Chapter 7: Chapter 7. Production account

(OLD Chapter 6: The production account)

A. Introduction

7.1 The production account is the starting point for the sequence of economic accounts for institutional units and sectors displaying how income is generated, distributed and used throughout the economy. Activities defined as production therefore determine the extent of GDP and the level of income for the economy. In concept, the economy-wide production account is the aggregation of a similar account for each production unit. Importantly, while production accounts can be compiled for an individual institutional unit as well as for sectors, they can also be compiled for establishments and thus for industries. It is this feature that allows the study of industrial activity in the economy and permits the compilation of supply and use tables and input-output tables.

7.2 The production account is linked to the definition of production. ***Production is an activity, carried out under the responsibility, control and management of an institutional unit, that uses inputs of labour, capital, and goods and services to produce outputs of goods and services.*** The production account shows the output of production and the various inputs to it. To do this, three concepts need clarifying.

7.3 The first concept to be clarified is what constitutes production within the SNA. This delineation is referred to as the production boundary of the SNA. Thereafter several key types of production need to be identified depending on whether production is for sale, for own use or is made available to others at little or no cost.

7.4 The next concept to be addressed is how output is to be valued. Key to this question is the role played by the various types of taxes imposed by (and subsidies given by) government on products and on the activity of production.

7.5 The third major concept to be considered is how the production process adds to the value of goods and services and leads to the generation of income. Does the whole contribution of labour and capital add to the value of these goods and services or should the fact that most capital declines in value as it is used need to be taken into account?

7.6 The general format of an account in the sequence of economic accounts is to show how ~~resources~~revenues are received and, after ~~uses~~expenditures are deducted, a balancing item is left. Because the production account is the first in the sequence of economic accounts, it is the first time the concept of a balancing item appears. The importance of balancing items in general and the one in this account in particular is also discussed before considering each of the entries of the production account in turn.

7.7 The production account for institutional units and sectors is illustrated in table ~~6~~7.1. It contains only three items apart from the balancing item. The output from production is recorded under ~~resources~~revenues on the right-hand side of the account. This item may be disaggregated to distinguish different kinds of output. For example, non-market output should be shown separately from market output and output for own final use in the sector accounts, when possible. The ~~uses~~expenditures recorded on the left-hand side of the account consist of intermediate consumption~~, and consumption of fixed capital~~depreciation and depletion. The first two items~~Both of these~~ may also be disaggregated, by distinguishing for which types of output these items are used as an input.

Table ~~6~~7.1: The production account – ~~uses~~expenditures

Table ~~6~~7.1 (cont): The production account - ~~resources~~revenues

7.8 The balancing item in the production account is value added. It can be measured either gross or net, that is, before or after deducting ~~consumption of fixed capital~~depreciation and depletion:

- ***Gross value added is the value of output less the value of intermediate consumption;***
- ***Net value added is the value of output less the values of both intermediate consumption, ~~and consumption of fixed capital~~depreciation and depletion.***

7.9 As value added is intended to measure the value created by a process of production, it ought to be measured net, since ~~the consumption of fixed capital~~depreciation and depletion are~~is a~~ costs of production. However, as explained in sections H and I of this chapter,~~later, consumption of fixed capital~~ depreciation as well as depletion may be less straightforward~~ can be difficult~~ to measure in practice.~~ and it may not always be possible to make a satisfactory estimate of its value and hence of net value added.~~ Furthermore, the use of gross measures for policy and analysis is a longstanding tradition. Provision has therefore ~~to~~ been made for value added to be measured gross as well as net. It follows that provision has also to be made for the balancing items in subsequent accounts of the SNA to be measured either gross or net of ~~the consumption of fixed capital~~depreciation and depletion.

B. The concept of production

1. Production as an economic activity

7.10 Production can be described in general terms as an activity in which an enterprise uses inputs to produce outputs. The economic analysis of production is mainly concerned with activities that produce outputs of a kind that can be delivered or provided to other institutional units. Unless outputs are produced that can be supplied to other units, either individually or collectively, there can be no division of labour, no specialization of production and no gains from trading. There are two main kinds of output, namely goods and services, and it is necessary to examine their characteristics in order to be able to delineate activities that are productive in an economic sense from other activities. Collectively, goods and services are described as products.

7.11 In the SNA, it is seldom if ever necessary to make a clear distinction between goods and services but in making the link to other data sets it is often necessary to understand which products have been treated as goods and which as services.

7.12 Industrial classifications, such as ISIC, identify a group of manufacturing industries. However, many of these industries also produce services. For example, some aircraft engine manufacturers may both fabricate aircraft engines and repair and service existing engines. When goods dispatched to another unit for processing do not change ownership, the work done on them constitutes a service even though it may be undertaken by a manufacturing industry. The fact that the processing is classified as a service does not prevent the processor from being classified within manufacturing.

7.13 Similarly, some service-producing industries may produce products that have many of the characteristics of goods. For convenience, the products of these industries are described in the SNA as knowledge-capturing products.

7.14 ***Products are goods and services (including knowledge-capturing products) that result from a process of production.***

Goods

7.15 ***Goods are physical, produced objects~~ for which a demand exists,~~ over which ownership rights can be established and whose ownership can be transferred from one institutional unit to another by engaging in transactions on markets.*** They ~~are in demand because they~~ may be used to satisfy the needs or wants of households or the community or used to produce other goods or services. The production and exchange of goods are quite separate activities. Some goods may never be exchanged while others may be bought and sold numerous times. The production of a good can always be separated from its subsequent sale or resale.

Services

7.16 The production of services must be confined to activities that are capable of being carried out by one unit for the benefit of another. Otherwise, service industries could not develop and there could be no markets for services. It is also possible for a unit to produce a service for its own consumption provided that the type of activity is such that it could have been carried out by another unit.

7.17 ***Services are the result of a production activity that changes the conditions of the consuming units, or facilitates***

the exchange of products or financial assets. These types of service may be described as change- effecting services and margin services respectively. Change-effecting services are outputs produced to order and typically consist of changes in the conditions of the consuming units realized by the activities of producers at the demand of the consumers. Change-effecting services are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. By the time their production is completed, they must have been provided to the consumers.

7.18 The changes that consumers of services engage the producers to bring about can take a variety of different forms as follows:

- Changes in the condition of the consumer's goods: the producer works directly on goods owned by the consumer by transporting, cleaning, repairing or otherwise transforming them;
- Changes in the physical condition of persons: the producer transports the persons, provides them with accommodation, provides them with medical or surgical treatments, improves their appearance, etc.;
- Changes in the mental condition of persons: the producer provides education, information, advice, entertainment or similar services in a face to face manner.

7.19 The changes may be temporary or permanent. For example, medical or education services may result in permanent changes in the condition of the consumers from which benefits may be derived over many years. On the other hand, attending a football match is a short-lived experience. In general, the changes may be presumed to be improvements, as services are produced at the demand of the consumers. The improvements usually become embodied in the persons of the consumers or the goods they own and are not separate entities that belong to the producer. Such improvements cannot be held in inventories by the producer or traded separately from their production.

7.20 A single process of production may provide services to a group of persons, or units, simultaneously. For example, groups of persons or goods belonging to different institutional units may be transported together in the same plane, ship, train or other vehicle. People may be instructed or entertained in groups by attending the same class, lecture or performance. Certain services are provided collectively to the community as a whole, or large sections of the community, for example, the maintenance of law and order, and defence.

7.21 Margin services result when one institutional unit facilitates the change of ownership of goods, knowledge-capturing products, some services or financial assets between two other institutional units. Margin services are provided by wholesalers and retailers and by many types of financial institutions. Margin services resemble change-effecting services in that they are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. By the time their production is completed they must have been provided to the consumers.

Knowledge-capturing products

7.22 Knowledge-capturing products concern the provision, storage, communication and dissemination of information, advice and entertainment in such a way that the consuming unit can access the knowledge repeatedly. The industries that produce the products are those concerned with the provision, storage, communication and dissemination of information, advice and entertainment in the broadest sense of those terms including the production of general or specialized information, news, consultancy reports, computer programs, movies, music, etc. The outputs of these industries, over which ownership rights may be established, are often stored on physical objects (whether on paper or on electronic media) that can be traded like ordinary goods. They have many of the characteristics of goods in that ownership rights over these products can be established and they can be used repeatedly. Whether characterized as goods or services, these products possess the essential common characteristic that they can be produced by one unit and supplied to another, thus making possible division of labour and the emergence of markets. It is important to note that these knowledge-capturing products should be recorded as either goods or services, and that they should not be classified as a distinct category of products.

2. The production boundary

7.23 Given the general characteristics of the goods and services produced as outputs, it becomes possible to define production. A general definition of production is given first, followed by the rather more restricted definition that is used in the SNA. Following this there is a discussion of the production boundary as it affects household activities and non-observed activities.

The general production boundary

7.24 Economic production may be defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services. There must be an institutional unit that assumes responsibility for the process of production and owns any resulting goods or knowledge-capturing products or is entitled to be paid, or otherwise compensated, for the change-effecting or margin services provided. A purely natural process without any human involvement or direction is not production in an economic sense. For example, the unmanaged growth of fish stocks in international waters is not production, whereas the activity of fish farming is production.

7.25 While production processes that produce goods can be identified without difficulty, it is not always so easy to distinguish the production of services from other activities that may be both important and beneficial. Activities that are not productive in an economic sense include basic human activities such as eating, drinking, sleeping, taking exercise, etc., that it is impossible for one person to employ another person to perform instead. Paying someone else to take exercise is no way to keep fit. On the other hand, activities such as washing, preparing meals, caring for children, the sick or aged are all activities that can be provided by other units and, therefore, fall within the general production boundary. Many households employ paid domestic staff to carry out these activities for them.

The production boundary in the SNA

7.26 The production boundary in the SNA is more restricted than the general production boundary. For reasons explained below, activities undertaken by households that produce services for their own use are excluded from the concept of production in the SNA, except for services provided by owner-occupied dwellings and services produced by employing paid domestic staff. Otherwise, the production boundary in the SNA is the same as the more general one defined in the previous paragraphs.

7.27 ***The production boundary of the SNA includes the following activities:***

- ***The production of all goods or services that are supplied to units other than their producers, or intended to be so supplied, including the production of goods or services used up in the process of producing such goods or services;***
- ***The own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation, including the production of electricity through the use of solar panels and wind power plants and the production of heat for heating water or a dwelling through geothermal heat or heat pumps;***
- ***The own-account production of knowledge-capturing products that are retained by their producers for their own final consumption or gross capital formation but excluding (by convention) such products produced by households for their own use;***
- ***The own-account production of housing services by owner occupiers; and***
- ***The production of domestic and personal services by employing paid domestic staff.***

The production boundary within households

The exclusion of most services produced for own use by households

7.28 The production of services by members of the household for their own final consumption has traditionally been excluded from measured production in national accounts and it is worth explaining briefly why this is so. It is

useful to begin by listing those services for which no entries are recorded in the accounts when they are produced by household members and consumed within the same household:

- The cleaning, decoration and maintenance of the dwelling occupied by the household, including small repairs of a kind usually carried out by tenants as well as owners;
- The cleaning, servicing and repair of household durables or other goods, including vehicles used for household purposes;
- The preparation and serving of meals;
- The care, training and instruction of children;
- The care of sick, infirm or old people;
- The transportation of members of the household or their goods.

