	0	7	5	2	1	6	9	7	40
6.	Trade services, restaurant and hotel services (6)	3	1	5	52	4	8	7	5	2	6	93
7.	Transport, storage and communication services (7)	2	1	2	32	4	14	11	6	3	4	79
8.	Business services (8)	3	2	9	107	23	21	14	57	31	32	299
9.	Community, social and pers. serv. exc. pub. adm. (9)	1	0	1	7	1	1	1	20	39	29	100
10.	Public administration (91)	0	0	0	0	0	0	0	0	1	0	1
<i>Adjustments:</i>												
11.	Direct purchases abroad by residents											
12.	Dir. purchases in domestic market by non-residents											
13.	C.i.f./f.o.b. adjustment											
14.	Total uses at basic prices	44	21	90	1 008	111	86	56	165	139	117	1 837
15.	Taxes less subsidies on products	1	0	3	35	4	2	0	0	0	1	46
16.	Total uses at purchasers' prices	45	21	93	1 043	115	88	56	165	139	118	1 883
17.	Total gross value added/GDP	42	20	61	671	129	77	40	404	227	50	1 721
18.	Compensation of employees	9	14	37	305	57	37	17	95	152	39	762
19.	Taxes less subsidies on production and imports	- 2	- 1	4	40	5	0	- 4	12	3	1	58
20.	Taxes on products	0	0	0	0	0	0	0	0	0	0	0
21.	Susidies on products	0	0	0	0	0	0	0	0	0	0	0
22.	Other taxes less subsidies on production	- 2	- 1	4	40	5	0	- 4	12	3	1	58
23.	Mixed income, net	14	0	4	226	35	29	6	103	15	0	432
24.	Operating surplus, net	10	4	9	25	20	- 2	9	135	37	0	247
25.	Consumption of fixed capital	11	3	7	75	12	13	12	59	20	10	222
26.	Mixed income, gross	15	0	4	229	36	32	8	103	15	0	442
27.	Operating surplus, gross	20	7	16	97	31	8	19	194	57	10	459
28.	Output of products at basic prices	87	41	154	1 714	244	165	96	569	366	168	3 604

[illegible]

E. Some aspects of input-output compilation

1. Input-output strategy

15.159. The supply and use table is both a framework for basic statistics and the foundation from which the analytical input-output tables are constructed. This sets an ambitious target including the following elements:

- (a) Supply and use table as working basis, possibly every year and at least from time to time in great detail;
- (b) Compilation of at least "commodity flows" data (goods and services account by products) annually and fully consistent with national accounts, providing a powerful tool for the calculation and verification of the national accounts;
- (c) Flexibility for analytical needs, responsiveness to aggregation, more details and rearrangements of flows.

15.160. If this ideal approach is not possible, mathematical techniques can be used to link benchmark year estimates to partial data for intervening years to generate at least aggregated annual series.

2. Constant-price estimation

15.161. Chapter XVI contains a comprehensive description of the decomposition of flows of goods and services into prices and volumes. In fact, the supply and use tables are the most complete consistent framework for constant price estimation and provide:

- (a) Interdependent measures of prices and volumes;
- (b) An important check on the numerical consistency and reliability of the entire set of such measures, interlinking values at constant and current prices, value and volume indices and deflators.

15.162. Constant price measures for gross value added are possible in the input-output framework by using the double deflation method, as the difference between:

- (a) The value of output deflated by a price index of output;

- (b) The value of intermediate consumption deflated by a price index for these inputs.

15.163. In most cases, volumes or volume indices might be derived indirectly, but not without carrying out certain plausibility checks. The price component can usually (except when inflation is high) be estimated more reliably than the volume component, since price indices (deflators) tend to be less variable or volatile than the corresponding quantity relatives.

15.164. The deflation process may be best carried out within the framework of the supply and use table. One possible approach might be to adopt direct deflators for output of resident producers, imports and exports of each product, while the deflator for "use of residents" of each product is derived residually.

15.165. Consumer price indices (CPI) might have a role to play in checking the resulting flows of household consumption expenditure at purchasers' prices. This provides a close link between the national accounts deflator of household consumption expenditure and the CPI.

15.166. Constant-price estimates also involve other general issues that become particularly important in an input-output (supply and use) context, such as change of base year and use of chain indices. These are dealt with in chapter XVI. Depending upon circumstances and which data are found most suitable for the various purposes, a choice has to be made between:

- (a) A fixed base of Laspeyres type volume measures;
- (b) More frequent rebasing, in particular annual chaining, which may especially appeal to countries experiencing a high degree of inflation or "structural change" in their economy.