7.29 In most countries a considerable amount of labour is devoted to the production of these services, and their consumption makes an important contribution to economic well-beingwelfare. However, national accounts serve a variety of analytical and policy purposes and are not compiled simply, or even primarily, to produce indicators of well-beingwelfare. The reasons for not imputing values for unpaid domestic or personal services produced and consumed within households may be summarized as follows:

- The own-account production of services within households is a self-contained activity with limited repercussions on the rest of the economy. The decision to produce a household service entails a simultaneous decision to consume that service. This is not true for goods. For example, if a household engages in the production of agricultural goods, it does not follow that it intends to consume them all. Once the crop has been harvested, the producer has a choice about how much to consume, how much to store for future consumption or production and how much to offer for sale or barter on the market. Similarly, part of the electricity produced through solar panels on the roof of a dwelling may be delivered to the grid, in exchange for a compensation in cash or a compensation in kind. The latter may consist of a compensation in the form of free electricity in periods that the own production of electricity is not sufficient to cover the own demand. Indeed, although it is customary to refer to the own-account production of goods, it is not possible to determine at the time the production takes place how much of it will eventually be consumed by the producer. For example, if an agricultural crop turns out to be better than expected, the household may dispose of some of it on the market even though it may have originally supposed it would consume it all. This kind of possibility is non-existent for services; it is not possible to produce a service and then decide whether to offer it for sale or not.
- As the vast majority of household services are not produced for the market, there are typically no suitable market prices that can be used to value such services may not be directly available. It is therefore extremelyrelatively difficult to estimate values not only for the outputs of the services but also for the associated incomes and expenditures that can be meaningfully added to the values of the monetary transactions on which most of the entries in the accounts are based.
- With the exception of the imputed rental of owner-occupied dwellings, the decision to produce services for own consumption is not influenced by and does not influence economic policy because the imputed values are not equivalent to monetary flows. Changes in the levels of household services produced do not affect the tax yield of the economy or the level of the exchange rate, to give two examples.

7.30 Thus, the reluctance of national accountants to impute values for the outputs, incomes and expenditures associated with the production and consumption of services within households is explained by a combination of factors, namely the relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market disequilibria.

7.307.31 Having said that, for the purpose of providing an improved measure of material well-being, countries are encouraged to compile extended accounts, in which the production (and asset) boundary is extended by also

including measures of unpaid household service work. See chapter 34 for more detailed information.

7.317.32 The exclusion of household services from the production boundary in the standard sequence of economic accounts has consequences for labour force and employment statistics. According to International Labour Organization (ILO) guidelines, economically active persons are persons engaged in production included within the boundary of production of the SNA. If that boundary were to be extended to include the production of own-account household services, virtually the whole adult population would be economically active and unemployment eliminated. In practice, it would be necessary to revert to the existing boundary of production in the SNA, if only to obtain meaningful employment statistics.

Own-account production of goods

7.327.33 Although services produced for own consumption within households fall outside the boundary of production used in the SNA, it is nevertheless useful to give further guidance with respect to the treatment of certain kinds of household activities which may be particularly important in some developing countries. The SNA includes the production of all goods within the production boundary. The following types of production by households are included whether intended for own final consumption or not:

- The production of agricultural products and their subsequent storage; the gathering of berries or other uncultivated crops; forestry; wood-cutting and the collection of firewood; hunting and fishing;
- The production of other primary products such as mining salt, cutting peat, etc.;
- The processing of agricultural products; the production of grain by threshing; the production of flour by milling; the curing of skins and the production of leather; the production and preservation of meat and fish products; the preservation of fruit by drying, bottling, etc.; the production of dairy products such as butter or cheese; the production of beer, wine, or spirits; the production of baskets or mats; etc.;
- Other kinds of processing such as weaving cloth; dress making and tailoring; the production of footwear; the production of pottery, utensils or durables; making furniture or furnishings; etc.;
- The production of electricity through the use of solar panels and wind power plants and the production of heat for heating water or a dwelling through geothermal heat or heat pumps;
- The supply of water is also considered a goods-producing activity in this context. In principle, supplying water is a similar kind of activity to extracting and piping crude oil.

7.337.34 It is not feasible to draw up a complete, exhaustive list of all possible productive activities but the above list covers the most common types. When the amount of a good produced within households is believed to be quantitatively important in relation to the total supply of that good in a country, its production should be recorded. Otherwise, it may not be worthwhile trying to estimate it in practice.

Services of owner-occupied dwellings

7.347.35 The production of housing services for their own final consumption by owner occupiers has always been included within the production boundary in national accounts, although it constitutes an exception to the general exclusion of own-account service production. The ratio of owner-occupied to rented dwellings can vary significantly between countries, between regions of a country and even over short periods of time within a single country or region, so that both international and inter-temporal comparisons of the production and consumption of housing services could be distorted if no imputation were made for the value of own-account housing services. The imputed value of the income generated by such production is taxed in some countries.

Production of domestic and personal services by employing paid domestic staff

7.357.36 Although paid domestic staff produce many of the services excluded from the production boundary of the SNA

when undertaken by household members, paying a person who comes to the house to wash, cook or look after children, for example, is as much a market activity as taking clothes to a laundry, eating at a restaurant or paying a nursery to care for children. By convention, though, only the wages of the domestic staff are treated as the value of output. Other materials used in their work are treated as household consumption expenditure because of the difficulty of identifying what is used by the staff and what by household members. Nor are payments to other household members treated as payments for services even if the payments are nominally for the performance of chores, for example pocket-money paid to children.

"Do-it-yourself" decoration, maintenance and small repairs

~~7.36~~7.37 "Do-it-yourself" repairs and maintenance to consumer durables and dwellings carried out by members of the household constitute the own-account production of services and are excluded from the production boundary of the SNA. The materials purchased are treated as final consumption expenditure.

~~7.37~~7.38 In the case of dwellings, "do-it-yourself" activities cover decoration, maintenance and small repairs, including repairs to fittings, of types that are commonly carried out by tenants as well as by owners. On the other hand, more substantial repairs, such as replastering walls or repairing roofs, carried out by owners, are essentially intermediate inputs into the production of housing services. However, the production of such repairs by an owner-occupier is only a secondary activity of the owner in his capacity as a producer of housing services. The production accounts for the two activities may be consolidated so that, in practice, the purchases of materials for repairs become intermediate expenditures incurred in the production of housing services. Major renovations or extensions to dwellings are fixed capital formation and recorded separately.

The use of consumption goods

7.39 The use of goods within the household for the direct satisfaction of human needs or wants is not treated as production. This applies not only to materials or equipment purchased for use in leisure or recreational activities but also to foodstuffs purchased for the preparation of meals. The preparation of a meal is a service activity and is treated as such in the SNA and ISIC Rev.4. It therefore falls outside the production boundary when the meal is prepared for own consumption within the household. The use of a durable good, such as a vehicle, by persons or households for their own personal benefit or satisfaction is intrinsically a consumption activity and should not be treated as if it were an extension, or continuation, of production. However, when vehicles, or other types of assets, are used in the production of goods and services (e.g., paid taxi services to third parties), the expenditure on the purchase of the durable should be split between gross fixed capital formation by the enterprise and household final consumption expenditure in proportion to its usage for business and personal purposes.

The production and use of "free" products

7.40 Subsidizing certain prices, often down to zero, is a common technique for increasing sales of complementary items at marked-up prices. For example, a telecom carrier may offer subsidized smartphones, or a manufacturer of ink cartridges and printers may subsidize the printers. Other examples are free online games that encourage in-game purchases and free software that encourages users to purchase support services and related software products. Subsidized items and the marked-up items that they help sell can be treated as an implicit bundle. They do not cause any of the producer's output to be missed as long as the revenue from the entire bundle is taken into account. Subsidized outputs of this type are used by the same group of users who purchase the marked-up outputs. Users themselves therefore fund the subsidies that they receive, and their expenditures on the bundle of outputs include the full value of the cross-subsidized components of the bundle.

7.41 However, even though the standard procedures for measuring output capture the full value of the "free" and subsidized items supplied by market producers, the recording of the output may be lagged if the marked-up item that funds the subsidy is sold in a later period than the cross-subsidized item. Certainly, for an individual consumer, the consumption of the "free" or subsidized output often comes first, and the wait until the purchase of the marked-up item may be significant. However, for consumers in the aggregate, a balanced mix of the supplier's cross-subsidized and marked-up products will be used in the steady state. Only during periods of rapid growth will the producer's output be understated. But during periods of falling demand, while the producer's

output will be overstated, for a broad aggregate such as GDP the net effect of such timing problems should be negligible.

7.42 Another issue which could potentially cause GDP to be underestimated is that prices of investment goods such as software and equipment are often cross-subsidized by marked-up supplies and services that the investment good helps sell. When this occurs, fixed capital formation and the value added of the users of the bundle of outputs will be understated, and their intermediate consumption of supplies and services will be overstated. Research on the extent of this problem and the feasibility of re-allocating the subsidies to the price of the investment good may be useful.

7.43 For (digital) platforms, "free" and subsidized outputs are not merely common, they are the rule. Two-sided platforms typically have a subsidized side, which is often free, and a funder side. Platform users differ in their willingness-to-pay for opportunities to connect with those on the other side and in the willingness-to-pay of those on the other side to connect with them. The platform responds to these differences by subsidizing the users whose presence on the platform will raise the value of the platform to those with a high willingness-to-pay, while marking up the prices paid by those in the latter group. For example, manufacturers of consumer products often have a high willingness-to-pay to inform potential customers, via advertising, about the benefits of their products as a way of increasing sales. Platforms thus assemble the necessary audience by supplying "free" services, and then recover the cost of supplying the free services by way of advertising revenues. The purchasers of advertising services, in turn, recover the cost of the platform's services through mark-ups on the advertised products.

7.44 However, different from the case of the first type of cross-subsidized items, the platform's funders recover their expenses from those on the other side as part of the transactions facilitated by the platform (e.g., sales of the advertised products). Thus, the consumers of the "free" platform services ultimately fund those services. Even if the set of individuals who pay the mark-ups and the set of individuals who consume the "free" services overlap only partially, households are collectively the funders of the "free" platform services used by households.

7.45 A third type of "free" services relates to the creation of content such as videos, images, text, and audio, both as a leisure activity and for commercial purposes such as receiving advertising revenue. Creating content for leisure purposes is outside the SNA production boundary. If the content creator does not receive remuneration, the content is assumed to be created for leisure purposes. The creation of open-source software also falls under this category. The value of open-source software produced by programmers employed by corporations, government, or NPISHs should already be included in measures of own-account software investment as estimated by the sum of costs method. Open-source software produced for commercial purposes by an unincorporated enterprise that is classified in the households sector is also conceptually inside the SNA production boundary. Moreover, enterprises may, for example, be bundling the free software with software support services, which would be another case of cross-subsidization of products. However, if the open-source software is produced by individual volunteers who are not remunerated in any way for their contribution, then the production is outside the 2008 SNA production boundary.

~~7.38~~7.46 More information of the treatment of "free" digital products in the integrated framework of national accounts, as well as further details on the compilation of extended accounts for "free" digital products, can be found in chapter 22.

The "non-observed" economy

~~7.39~~7.47 There is considerable interest in the phenomenon of the non-observed economy. This term is used to describe activities that, for one reason or another, are not captured in regular statistical enquiries. The reason may be that the activity is informal and thus escapes the attention of surveys geared to formal activities; it may be that the producer is anxious to conceal a legal activity, or it may be that the activity is illegal. Chapter ~~25~~39 discusses measurement of the informal economy within households.

~~7.40~~7.48 Certain activities may clearly fall within the production boundary of the SNA and also be quite legal (provided certain standards or regulations are complied with) but deliberately concealed from public authorities for the following kinds of reasons:

- To avoid the payment of income, value added or other taxes;
- To avoid the payment of social security contributions;

- To avoid having to meet certain legal standards such as minimum wages, maximum hours, safety or health standards, etc.;
- To avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

~~7.41~~7.49 Because certain kinds of producers try to conceal their activities from public authorities, it does not follow that they are not included in national accounts in practice. Many countries have had considerable success in compiling estimates of production that cover the non-observed economy as well as the ordinary economy. In some industries, such as agriculture or construction, it may be possible by using various kinds of surveys and the commodity flow method to make satisfactory estimates of the total output of the industry without being able to identify or measure that part of it that is not observed. Because the non-observed economy may account for a significant part of the total economy of some countries, it is particularly important to try to make estimates of total production that include it, even if it cannot always be separately identified as such.

~~7.42~~7.50 There may be no clear borderline between the non-observed economy and illegal production. For example, production that does not comply with certain safety, health or other standards could be described as illegal. Similarly, the evasion of taxes is itself usually a criminal offence. However, it is not necessary for the purposes of the SNA to try to fix the precise borderline between non-observed and illegal production as both are included within the production boundary in any case. It follows that transactions on unofficial markets that exist in parallel with official markets (for example, for foreign exchange or goods subject to official price controls) must also be included in the accounts, whether or not such markets are actually legal or illegal.

~~7.43~~7.51 There are two kinds of illegal production:

- The production of goods or services whose sale, distribution or possession is forbidden by law;
- Production activities that are usually legal but become illegal when carried out by unauthorized producers; for example, unlicensed medical practitioners.

~~7.44~~7.52 Examples of activities that may be illegal but productive in an economic sense include the manufacture and distribution of narcotics, illegal transportation in the form of smuggling of goods and of people, and services such as prostitution.

~~7.45~~7.53 Both kinds of illegal production are included within the production boundary of the SNA provided they are genuine production processes whose outputs consist of goods or services for which there is an effective market demand. The units that purchase smuggled goods, for example, may not be involved in any kind of illegal activities and may not even be aware that the other party to the transaction is behaving illegally. Transactions in which illegal goods or services are bought and sold need to be recorded not simply to obtain comprehensive measures of production and consumption but also to prevent errors appearing elsewhere in the accounts. The incomes generated by illegal production may be disposed of quite legally, while conversely, expenditures on illegal goods and services may be made out of funds obtained quite legally. The failure to record illegal transactions may lead to significant errors within the accounts if the consequences of the activity are recorded in the financial account and the external accounts, say, but not in the production and income accounts.

~~7.46~~7.54 Regular thefts of products from inventories are not included in the value of output. Suppose a shop suffers regular theft from inventories. In calculating the value of output of the shop, part of the margin on the goods sold must cover the cost of the goods stolen. Thus the margin is calculated as the value received for the goods sold less the cost of both the goods sold and the goods stolen. If the stolen products are sold elsewhere, for example on a street stall, the value of the output of the street trader is still calculated as the difference between the value received for the goods and the value paid for them. In this case, though, if nothing is paid for the goods, the whole of the sales value appears as the margin.

~~7.47~~7.55 Illegal production does not refer to the generation of externalities such as the discharge of pollutants. Externalities may result from production processes that are themselves quite legal. Externalities are created without the consent of the units affected and no values are imputed for them in the SNA.

~~7.48~~7.56 Although non-observed and illegal activities require special consideration, it is not necessarily the case that they

are excluded from normal data collection processes.

C. Basic, producers' and purchasers' prices

~~7.49~~7.57 More than one set of prices may be used to value outputs and inputs depending upon how taxes and subsidies on products, and also transport charges, are recorded. Moreover, value added taxes (VAT), and similar deductible taxes may also be recorded in more than one way. The methods of valuation used in the SNA are explained in this section.

~~7.50~~7.58 The detailed discussion of taxes related to production appears in section C of chapter ~~7~~8 but it is important in the context of discussing alternative price measures to make the distinction between taxes (and subsidies) on products and other taxes (and subsidies) on production. As the name implies, taxes on products are payable per unit of the product. The tax may be a flat amount dependent on the physical quantity of the product or may be a percentage of the value at which the product is sold. Other taxes on production are taxes imposed on the producer that do not apply to products nor are levied on the profits of the producer. Examples include taxes on land or premises used in production or on the labour force employed. The distinction between subsidies on products and other subsidies on production is made on similar grounds.

1. Basic and producers' prices

~~7.51~~7.59 The SNA utilizes two kinds of prices to measure output, namely, basic prices and producers' prices:

- ***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, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer.***
- ***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.***

Neither the producer's nor the basic price includes any amounts receivable in respect of VAT, or similar deductible tax, invoiced on the output sold.

~~7.52~~7.60 Unlike the basic price, the producer's price includes taxes on products (taxes payable per unit of output) and excludes subsidies on products (subsidies receivable per unit of output). The producer's price is the price, excluding VAT, that the producer invoices to the purchaser. The basic price measures the amount retained by the producer and is, therefore, the price most relevant for the producer's decision-taking. It is becoming increasingly common in many countries for producers to itemize taxes separately on their invoices so that purchasers are informed about how much they are paying to the producer and how much as taxes to the government.

~~7.53~~7.61 Basic prices exclude any taxes on products the producer receives from the purchaser and passes on to government but include any subsidies the producer receives from government and uses to lower the prices charged to purchasers.

~~7.54~~7.62 Both producers' and basic prices are actual transaction prices that can be directly observed and recorded. Basic prices are often reported in statistical inquiries and some official "producer price" indices actually refer to basic prices rather than to producers' prices as defined here.

VAT and similar deductible taxes

~~7.55~~7.63 Many countries have adopted some form of VAT. VAT is a wide-ranging tax usually designed to cover most or all goods and services. In some countries, VAT may replace most other forms of taxes on products, but VAT may also be levied in addition to some other taxes on products, such as excise duties on tobacco, alcoholic drink or fuel oils.

~~7.56~~7.64 VAT is a tax on products collected in stages by enterprises. 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, resale 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. The percentage rate of VAT is liable to vary between different categories of goods and services and also according to the type of purchaser. For example, sometimes goods purchased by visiting non-residents, which count as exports, may be exempt from VAT.

~~7.57~~7.65 Other tax regimes exist, not called VAT, that operate in a similar manner. Within the SNA, the term VAT is used to apply to any similar deductible tax scheme even if the scope is narrower than a full system of VAT.

~~7.58~~7.66 The following terminology needs to be defined:

- ***Invoiced VAT is the VAT payable on the sales of a producer; it is shown separately on the invoice that the producer presents to the purchaser.***
- ***Deductible VAT is the VAT payable on purchases of goods or services intended for intermediate consumption, gross fixed capital formation or for resale that a producer is permitted to deduct from his own VAT liability to the government in respect of VAT invoiced to his customers.***
- ***Non-deductible VAT is VAT payable by a purchaser that is not deductible from his own VAT liability, if any.***

Thus, a market producer is able to recover the costs of any deductible VAT payable on his own purchases by reducing the amount of his own VAT liability in respect of the VAT invoiced to his own customers. On the other hand, the VAT paid by households for purposes of final consumption or fixed capital formation in dwellings is not deductible. The VAT payable by non-market producers owned by government units or NPISHs may also not be deductible.

Gross and net recording of VAT

~~7.59~~7.67 There are two alternative systems that may be used to record VAT, the "gross" or "net" systems. Under the gross system, all transactions are recorded including the amounts of any invoiced VAT. Thus, the purchaser and the seller record the same price, irrespective of whether or not the purchaser is able to deduct the VAT subsequently.

~~7.60~~7.68 While the gross system of recording seems to accord with the traditional notion of recording at "market" prices, it presents some difficulties. Practical experience with the operation of VAT over many years in a number of countries has shown it may be difficult, if not impossible, to utilize the gross system because of the way business accounts are computed and records are kept. Sales are normally reported excluding invoiced VAT in most industrial inquiries and business surveys. Conversely, purchases of goods and services by producers are usually recorded excluding deductible VAT. Although the gross system has been tried in some countries, it has had to be abandoned for these reasons. Further, it can be argued that the gross system distorts economic reality to the extent that it does not reflect the amounts of VAT actually paid by businesses. Large amounts of invoiced VAT are deductible and thus represent only notional or putative tax liabilities.

~~7.61~~7.69 The SNA therefore requires that the net system of recording VAT should be followed. In the net system:

- Outputs of goods and services are valued excluding invoiced VAT; imports are similarly valued excluding invoiced VAT;
- Purchases of goods and services are recorded including non-deductible VAT.

Under the net system, VAT is recorded as being payable by purchasers, not sellers, and then only by those purchasers who are not able to deduct it. Almost all VAT is therefore recorded in the SNA as being paid on final uses, mainly on household consumption. However, small amounts of VAT may be paid by businesses in respect of certain kinds of purchases on which VAT may not be deductible.

~~7.62~~7.70 The disadvantage of the net system is that different prices must be recorded for the two parties to the same transaction when the VAT is not deductible. The price recorded for the producer does not include invoiced VAT whereas the price recorded for the purchaser does include the invoiced VAT to the extent that it is not deductible. Thus, in aggregate, the total value of the expenditures recorded for purchasers must exceed the total value of the corresponding sales receipts recorded for producers by the total amount raised as non-deductible VAT.

~~7.63~~7.71 The producer's price thus defined is a hybrid that excludes some, but not all, taxes on products. The basic price, which does not include any taxes on the product (but includes subsidies on the product) becomes a clearer concept in these circumstances and is the preferred method for valuing the output of producers.

2. Purchasers' prices

~~7.64~~7.72 ***The purchaser's price is the amount paid by the purchaser, excluding any VAT or similar tax deductible by the purchaser, 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.***

~~7.65~~7.73 When a purchaser buys directly from the producer, the purchaser's price may exceed the producer's price by:

- The value of any non-deductible VAT, payable by the purchaser; and
- The value of any transport charges on a good paid separately by the purchaser and not included in the producer's price.