15.167. Symmetric input-output tables should also be prepared at constant prices, both because of their wide use and because most of the traditional input-output assumptions are related to such tables. They are obtained in the same way as the input-output tables at current prices, i.e., from the supply and use tables at constant prices.

F. Purposes and uses of input-output data

1. Input-output as a framework

15.168. In addition to their use for analytical purposes, input-output tables and the concept of input-output serve various statistical needs:

- (a) Framework for basic data compilation;
- (b) Framework for weighting and calculation of index numbers;
- (c) Framework for assessing quality and completeness;

- (d) Framework for developing interrelated price and volume measures;

- (e) Framework for consistency checking.

15.169. Input-output as a framework for basic data compilation is important in terms of identifying gaps and inconsistencies in basic data to be collected. The integration of input-output with other parts of national accounts is equally important; compilation of input-output tables should be closely linked to economic statistics and national accounts in general.

15.170. Input-output as a framework for weighting and compilation of index numbers must be viewed from the central role input-output has in the production account and goods and services account of the national accounting framework. As a consequence, it becomes an invaluable frame for various purposes such as:

- (a) Determining the weights in the base-year and the current year of the system of index numbers;
- (b) Selecting interrelated samples for collecting integrated series of quantity, price and value indicators;
- (c) Selecting samples and weights in the various types of inquiries;
- (d) Compiling linked and consistent series of index numbers of price, volume and value.

15.171. Input-output as a framework for assessing quality and completeness is particularly enhanced in national accounting work when basing its compilation on supply and use tables. The needs of national accounts should count heavily when collecting new data or altering the design of existing basic statistics. Improvements in basic statistics will inevitably lead to improvements in the reliability of national accounts data.

15.172. Input-output as a framework for price and volume measures is considered a most complete environment for accurate constant-price calculation. Input-output tables at constant prices form part of the whole statistical system of price and quantity index numbers.

15.173. Input-output as a framework for consistency checking has been stressed various times throughout this chapter and applies as well to estimation at constant prices. The fact of decomposing into price and volume provides yet more checks on plausibility. Price statistics that are available should be applied to the relevant product flows in the accounting framework. This might mean a more sophisticated use of price deflators or extrapolators in the balancing of products.

2. Input-output for analysis

15.174. Input-output tables are a powerful analytical tool. Running from supply and use tables through symmetric input-output tables to the inverse tables (see below) they are put to use in various kinds of economic analysis. Some of the most important areas in which the input-output framework is used for analytical purposes, are listed below and described briefly:

- Analysis of production
- Analysis of structure of demand, export ratios, etc.
- Analysis of employment
- Analysis of prices and costs
- Analysis of imports required

Analysis of investment and capital

Analysis of exports

Analysis of energy

Analysis of environment

Sensitivity analysis.

15.175. In describing these points briefly, the inverse table and the notion of direct and indirect requirements should first be introduced. The input structure in the columns of the input-output table shows what is required of intermediate and other inputs to produce the corresponding output. Any increase in output of a product starts a long chain of production, since the new inputs also need to be produced, in turn requiring inputs of their own. The Leontief input-output model defines output of each product in terms of the amounts used by other producers and the amounts sold to final uses. This defines a set of structural equations which express the input-output relations in terms of the entries in the table or matrix. It is very useful for analysis to express these relations in terms of coefficients. A coefficient table records the amount of each product used as input per unit of output of the various products. By solving the basic equations, one arrives at the so-called Leontief inverse table which shows the full impact of a given demand for outputs on all the other producers. Thus, the columns of the inverse table show the total input requirements, both direct and indirect, generated by one unit of output.

15.176. Turning back to the applications, the basic role of input-output analysis is to analyse the link between final demand and industrial output levels. The inverse table could be used to assess the effects on the productive system of a given level of final demand. Employment implications are equally important in this respect. Input-output tables can also be used for analysing changes in prices stemming from changes in costs or from changes in taxes or subsidies. The determination of the level of imports is often a vital part of an input-output exercise, particularly in economies where the balance of payments imposes a constraint on their economic policies. There are both the question of direct demand for imports, and secondly, indirect demand for imported inputs from all industries involved directly or indirectly. The input-output framework might be extended to also cover demands for fixed assets, by relating the investment table to output. One of the standard input-output applications is the analysis between exports and the necessary direct and indirect inputs, some of which may be imported.