It follows that the purchaser's price may exceed the basic price by the amount of the two items just listed plus the value of any taxes less subsidies on the product (other than VAT).

~~7.66~~7.74 If purchasers buy output not from the producer directly but from a wholesaler or retailer, it is necessary to include their margins in the difference between basic and purchasers' prices also.

~~7.67~~7.75 For certain purposes, including input-output analysis, it may be convenient to consider that the purchase of a product consists of two separate transactions. The first of these is the purchase of the product from the producer and the second is the margin paid to the wholesaler or retailer of the product. The margin represents the difference between the price paid by the final purchaser of a product after it has passed through the wholesale and retail distribution chains and the producer's price received by its original producer.

~~7.68~~7.76 The traditional concept of the ""market" price becomes somewhat blurred under a system of VAT or similar deductible taxes because there may be two different prices for a single transaction: one from the seller's point of view and another from the purchaser's, depending upon whether or not the tax is deductible. It is recommended in the SNA that the term "market prices" should be avoided when referring to value added and the price basis used, (basic, producers' or purchasers'), be specified to avoid ambiguity.

3. Basic, producers' and purchasers' prices – a summary

~~7.69~~7.77 Figure ~~1~~7.1 gives an overview of the essential differences between basic, producers' and purchasers' prices.

Figure ~~6~~7.1: Basic, producers' and purchasers' prices

D. Value added and GDP

1. Gross and net value added

~~7.70~~7.78 The balancing item of a current account is the excess of ~~resources~~revenues over ~~uses~~expenditures. The rationale

for dividing transactions into sets of accounts is that the balancing item of each account is of economic interest. The balancing item of the production account is value added, so called because it measures the value created by production. Because a production account may be compiled for an institutional unit or sector, or establishment or industry, ~~so~~ value added may be derived for any of these. Value added is of analytical interest because when the value of taxes on products (less subsidies on products) is added, the sum of value added for all resident units gives the value of gross domestic product (GDP).

~~7.71~~7.79 Value added represents the contribution of labour and capital to the production process. Once the amount of value added appropriated by government in the form of other taxes on production is deducted from value added and the value of subsidies is added, the compensation of labour and capital is revealed. However, capital in the form of fixed capital and most natural resources has a finite life length. Some part of value added should therefore be regarded as the reduction in value of ~~fixed~~ capital due to its use in production. ~~This~~These allowances are ~~is~~ called ~~consumption of fixed capital~~depreciation and depletion.

~~7.72~~7.80 ~~Consumption of fixed capital~~Depreciation and depletion are ~~is one of the most~~ important elements in the SNA. In most cases, when a distinction is drawn between "gross" and "net" recording, "gross" means without deducting ~~consumption of fixed capital~~depreciation and depletion, while recording "net" means after deducting ~~consumption of fixed capital~~depreciation and depletion. In particular, all the major balancing items in the accounts from value added through to saving may be recorded gross or net, that is, before or after deducting ~~consumption of fixed capital~~depreciation and depletion. It should also be noted that ~~consumption of fixed capital~~depreciation and depletion are ~~is~~ typically quite large compared with most of the net balancing items. ~~It may account for 10 per cent or more of GDP.~~

~~7.73~~7.81 ~~Consumption of fixed capital~~Depreciation and depletion are among ~~is one of~~ the most difficult items in the accounts to define conceptually and to estimate in practice. Further, ~~consumption of fixed capital~~depreciation and depletion do~~es~~ not represent the aggregate values of a set of transactions. ~~It is an~~They are imputed values whose economic significance is different from entries in the accounts based mainly on market transactions. For these reasons, the major balancing items in national accounts have always tended to be recorded both gross and net of ~~consumption of fixed capital~~depreciation and depletion. This tradition is continued in the SNA where provision is made for balancing items from value added through to saving to be recorded both ways. In general, the gross figure is the easier to estimate and so may be more reliable, but the net figure is ~~usually~~ the one that is conceptually more appropriate and relevant for analytical purposes. As net measures are superior from a conceptual point of view, more emphasis should be placed on these measures in communication, complementing but not necessarily replacing gross measures which are traditionally used. See also chapters 2 and 21).

~~7.74~~7.82 As stated above:

- "Gross value added" is defined as the value of output less the value of intermediate consumption;
- "Value added net of depreciation" is defined as the value of output less the value of both intermediate consumption and depreciation;
- "Net value added" is defined as the value of output less the values of ~~both~~ intermediate consumption, ~~and consumption of fixed capital~~depreciation and depletion.

To avoid repetition, only gross value added will be cited in the following sections when the corresponding conclusions for net value added are obvious.

2. Alternative measures of value added

~~7.75~~7.83 In the SNA, intermediate inputs are valued and recorded at the time they enter the production process, while outputs are recorded and valued as they emerge from the process. Intermediate inputs are normally valued at purchasers' prices and outputs at basic prices, or alternatively at producers' prices if basic prices are not available. The difference between the value of the intermediate inputs and the value of the outputs is gross value added against which must be charged ~~consumption of fixed capital~~depreciation and depletion, taxes on production (less subsidies) and ~~compensation~~remuneration of employees. The positive or negative balance remaining is the net operating surplus or mixed income.

~~7.76~~7.84 As indicated above, alternative measures of gross value added may be obtained by associating different sets of prices with a set of quantities of inputs and outputs. The various measures that may be derived using the different sets of prices recognized in the SNA are considered below.

Gross value added at basic prices

~~7.77~~7.85 ***Gross value added at basic prices is defined as output valued at basic prices less intermediate consumption valued at purchasers' prices***. Although the outputs and inputs are valued using different sets of prices, for brevity the value added is described by the prices used to value the outputs. From the point of view of the producer, purchasers' prices for inputs and basic prices for outputs represent the prices actually paid and received. Their use leads to a measure of gross value added that is particularly relevant for the producer.

Gross value added at producers' prices

~~7.78~~7.86 ***Gross value added at producers' prices is defined as output valued at producers' prices less intermediate consumption valued at purchasers' prices***. As already explained, in the absence of VAT, the total value of the intermediate inputs consumed is the same whether they are valued at producers' or at purchasers' prices, in which case this measure of gross value added is the same as one that uses producers' prices to value both inputs and outputs. It is an economically meaningful measure that is equivalent to the traditional measure of gross value added at market prices. However, in the presence of VAT, the producer's price excludes invoiced VAT, and it would be inappropriate to describe this measure as being at "market" prices.

~~7.79~~7.87 Both this measure of gross value added and that described in the previous subsection use purchasers' prices to value intermediate inputs. The difference between the two measures is entirely attributable to their differing treatments of taxes or subsidies on products payable on outputs (other than invoiced VAT). By definition, the value of output at producers' prices exceeds that at basic prices by the amount, if any, of the taxes on products, less subsidies on products so that the two associated measures of gross value added must differ by the same amount.

Gross value added at factor cost

~~7.80~~7.88 Gross value added at factor cost is not a concept used explicitly in the SNA. Nevertheless, it can easily be derived from either of the measures of gross value added presented above by subtracting the value of any taxes on production, less subsidies on production, payable out of gross value added as defined. For example, the only taxes on production remaining to be paid out of gross value added at basic prices consist of "other taxes on production". These consist mostly of current taxes (or subsidies) on the labour or capital employed in the enterprise, such as payroll taxes or current taxes on vehicles or buildings. Gross value added at factor cost can thus be derived from gross value added at basic prices by subtracting other taxes on production, and adding~~less~~ subsidies on production.

~~7.81~~7.89 The conceptual difficulty with gross value added at factor cost is that there is no observable set of prices such that gross value added at factor cost is obtained directly by multiplying this set of prices by the sets of quantities of outputs. By definition, other taxes or subsidies on production are not taxes or subsidies on products that can be eliminated from the input and output prices. Thus, despite its traditional name, gross value added at factor cost is not strictly a measure of value added; it is essentially a measure of income and not output. It represents the amount remaining for distribution out of gross value added, however defined, after the payment of all taxes on production and the receipt of all subsidies on production. It makes no difference which measure of gross value added is used to derive this income measure because the alternative measures of value added considered above differ only in respect of the amounts of the taxes or subsidies on production that remain payable out of gross value added.

3. Gross domestic product (GDP)

~~7.82~~7.90 The underlying rationale behind the concept of gross domestic product (GDP) for the economy as a whole is that it should measure the total gross value added from all institutional units resident in the economy. However, while the concept of GDP is based on this principle, GDP as defined in the SNA is such that an identity exists between

a measure built on value added, a measure built on income and one based on final expenditures. To achieve this, it is important that the same contribution to GDP is made by taxes on production under all three measures. The expenditure measure of GDP includes all taxes on production and taxes on imports since ultimately these are included in the purchasers' prices of the final users.

~~7.83~~7.91 Given this definition of GDP, the following identities hold when the summations are taken over all resident producers:

- GDP = the sum of the gross value added at producers' prices,

  plus taxes on imports, less subsidies on imports, plus non-deductible VAT.

- GDP = the sum of the gross value added at basic prices,

  plus all taxes on products,

  less all subsidies on products.

- GDP = the sum of the gross value added at factor cost

  plus all taxes on products,

  less all subsidies on products,

  plus all other taxes on production,

  less all other subsidies on production.

In cases (b) and (c), the items taxes on products and subsidies on products includes taxes and subsidies on imports as well as on outputs.

4. Domestic production

~~7.84~~7.92 GDP measures the production of all resident producers. This does not necessarily coincide with all production taking place within the geographical boundary of the economic territory. Some of the production of a resident producer may take place abroad, while some of the production taking place within the geographical boundary of the economy may be carried out by non-resident producer units. For example, a resident producer may have teams of employees working abroad temporarily on the installation, repair or servicing of equipment. This output is an export of a resident producer and the productive activity does not contribute to the GDP of the country in which it takes places. Thus, the distinction between resident and non-resident institutional units is crucial to the definition and coverage of GDP. In practice most of the productive activity of resident producers takes place within the country in which they are resident. However, producers in service industries that typically have to deliver their outputs directly to their clients wherever they are located are increasingly tending to engage in production in more than one country, a practice that is encouraged by rapid transportation and instantaneous communication facilities. Geographical boundaries between adjacent countries are becoming less significant for mobile service producers, especially in small countries bordered by several other countries.

E. The measurement of output

1. Production versus output

~~7.85~~7.93 Production is an activity carried out by an establishment. It may not always be clear whether an establishment is producing a good or is providing a service. For example, an oil refinery processing crude oil that it owns is producing a good (refined petroleum); if the same refinery processes crude oil belonging to another unit, then it is providing a refinery service to that unit. This lack of clarity may often appear for goods passing between establishments of the same enterprise and it is important to know when to record the output of a good and when of a change-effecting service. When the establishments belong to different enterprises (that is to different institutional units), the defining principle is that of economic ownership. If an establishment has no discretion about the level of production, the price to be charged for the good or the destination of the good, there is evidence

that the establishment has not taken economic ownership of the goods being processed and the value of the output should be treated as the processing element only. This is the case for the refinery service cited above.

7.94 When the establishments involved belong to the same enterprise, there is no change of ownership since both establishments have the same owner. However, the principle of transferring risk, which accompanies change of ownership, can still be applied. Suppose, for example, that an establishment receives coal from another establishment in the same enterprise, uses it to generate electricity and then sells the electricity on the open market. The electricity generator has discretion about the amount of coal it demands, the amount of electricity to be generated and the prices to be charged. In such a case, the value of electricity generated should be measured including the cost of the coal consumed in the process even though there is no legal change in ownership given that both establishments belong to the same enterprise.

~~7.86~~7.95 The measurement of output (and related inputs), including the determination of (changes in) economic ownership, may be complicated by the way in which global production arrangements are established. More details on the recording of such arrangements can be found in chapter 23.

~~7.87~~7.96 In general, all goods and services that are produced and used by the same establishment are excluded from the measure of output. However, there are exceptions here also. For example, output is recorded if the goods and services being produced are used for capital formation of the establishment. Similarly output is recorded for products entering inventories even if eventually they are withdrawn from inventories for use as intermediate consumption in the same establishment in a later period. If the establishment is a household unincorporated enterprise growing maize, the value of maize produced includes maize kept for household consumption.

~~7.88~~7.97 An establishment may produce goods and services that are used as its own intermediate consumption. An example is unglazed china that is only delivered to other units after glazing. In general the unglazed china is not recorded as output but if there is some china remaining unglazed at the end of the production period, it should be recorded as being produced and entering inventories. In the subsequent period, the unglazed china is withdrawn from inventories and the act of glazing constitutes output in the second period.

~~7.89~~7.98 Although production is related to activities and thus the output of one production process is one set of products, output is measured for an establishment and may include the output of several production processes. Thus output is defined as the goods and services produced by an establishment,

- ***excluding the value of any goods and services used in an activity for which the establishment does not assume the risk of using the products in production, and***
- ***excluding the value of goods and services consumed by the same establishment except for goods and services used for capital formation (fixed capital or changes in inventories) or own final consumption.***

2. Time of recording

~~7.90~~7.99 The output of most goods or services is usually recorded when their production is completed. However, when it takes a long time to produce a unit of output, it becomes necessary to recognize that output is being produced continuously and to record it as "work-in-progress". For example, the production of certain agricultural goods or large durable goods such as ships or buildings may take months or years to complete. In such cases, it would distort economic reality to treat the output as if it were all produced at the moment of time when the process of production happens to terminate. Whenever a process of production extends over two or more accounting periods, it is necessary to calculate the work-in-progress completed within each of the periods in order to be able to measure how much output is produced in each period.

~~7.91~~7.100 On the other hand, goods and services may be completed in an accounting period but not delivered (sold) to a user in that period. Output is recorded when the work is completed and not when sold. There is thus a significant difference between the value of output in a period and the value of sales, the difference being accounted for by changes in inventories of finished goods and work-in-progress.

3. Valuation of output

~~7.92~~7.101 Goods and services produced for sale on the market at economically significant prices may be valued

either at basic prices or at producers' prices. The preferred method of valuation is at basic prices, especially when a system of VAT, or similar deductible tax, is in operation. Producers' prices should be used only when valuation at basic prices is not feasible.

~~7.93~~7.102 Output produced by market producers for own final use should be valued at the average basic prices of the same goods or services sold on the market, provided they are sold in sufficient quantities to enable reliable estimates to be made of those average prices. If not, the output should be valued by the total production costs incurred, including ~~consumption of fixed capital~~depreciation (and depletion where relevant), plus any taxes (less subsidies) on production other than taxes or subsidies on products, plus a net return ~~on the fixed capital and natural resources~~to non-financial assets used in production, plus rents payable on the use of non-produced non-financial assets. The concept of the net return to capital is introduced in section H and discussed more fully in chapter ~~20~~17.

~~7.94~~7.103 The non-market output produced by government units, the central bank and NPISHs that is supplied free, or at prices that are not economically significant, to other institutional units or the community as a whole is valued by total production costs incurred, similar to the method described in the above paragraph. ~~including consumption of fixed capital, plus taxes (less subsidies) on production other than taxes or subsidies on products. By convention, no net return to capital is included for non-market production. Similarly, no net return to capital is included in the estimates of production~~ The same holds for the valuation of production for own final use by non-market producers when these are estimated as the sum of costs. However, although generally a return to capital should be included in valuing non-market output, a return to capital for city parks and historical monuments is to be excluded on pragmatic grounds.

4. Market output, output for own final use and non-market output

~~7.95~~7.104 A fundamental distinction is drawn in the SNA between market output and non-market output because of the way the output of each is valued. Market output is the normal situation in a market economy where producers make decisions about what to produce and how much to produce in response to expected levels of demand and expected costs of supply. The determining factor behind production decisions is that economically significant prices prevail. ***Economically significant prices are prices that have a significant effect on the amounts that producers are willing to supply and on the amounts purchasers wish to buy. These prices normally result when:***

- ***The producer has an incentive to adjust supply either with the goal of making a profit in the long run or, at a minimum, covering capital and other costs; and***
- ***Consumers have the freedom to purchase or not purchase and make the choice on the basis of the prices charged.***

~~7.96~~7.105 There is further discussion on economically significant prices in chapter ~~22~~30.

~~7.97~~7.106 Non-market output is output undertaken by general government, the central bank and NPISHs that takes place in the absence of economically significant prices. A price is said to be not economically significant when it has little or no influence on how much the producer is prepared to supply and is expected to have only a marginal influence on the quantities demanded. It is a price that is not quantitatively significant from the point of view of either supply or demand. Such prices are likely to be charged in order to raise some revenue or achieve some reduction in the excess demand that may occur when services are provided completely free, but they are not intended to eliminate such excess demand. Once a decision has been taken on administrative, social or political grounds about the total amount of a particular non-market good or service to be supplied, its price is deliberately fixed below the equilibrium price that would clear the market. The difference between a price that is not economically significant and a zero price is, therefore, a matter of degree. The price merely deters those units whose demands are the least pressing without greatly reducing the total level of demand.

~~7.98~~7.107 Non-market output may be produced for two reasons:

- It may be technically impossible to make individuals pay for collective services because their consumption cannot be monitored or controlled. The pricing mechanism cannot be used when transactions costs are too high and there is market failure. The production of such services has to be

organized collectively by government units or the central bank and financed out of funds other than receipts from sales, namely taxation or other ~~government~~ incomes;

- Government units and NPISHs may also produce and supply goods or services to individual households for which they could charge but choose not to do so as a matter of social or economic policy. The most common examples are the provision of education or health services, free or at prices that are not economically significant, although other kinds of goods and services may also be supplied.

Market output

~~7.99~~7.108 ***Market output consists of output intended for sale at economically significant prices***. The value of market output is determined as the sum of the following items:

- The value of goods and services sold at economically significant prices;
- The value of goods or services bartered in exchange for other goods, services or assets;
- The value of goods or services used for payments in kind, including compensation in kind;
- The value of goods or services supplied by one establishment to another belonging to the same market enterprise to be used as intermediate inputs where the risk associated with continuing the production process is transferred along with the goods;
- The value of changes in inventories of finished goods and work-in-progress intended for one or other of the above uses;
- The margins charged on the supply of goods and services, transport margins, margins on the acquisition and disposal of financial assets, etc.

Recording of sales

~~7.100~~7.109 The times at which sales are to be recorded are when the receivables and payables are created: that is, when the ownership of the goods passes from the producer to the purchaser or when the services are provided to the purchaser. Goods or services are valued at the basic prices at which they are sold. If valuation at basic prices is not feasible, they may be valued at producers' prices instead. If it is necessary to value the sale of goods at producers' prices rather than basic prices, then the implicit value of margin services should also include any applicable taxes on products. For some margin services, especially those concerning financial assets, the value of the service provided may be implicit.

~~7.101~~7.110 The values of sales are determined by the amounts receivable and payable by the producers and purchasers, suitably adjusted for trade and transport margins. The amounts receivable and payable do not always coincide with the amounts actually received and paid. The amount payable should be shown in the production account and the difference between amounts payable and paid should be shown as accounts payable or receivable in the financial account. Subsequent payments of these amounts outstanding are recorded as financial transactions and not as part of the production account. If payments made in advance or in arrears attract interest charges, these should be shown as separate transactions and not included in the value of sales.

Recording of barter

~~7.102~~7.111 Barter occurs when goods and services are exchanged for other goods, services or assets. The value of goods or services bartered should be recorded when the ownership of the goods is transferred or the services are provided. The output of goods bartered is valued at the basic prices that would have been received if they had been sold.

Recording of compensation in kind or other payments in kind

~~7.103~~7.112 Goods or services provided to employees as ~~compensation~~remuneration in kind, or used for other payments in kind, should be recorded when the legal ownership of the goods is transferred or the services are provided. They should be valued at the basic prices that would have been received if they had been sold.

Recording of intra-enterprise deliveries

~~7.104~~7.113 Intra-enterprise deliveries are recorded only when the establishment receiving the goods assumes responsibility for making the decisions about the levels of supply and prices at which their output is delivered to the market. When incoming deliveries are recorded, they should be valued at the basic prices that would have been received if they had been sold.

Changes in inventories of finished goods

~~7.105~~7.114 The basic principle underlying the measurement of changes in inventories of finished goods is that output should be recorded at the time it is produced and valued at the same price whether it is sold, otherwise used or entered into inventories for sale or use later. In effect, goods only enter inventories when they are not immediately used for sale or other use in the period they are produced. Similarly, goods are withdrawn from inventories when the demand for the goods exceeds the amount produced in a period. No output is recorded when goods produced previously are withdrawn from inventories and sold or otherwise used unless a storage activity as described below in section F takes place.

~~7.106~~7.115 Inventories of finished goods therefore explain the difference between production and sales (or other use) in a single period. It follows that entries into inventories must be valued at the basic prices prevailing at the time of entry, while withdrawals must be valued at the prices at which they are then sold. This method of valuing changes in inventories, which may be described as the "perpetual inventory method" or PIM, is not always easy to implement in practice, however, and it sometimes leads to results that may be counter intuitive.

~~7.107~~7.116 When prices are stable, the measurement of changes in inventories is relatively simple. However, when there is inflation (or deflation), significant price increases (decreases) may occur while goods are held in inventories. Holding gains (losses) accruing on goods held in inventories after they have been produced must not be included in the value of output. It follows from the valuation method used that, when prices are changing, goods entering and leaving inventories at different times are valued at different prices, even within the same accounting period (as also are goods sold at different times). This requires that, in principle, all entries to, and withdrawals from, inventories be recorded continuously as they occur, and helps explain the complexity of the perpetual inventory method. The perpetual inventory method ensures their exclusion by valuing goods withdrawn from inventories at the prices prevailing at the time they are withdrawn and not at the prices at which they are entered, or their "historic costs". This method of valuation can lead to much lower figures for both output and profits in times of inflation than those obtained by business accounting methods based on historic costs. Further discussion on the valuation of inventories appears in chapter ~~10~~11.