15.177. There has been an increased use of input-output for more structural analysis. Two prominent areas might be mentioned: energy and environment. It is possible to calculate the energy content of the different products in intermediate and final demand, and thereby direct and indirect energy needs from energy matrices, either in physical or value terms. The input-output approach is an essential component in environmental analysis, as it enables the determination of direct and

Table 15.7. Input-output symmetric table, basic prices—product by product with imported products separated from domestic products

		Intermediate consumption of industries Homogeneous units of production										
		Agric., fishery, forestry products (0) (1)	Ores and minerals (1) (2)	Elec., gas, water (17-18) (3)	Manufac- turing (2-4) (4)	Construc- tion work, construc- tion, land (5) (5)	Trade services, restaurants, hotels (6) (6)	Transport, storage, communi- cation services (7) (7)	Business services (8) (8)	Comm., social, personal services (9) (9)	Public admin., defence, other public services (91) (10)	Total industry (11)
Uses of products												
Goods and services, (by CPC sections)												
Total uses												
1.	Agriculture, forestry and fishery products (0)	3	0	6	37	0	3	1	6	2	2	60
2.	Ores and minerals (1)	1	3	8	21	0	0	0	1	0		34
3.	Electricity, gas and water (17-18)	2	2	8	83	1	5	3	5	5	4	118
4.	Manufacturing (2-4)	28	10	41	489	68	32	18	59	47	33	825
5.	Construction work and construction, land (5)	1	2	0	7	5	2	1	6	9	7	40
6.	Trade services, restaurant and hotel services (6)	3	1	5	37	4	5	4	5	2	6	72
7.	Transport, storage and communication services (7)	2	1	2	22	4	9	11	5	3	4	63
8.	Business services (8)	3	2	9	102	18	19	14	52	31	32	282
9.	Community, social and pers. serv. exc. pub. adm. (9)	1	0	1	7	1	1	1	20	39	29	100
10.	Public administration (91)	0	0	0	0	0	0	0	0	1		1
Adjustments:												
11.	Direct purchases in domestic market by non-residents											
12.	Imports	0	0	10	203	10	10	3	6	0	0	242
13.	Total uses at basic prices	44	21	90	1 008	111	86	56	165	139	117	1 837
14.	Taxes less subsidies on products	1	0	3	35	4	2	0	0	0	1	46
15.	Total uses at purchasers' prices	45	21	93	1 043	115	88	56	165	139	118	1 883
16.	Total gross value added/GDP	42	20	61	671	129	77	40	404	227	50	1 721
17.	Compensation of employees	9	14	37	305	57	37	17	95	152	39	762
18.	Taxes subsidies on production and imports	- 2	- 1	4	40	5	0	- 4	12	3	1	58
19.	Taxes on products	0	0	0	0	0	0	0	0	0	0	0
20.	Subsidies on products	0	0	0	0	0	0	0	0	0	0	0
21.	Other taxes less subsidies linked to production	- 2	- 1	4	40	5	0	- 4	12	3	1	58
22.	Mixed income, net	14	0	4	226	35	29	6	103	15	0	432
23.	Operating surplus, net	10	4	9	25	20	- 2	9	135	37	0	247
24.	Consumption of fixed capital	11	3	7	75	12	13	12	59	20	10	222
25.	Mixed income, gross	15	0	4	229	36	32	8	103	15	0	442
26.	Operating surplus, gross	20	7	16	97	31	8	19	194	57	10	459
27.	Output of products at basic prices	87	41	154	1 714	244	165	96	569	366	168	3 604

[illegible]

indirect sources of pollution by linking data on emissions in physical terms to the input-output tables. The "pollution" content of final demand can then be calculated. Input-output tables with environment-related extensions are a major component of the basic framework for satellite accounting of the environment (chapter XXI).

- 15.178. Finally, input-output could also be used for various kinds of sensitivity analysis. This analysis reveals the effects if some variables in the output model are changed. Increased attention has also been devoted to dynamic input-output models. The

essential distinction of a dynamic model is that it traces the path of the economy from the base year to the target year, and it may be applied to calculate the requirements of a given final output not only in the current year, but also through direct and indirect capital requirements in all preceding years. Dynamic models look at the future growth path of the economy year by year, and while data and computational limitations presently hinder their practical application, this may be somewhat less of a problem in the future.