~~7.108~~7.117 It follows from the general principles outlined in the previous section that:

- Goods entering inventories are valued at the basic prices prevailing at that time: that is, at the prices at which they could have been sold when first produced;
- Goods withdrawn from inventories are valued at the basic prices prevailing at that time: that is, at the prices at which they can then be sold.

~~7.109~~7.118 Goods held in inventories are subject to deterioration through the passage of time and are at risk from theft or accidental damage. Recurrent losses due to normal rates of wastage, theft and accidental damage are treated in the same way as withdrawals from inventories and thus reduce the value of output. This practice is followed even if the losses are high relative to output as long as they are recurrent. The total value of the changes in inventories of finished goods recorded within a specified accounting period is then given by:

the sum of the values of all goods entering inventories

less the sum of the values of all goods withdrawn from inventories

less the value of any recurrent losses of goods held in inventories.

Changes in inventories of work-in-progress

~~7.110~~7.119 When the process of production takes a long time to complete, output must be recognized as being produced continuously as work-in-progress. As the process of production continues, intermediate inputs are continually being consumed so that it is necessary to record some corresponding output. Otherwise, recording the inputs and outputs as if they took place at different times, or even in different accounting periods would give meaningless figures for value added. Work-in-progress is essentially incomplete output that is not yet marketable: that is, output that is not sufficiently processed to be in a state in which it can easily be supplied or sold to other institutional units. It is essential to record such output whenever the process of production is not completed within a single accounting period so that work-in-progress is carried forward from one period to the next. In this case, the current value of the work-in-progress completed up to the end of one period is recorded in the closing balance sheet, which also serves as the opening balance sheet for the next period.

~~7.111~~7.120 Work-in-progress may need to be recorded in any industry, including service industries such as the production of movies, depending upon the length of time it takes to produce a unit of output. It is particularly important in industries with long gestation periods, such as certain types of agricultural production or durable producers' goods production, where the period of production may extend over several years.

~~7.112~~7.121 Work-in-progress is treated in the SNA as one component of inventories of outputs held by producers. However, the borderline between inventories of partially completed buildings and structures and gross fixed capital formation may not always be clear. Gross fixed capital formation is undertaken by users of fixed assets so gross fixed capital formation cannot be recorded until the legal ownership of the assets is transferred from their producers to their users. This transfer does not usually occur until the process of production is completed. However, when a contract of sale has been concluded in advance, the transfer of legal ownership may be deemed to occur in stages as value is put in place. In such cases, stage payments made by the purchaser can often be used to approximate the value of the transfer of partially completed assets,~~gross fixed capital formation~~ although stage payments may sometimes be made in advance or in arrears of the completion of the stage, in which case short-term credits are also extended from the purchaser to the producer, or vice versa. Although the partially completed asset has been transferred, it should remain to be recorded as work-in-progress, albeit in the accounts of the purchaser. In the absence of a contract of sale, the output produced must be treated as additions to the producer's inventories, that is, as work-in-progress, however large the partially completed structure may be. When the production process is terminated, the whole of the work-in-progress accumulated up to that point is effectively transformed into inventories of finished product ready for delivery or sale. When a sale takes place, the value of the sale must be cancelled by a withdrawal from inventories of equal value so that only the additions to work-in-progress recorded while production was taking place in the period in question remain as measures of output. In this way, the output is distributed over the entire period of production.

~~7.113~~7.122 Additions to, and withdrawals from, work-in-progress are treated in the accounts in the same way as entries to, and withdrawals from, inventories of finished goods. They must be recorded at the times they take place and at the basic prices prevailing at those times. However, further explanation is needed of the valuation in view of the special characteristics of work-in-progress. This explanation appears in chapter ~~20~~17.

Output for own final use

~~7.114~~7.123 Output for own final use consists of products retained by the producer for his own use as final consumption or capital formation. The value of output for own final use is determined as the sum of the following:

- The value of goods produced by an unincorporated enterprise and consumed by the same household;
- The value of services provided to households by paid domestic staff;
- The value of the imputed services of owner-occupied dwellings;
- The value of the fixed assets produced by an establishment that are retained within the same enterprise for use in future production (own-account gross fixed capital formation);

- The value of changes in inventories of finished goods and work-in-progress intended for one or other of the above uses;
- In exceptional cases, as described later in this section, there may be output for own intermediate use.

Goods produced by households

~~7.115~~7.124 All goods produced by households are within the production boundary and those that are not delivered to other units should be treated as either being consumed immediately or stored in inventories for later use.

Services of domestic staff

~~7.116~~7.125 Paid domestic staff (child minders, cooks, gardeners, chauffeurs, etc.) are formally treated as employees of an unincorporated enterprise that is owned by the household. The services produced are consumed by the same unit that produces them and they constitute a form of own-account production. By convention, any intermediate costs in the production of the domestic services are treated not as intermediate consumption of the output of the domestic services but as final consumption expenditure of the household. Thus the value of the output produced is deemed to be equal to the ~~compensation~~remuneration of employees paid, including any compensation in kind such as food or accommodation.

Services of owner-occupied dwellings

~~7.117~~7.126 Households that own the dwellings they occupy are formally treated as owners of unincorporated enterprises that produce housing services consumed by those same households. When well-organized markets for rented housing exist, the output of own-account housing services can be valued using the prices of the same kinds of services sold on the market in line with the general valuation rules adopted for goods or services produced on own account. In other words, the output of the housing services produced by owner occupiers is valued at the estimated rental that a tenant would pay for the same accommodation, taking into account factors such as location, neighbourhood amenities, etc. as well as the size and quality of the dwelling itself. The same figure is recorded under household final consumption expenditures. In many instances, no well-organized markets exist and other means of estimating the value of housing services must be developed.

7.127 There are two phenomena which may potentially lead to double-counting. The first one concerns the own-account production of electricity through the use of solar panels and wind power plants and the production of heat for heating water or a dwelling through geothermal heat or heat pumps. Installations for the generation and use of renewable energy (electricity or heat) may lead to higher market rentals for rented dwellings. Depending on the estimation and stratification methods, this "rental premium" may also feed into the output of owner-occupied housing services, and in this case the owner-occupied housing services need to be adjusted for this rental premium. In cases where very few rented dwellings have renewable energy installations, the risk of double-counting is expected to be negligible.

~~7.118~~7.128 The other potential risk for double-counting concerns the phenomenon that households may sublet their own dwelling for short periods of time, for example via online market places for accommodation rentals. Again, depending on estimation and stratification methods, one may assume that this "rent premium" affects the output of housing services produced on own-account, as households renting a dwelling may not be allowed to sub-lease the dwelling for short periods of time. If this is indeed the case, the estimated value of the services related to owner-occupied dwellings needs to split into the rentals from leasing the dwelling for short periods of time, and the part reflecting the consumption of owner-occupied housing serves. In addition, any purchases in relation to the leasing of the dwelling may need to be reclassified from final consumption expenditure to intermediate consumption.

Own gross fixed capital formation

~~7.119~~7.129 Goods or services used for own gross fixed capital formation can be produced by any kind of enterprise, whether corporate or unincorporated. They include, for example, the special machine tools produced for their

own use by engineering enterprises, or dwellings, or extensions to dwellings, produced by households. A wide range of construction activities may be undertaken for the purpose of own gross fixed capital formation in rural areas in some countries, including communal construction activities undertaken by groups of households. In addition, intellectual property products such as R&D, ~~and~~ software products, including data and databases, may be produced on own account.

Changes in inventories

~~7.120~~7.130 Additions to work-in-progress on structures intended for own use continue to be treated as changes in inventories until they are completed. As it may not always be feasible to distinguish work-in-progress from completed products, particularly in the case of intellectual property products, the relevant additions to work-in-progress are treated as acquisitions of fixed assets by their producers. Goods or services produced for own final use may be placed in inventories of finished products for use later. They are valued at the basic prices of similar products sold on the market at the time they enter inventories or by their costs of production if no suitable basic prices are available.

Own intermediate consumption

~~7.121~~7.131 It is unusual to record goods and services used as intermediate consumption within the same establishment but there are occasions where it may be desirable. If such recording is made, the goods and services in question add to both intermediate consumption and output so value added is unaffected by this practice.

~~7.122~~7.132 If an activity such as delivery services is of particular interest and there is a diversity of practice about whether it is treated as secondary output (that is, is charged for) or as being for own use (not charged for) then it may be desirable to show all delivery services as if they were secondary products with the output shown as own intermediate consumption where appropriate.

~~7.123~~7.133 As explained in paragraph ~~6.104~~ 7.113 if a product is delivered by one establishment to another within the same enterprise, the delivery is recorded as output of the first establishment and intermediate consumption of the second only when the second establishment assumes the responsibility for making the decisions about the level of supply and prices at which the output is delivered to the market. When this is not the case, the output of the first establishment is shown as entering inventories while the second establishment delivers a processing service and charges for it. If a production account is being compiled for the enterprise, in the first case it may be preferable to show the product as both output and intermediate consumption of the enterprise rather than to consolidate it out. In the second case, the output of the enterprise will be the value of the product as produced by the first establishment plus the processing fee for the second.

~~7.124~~7.134 In some cases, part of the current output may be placed in inventories for use as intermediate consumption in future. An example is agriculture where some of the current crop may be used for seed in future.

Valuation of output for own final use

~~7.125~~7.135 Output for own final use should be valued at the basic prices at which the goods and services could be sold if offered for sale on the market. In order to value them in this way, goods or services of the same kind must actually be bought and sold in sufficient quantities on the market to enable reliable market prices to be calculated for use for valuation purposes. The expression "on the market" means the price that would prevail between a willing buyer and willing seller at the time and place that the goods and services are produced. In the case of agricultural produce, for example, this does not necessarily equate to the prices in the local market where transportation costs and possibly wholesale margins may be included. The nearest equivalent price is likely to be the so-called "farm-gate" price; that is, the price that the grower could receive by selling the produce to a purchaser who comes to the farm to collect the produce.

~~7.126~~7.136 When reliable market prices cannot be obtained, a second best procedure must be used in which the value of the output of the goods or services produced for own final use is deemed to be equal to the sum of their costs of production: that is, as the sum of:

- Intermediate consumption;
- ~~Compensation~~Remuneration of employees;
- ~~Consumption of fixed capital~~Depreciation (and depletion where relevant);
- A net return to non-financial assets used in production;
- Rent payable on the use of non-produced non-financial assets;
- Other taxes (less subsidies) on production.

~~By convention, no net return to capital is included when own-account production is undertaken by non-market producers.~~

~~7.127~~7.137 For unincorporated enterprises, ~~it may not be possible to estimate compensation of employees, consumption of fixed capital and a~~ the compensation for labour input and the return to capital are not separately available, both being part~~in which case an estimate~~ of mixed income~~, covering all these items, should be made~~. In these cases, it may nevertheless be useful for certain types of analysis to impute an estimate of labour input separately, based on wage rates paid for similar kinds of work. The return to capital could then be estimated following the standard procedure.

~~7.128~~7.138 It will usually be necessary to value the output of own-account construction on the basis of costs as it is likely to be difficult to make a direct valuation of an individual and specific construction project that is not offered for sale. When the construction is undertaken for itself by an enterprise, the requisite information on costs may be easily ascertained, but not in the case of the construction of dwellings by households or communal construction for the benefit of the community undertaken by informal associations or groups of households. Most of the inputs into communal construction projects, including labour inputs, are likely to be provided free so that even the valuation of the inputs may pose problems. As unpaid labour may account for a large part of the inputs, it is important to make some estimate of its value using wage rates paid for similar kinds of work on local labour markets. While it may be difficult to find an appropriate rate, it is likely to be less difficult than trying to make a direct valuation of a specific construction project itself. The fact that an imputation is made for the value of labour input is a means to approximate the market price for the construction. It does not imply that these labour costs should also be treated as ~~compensation~~remuneration of employees. As explained in chapter ~~7~~8, when labour is provided on a voluntary basis to a producer unit other than the labourer's own household, no imputation for ~~compensation~~remuneration of employees is made. If labour is provided for a nominal payment, only the nominal payment is recorded as ~~compensation~~remuneration of employees. The other labour costs are treated as mixed income.

Non-market output

~~7.129~~7.139 ***Non-market output consists of goods and individual or collective services produced by government, the central bank and non-profit institutions serving households (NPISHs)~~ or government~~ that are supplied free, or at prices that are not economically significant, to other institutional units or the community as a whole***. Although this output is shown as being acquired by government, the central bank and NPISHs in the use of income account, it should not be confused with production for own use. The expenditure is made by government, by the central bank and by NPISHs but the use of individual goods and services is by households, and the use of collective services by households or other resident institutional units. Thus non-market output should never be confused with output for own use where the producer unit not only has imputed expenditure on the output but also actually uses the output. Chapter ~~9~~10 discusses the difference between expenditure and use in more detail.

~~7.130~~7.140 As explained above, government units, the central bank or NPISHs may engage in non-market production because of market failure or as a matter of deliberate economic or social policy. Such output is recorded at the time it is produced, which is also the time of delivery in the case of non-market services. In general, however, it cannot be valued in the same way as goods or services produced for own final consumption or own capital formation that are also produced in large quantities for sale on the market. There are no markets for

collective services such as public administration and defence, but even in the case of non-market education, health or other services provided to individual households, suitable prices may not be available. It is not uncommon for similar kinds of services to be produced on a market basis and sold alongside the non-market services but there are usually important differences between the types and quality of services provided. In most cases it is not possible to find enough market services that are sufficiently similar to the corresponding non-market services to enable their prices to be used to value the latter, especially when the non-market services are produced in very large quantities.

~~7.131~~7.141 The value of the non-market output provided without charge to households is estimated as the sum of costs of production, as follows:

- Intermediate consumption;
- ~~Compensation~~Remuneration of employees;
- ~~Consumption of fixed capital~~Depreciation (and depletion where relevant);
- Other taxes (less subsidies) on production;
- A return to non-financial assets used in production;
- Rent payable on the use of non-produced non-financial assets.

As noted before, on pragmatic grounds, a return to capital for city parks and historical monuments is excluded for non-market production.

~~7.132~~7.142 If the output is made available at nominal cost, the prices are not economically significant prices and may reflect neither relative production costs nor relative consumer preferences. They therefore do not provide a suitable basis for valuing the outputs of the goods or services concerned. The non-market output of goods or services sold at these prices is valued in the same way as goods or services provided free, that is, by their costs of production. Part of this output is purchased by households, the remainder constituting final consumption expenditures by government units or NPISHs.

~~7.133~~7.143 Government units, the central bank and NPISHs may be engaged in both market and non-market production. Whenever possible, separate establishments should be distinguished for these two types of activities, but this may not always be feasible. Thus, a non-market establishment may have some receipts from sales of market output produced by a secondary activity: for example, sales of reproductions by a non-market museum. However, even though a non-market establishment may have sales receipts, its total output covering both its market and its non-market output is still valued by the production costs. The value of its market output is given by its receipts from sales of market products, the value of its non-market output being obtained residually as the difference between the values of its total output and its market output. The value of receipts from the sale of non-market goods or services at prices that are not economically significant remains as part of the value of its non-market output.

Market and non-market producers

~~7.134~~7.144 ***Market producers are establishments, all or most of whose output is market production. Non-market producers consist of establishments owned by government units, the central bank or NPISHs that supply goods or services free, or at prices that are not economically significant, to households or the community as a whole.*** These producers may also have some sales of secondary market output whose prices are intended to cover their costs or earn a surplus: for example, sales of reproductions by non-market museums. Though government, the central bank and NPISHs may have establishments undertaking market production, including own account capital construction, most of their activity will be undertaken on a non-market basis.

~~7.135~~7.145 When production for own final use is undertaken by a ~~unit in the general~~ government unit, the central bank or an NPISH~~s sector~~, it is treated as being undertaken by a non-market producer. It may also be undertaken by market producers or by units outside general government, the central bank and NPISHs who produce only for own final use.

F. The output of particular industries

1. Introduction

7.146 The rules governing the recording and valuation of output are not sufficient to determine the way in which the output of certain kinds of industries, mostly service industries, such as wholesale and retail trade and financial institutions, is measured. The following sections provide further information about the measurement of the output of a number of specific industries. For convenience, the industries concerned are given in the same order as they appear in the ISIC.

~~7.136~~7.147 This section does not address issues related to the measurement of output in the case of global production arrangements resulting from the increased globalisation of the worldwide economy. Further details on such arrangements and the related complexities, including their impact on the interpretation and analysis of macro-economic aggregates, can be found in chapter 23.

2. Agriculture, forestry and fishing

~~7.137~~7.148 The growth and regeneration of crops, trees, livestock or fish which are controlled by, managed by and under the responsibility of institutional units constitute a process of production in an economic sense. Growth is not to be construed as a purely natural process that lies outside the production boundary. Many processes of production exploit natural forces for economic purposes, for example, hydroelectric plants exploit rivers and gravity to produce electricity.

~~7.138~~7.149 The measurement of the output of agriculture, forestry and fishing is complicated by the fact that the process of production may extend over many months, or even years. Many agricultural crops are annual with most costs incurred at the beginning of the season when the crop is sown and again at the end when it is harvested. However, immature crops have a value depending on their closeness to harvest. The value of the crop has to be spread over the year and treated as work-in-progress. Often the final value of the crop will differ from the estimate made of it and imputed to the growing crop before harvest. In such cases revisions to the early estimates will have to be made to reflect the actual outcome. When the crop is harvested, the cumulated value of work-in-progress is converted to inventories of finished goods that is then run down as it is used by the producer, sold or is lost to vermin.

~~7.139~~7.150 Some plants and many animals take some years to reach maturity. In this case, the increase in their value is shown as output and treated as increases in fixed capital or inventories depending on whether the plant or animal yields repeat products or not. (There is more discussion of this distinction in chapter ~~10~~11.) The value of the increase in the plants or animals should take account of the delay before the yield from them is realized as explained in chapter ~~20~~17. Once the plant or animal has reached maturity, it will decline in value and this decline should be recorded as ~~consumption of fixed capital~~depreciation.

3. Machinery, equipment and construction

~~7.140~~7.151 The production of high value capital goods such as ships, heavy machinery, buildings and other structures may take several months or years to complete. The output from such production must usually be measured by work-in-progress and cannot be recorded simply at the moment in time when the process of production is completed. The way in which work-in-progress is to be recorded and valued is explained in chapter ~~20~~17.

~~7.141~~7.152 When a contract of sale is agreed in advance for the construction of buildings and structures, but not for other production spreading over several periods, the output produced each period is treated as being sold to the purchaser at the end of each period, that is, as a sale ~~rather than work in progress~~. In effect, the output produced by the construction contractor is treated as being sold to the purchaser in stages as the latter takes legal possession of the output. It is recorded as work-in-progress~~gross fixed capital formation~~ by the purchaser and not as work-in-progress by the producer. When the contract calls for stage payments, the value of the output may often be approximated by the value of stage payments made each period. In the absence of a contract of sale, however, the

incomplete output produced each period must be recorded as work-in-progress of the producer. Dwellings built speculatively (that is, without a prior contract of sale) remain in the inventories of the construction company until sold, changing status within inventories from work-in-progress to finished products if they remain unsold on completion.

4. Electricity and heat

7.153 The measurement of output in the area of electricity and heat is relatively straightforward. However, the production, by households, of electricity through the use of solar panels and wind power plants and the production of heat for heating water or a dwelling through geothermal heat or heat pumps may raise some issues. Specifically for electricity, a complication comes from the fact that different production and consumption models exist, often overlapping even within the same production unit. In fact, electricity can be used directly by the producing household for own final consumption, can be sold to the local grid, or a mix of the two (with complicated price structures involved). On the contrary, household production of heat is normally used for own final consumption.

7.154 Output for own final use should be valued at the basic price at which the goods or services could be sold on the market. For the production of electricity for own final use, the feed in tariff that the household would receive for electricity fed to the grid at the moment of use is considered the most appropriate valuation. In this respect, the use of batteries allows households to store excess electricity during peak times and use it, either for own final use or for delivery to the grid, in the evenings when feed in tariffs are generally higher. This difference in prices, by taking advantage of regular, predictable price variations due to changes in the patterns of supply and demand is to be treated as output, not as holding gains and losses; see also below. Receipts from deliveries to the grid in periods of excess production as well as payments for the use of electricity in periods that the own-account production is not sufficient to meet demands should be recorded accordingly. Charges to feed electricity to the grid are to be treated as a reduction in the basic price of electricity generated from solar panels for own use or fed to the grid.

~~4.~~5. Transportation and storage

Transportation

~~7.142~~7.155 The output of transportation is measured by the value of the amounts receivable for transporting goods or persons. In economics a good in one location is recognized as being a different quality from the same good in another location, so that transporting from one location to another is a process of production in which an economically significant change takes place even if the good remains otherwise unchanged. The volume of transport services may be measured by indicators such as tonne-kilometres or passenger-kilometres, which combine both the quantities of goods, or numbers of persons, and the distances over which they are transported. Factors such as speed, frequency or comfort also affect the quality of services provided.

Storage

~~7.143~~7.156 Although the production of storage for the market may not be very extensive, the activity of storage is important in the economy as a whole as it is carried out in many enterprises. During storage the inventories of goods have to be physically stored somewhere. Many goods have to be stored in a properly controlled environment and the activity of storage can become an important process of production in its own right whereby goods are "transported" from one point of time to another. In economics, it is generally recognized that the same goods available at different times, or locations, may be qualitatively different from each other and command different prices for this reason. The increase in price of a product due to the fact that it has been in storage and storage costs have been incurred is a production process. However, it is important that the increase in price due to storage is clearly distinguished from holding gains and losses, which must be excluded from the value of production in the case of storage as in other activities.

~~7.144~~7.157 When goods are first produced, they may be held in store for a time in the expectation that they may be sold, exchanged or used more advantageously in the future. If the increase in value simply reflects a rise in price with no change in quality resulting from being held in storage, then there is no further production during the

period in addition to the costs of storage just described. However, there are three reasons why the increase in value can be construed as further production. The first is that the production process is sufficiently long that discounting factors should be applied to work put in place significantly long before delivery. The second reason is that the quality of the good may improve with the passage of time (such as wine). The third reason is that there may be seasonal factors affecting the supply or the demand for the good that lead to regular, predictable variations in its price over the year, even though its physical qualities may not have changed otherwise. In all these circumstances, storage can be regarded as an extension of the production process over time. The storage services become incorporated in the goods, thereby increasing their value while being held in store. Thus, in principle, the values of additions to inventories should include not only the values of the goods at the time they are stored but also the value of the additional output produced while the goods are held in store.

~~7.145~~7.158 However, most manufactured goods are produced and sold continuously throughout the year and are not subject to regular changes in supply or demand conditions. Nor do they "mature" while being stored. Changes in the prices of such goods while in inventories cannot be treated as additions to work-in-progress. In order to estimate the increase in the value of goods stored over and above the storage costs, use may be made of the expected increase in value over and above the general rate of inflation over a predetermined period. Any gain that occurs outside the predetermined period continues to be recorded as a holding gain or loss. Further explanation of the calculation of the value of storage and its separation from holding gains and losses is given in the annex to this chapter.

~~7.146~~7.159 This inclusion of output due to storage applies only to goods that take a long time to complete, those that have an established annual seasonal pattern or those where maturing is part of the regular production process. It does not apply to holding financial assets, valuables or other non-financial assets including land and buildings. Even if anticipated increases in value result in these cases, the motive for holding the items is speculation. The increases in value are treated as holding gains and not as part of the production process.

~~5.~~6. Wholesale and retail distribution

~~7.147~~7.160 Although wholesalers and retailers actually buy and sell goods, the goods purchased are not treated as part of their intermediate consumption when they are resold with only minimal processing such as grading, cleaning, packaging, etc. Wholesalers and retailers are treated as supplying services to their customers by storing and displaying a selection of goods in convenient locations and making them easily available for customers to buy. Their output is measured by the total value of the trade margins realized on the goods they purchase for resale. ***A trade margin is defined as the difference between the actual or imputed price realized on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of.*** The margins realized on some goods may be negative if their prices have to be marked down. They must also be negative on goods that are never sold because they go to waste or are stolen.

~~7.148~~7.161 The standard formula for measuring output has to be modified for wholesalers or retailers by deducting from the value of the goods sold or otherwise used the value of the goods that would need to be purchased to replace them. The latter includes the additional goods needed to make good recurrent losses due to normal wastage, theft or accidental damage. In practice, the output of a wholesaler or retailer is given by the following identity:

the value of output =

the value of sales,

plus the value of goods purchased for resale and used for intermediate consumption, ~~compensation~~remuneration of employees, etc.,

minus the value of goods purchased for resale,

plus the value of additions to inventories of goods for resale,

minus the value of goods withdrawn from inventories of goods for resale,

minus the value of recurrent losses due to normal rates of wastage, theft or accidental damage.

~~7.149~~7.162 The following points should be noted:

- Goods sold are valued at the prices at which they are actually sold, even if the trader has to mark their prices down to get rid of surpluses or avoid wastage. Allowance should also be made for the effect of reductions in price due to loyalty programmes or other schemes to offer reduced prices to certain customers in certain circumstances.
- Goods provided to employees as remuneration in kind should be valued at the current purchasers' prices payable by the traders to replace them; that is, the realized margins are zero. Similarly, goods withdrawn by the owners of unincorporated enterprises for their own final consumption should be valued at the current purchasers' prices payable by the traders to replace them.
- Goods purchased for resale should be valued excluding any transport charges invoiced separately by the suppliers or paid to third parties by wholesalers or retailers: these transport services form part of the intermediate consumption of the wholesalers or retailers.
- Additions to inventories of goods for resale should be valued at the prices prevailing at the time of entry into inventories.
- The value of goods withdrawn from inventories of goods for resale depends on whether the goods were acquired with the intention of making a real holding gain over a given period in storage. In the general case, when the goods being resold were not expected to realize a real holding gain while in storage, the value of the goods on withdrawal from inventories should be the cost to the wholesaler or retailer at the time of the withdrawal of acquiring exactly similar replacement goods for later sale. This valuation is necessary to exclude holding gains and losses from the measurement of output, as is the general rule in the SNA. However, when the goods have been stored for reasons of seasonal variation in prices or as part of the maturing process, the expected real holding gain over the anticipated period is deducted from the replacement value of goods withdrawn from inventories. This deduction is fixed in value at the time the goods enter storage and is not altered in the light of actual holding gains, real or nominal.
- The value of recurrent losses due to wastage, theft or accidental damage; goods lost are valued in the same way as goods withdrawn from inventories. For this reason, the two terms are often combined.

~~7.150~~7.163 The costs of storage incurred by wholesalers and retailers are not added to the value of the goods when they are withdrawn from inventories but are treated as part of intermediate consumption.

~~7.151~~7.164 The margins realized on goods purchased for resale thus vary according to their eventual use. The margins realized on goods sold at the full prices intended by the traders could be described as the normal margins. In fixing these margins, traders take account not only of their ordinary costs such as intermediate consumption and ~~compensation~~remuneration of employees but also of the fact that some goods may ultimately have to be sold off at reduced prices while others may go to waste or be stolen. The margins realized on goods whose prices have to be marked down are obviously less than the normal margins and could be negative. The margins on goods used to pay employees as ~~compensation~~remuneration in kind or withdrawn for final consumption by owners are zero because of the way these goods are valued. Finally, the margins on goods wasted or stolen are negative and equal to the current purchasers' prices of replacements for them. The average margin realized on goods purchased for resale may be expected to be less than the normal margin, possibly significantly less for certain types of goods such as fashion goods or perishable goods.

~~6.~~7. Output of the central bank

7.165 Central banks provide a variety of financial services, which may differ across countries. Typically, one can distinguish a certain mix of the following broad groups of services: monetary policy services, including by issuing currency and regulating money supply; services related to promoting financial stability, including regulation and macroprudential supervision; services related to managing international reserves and the payments systems; and acting as banker to government.

7.166 In general, these services are provided for free, or at prices which are not economically significant, for the benefit

of the society as a whole. This clearly holds for monetary policy services and services related to the management of international reserves, but it also applies to, for example, services related to promoting financial stability and managing the payments systems. While these types of services may be important for financial intermediaries, their general purpose is to serve the broader financial system, including markets and market infrastructure, and the community as a whole.

7.167 Regarding supervision services, the stronger arguments also point in the direction of considering these services as being provided for the benefit of the society as a whole, to safeguard the society from poor business practices. Supervision services are usually not put in place to safeguard an individual financial corporation from putting their own funds/reserves at risk, which first and foremost would be the responsibility of the relevant corporation and its shareholders. In the case of these services, some payments may be made by financial corporations, but these payments are typically compulsory and not in proportion to the services provided, and should therefore be treated as current transfers.

7.168 In respect of the possible provision of implicit financial services on loans and deposits (see below) by central banks, it can be noted that central banks usually do not hold loans and deposits, predominantly to/from financial corporations and government, for commercial reasons. Central banks are atypical financial intermediaries, which take on liabilities and engage in lending, not with the purpose of earning a margin between the corresponding income streams, but to conduct monetary policy and meet other public functions. Even though their activity facilitates the channelling of funds between lenders and borrowers, their decisions in terms of volumes intermediated and/or prices charged are not motivated by the same considerations which are relevant for "regular" financial intermediaries like commercial banks. As such, the concept of implicit financial services on loans and deposits could thus be considered as irrelevant for them and certainly non-representative of their actual output. Furthermore, for a considerable part of the loans and deposits on the balance sheets of central banks, the interest rates are set in such a way that they have an impact on the market interest rates, thus also affecting the reference rates for the calculation of implicit financial services on loans and deposits, directly and indirectly. The reference rate, which can be looked upon as an exogenous variable for financial intermediaries charging this type of financial services, is to a certain degree endogenous for central banks.

7.169 As a consequence, the above services of central banks are considered as non-market output provided to the society as a whole (i.e., collective services), and total output is to be valued at the sum of costs, while compulsory payments by financial corporations to the central bank should be treated as current transfers, and not as purchases of services. In addition, central banks may occasionally receive revenue from sales of market output produced as a secondary activity. However, total output of the central bank covering both its market and its non-market output is still valued by their costs of production. The value of its market output is given by its receipts from sales of market products, the value of its non-market output being obtained residually as the difference between the values of its total output and its market output.

~~Before discussing financial services more generally, it is helpful to discuss the output of the central bank. There are three broad groups of central bank services. These are monetary policy services, financial intermediation and borderline cases. Monetary policy services are collective in nature, serving the community as a whole, and thus represent non-market output. Financial intermediation services are individual in nature and in the absence of policy intervention in the interest rates charged by the central banks, would be treated as market production. The borderline cases, such as supervisory services may be classified as market or non-market services depending on whether explicit fees are charged that are sufficient to cover the costs of providing the services.~~

~~In principle, a distinction should be made between market and non-market output but in practice the possible resource intensiveness of the exercise and the relative importance of making the distinction should be considered before implementing the conceptual recommendations. In cases where market output is not separated from non-market output, the whole of the output of the central bank should be treated as non-market and valued at the sum of costs.~~

~~Borderline cases such as supervisory services~~

~~Central banks frequently provide supervisory services overseeing the financial corporations. One could argue that~~

~~this is for the benefit of society in general and the national accounts should record them as government final consumption. In support of this view, one could draw a parallel with government performing market regulation policies, which it also may entrust to a specialized agency, or to government providing for roads, dams and bridges. From this point of view, surveillance services are collective services and should be recorded as government consumption expenditure.~~

~~However, one could also argue that government's regulatory services are to the benefit of the financial intermediaries, because these services contribute to the functioning and financial performance of these institutions. From this perspective, they are comparable to regulatory services of government such as quality control on food and drugs, which the national accounts record as intermediate consumption of producers. The fact that financial intermediaries pay a fee for these services in some countries (for example in a number of countries in Latin America) supports this view. Following this reasoning, surveillance services are not collective services but should be recorded as intermediate consumption of financial intermediaries. However, even if the view is taken that supervisory services are market output because a fee is charged, if the fees are not sufficient to cover the supervisory costs incurred by the bank, then the services should be treated as non-market output and part of government consumption expenditure.~~

~~Provision of non-market output~~

~~As long as it can be identified as a separate institutional unit, the central bank is always included in the financial institutions sector and never in general government. The collective consumption represented by monetary policy services is recorded as expenditure by general government but government does not incur the costs incurred by the central bank. Therefore a current transfer of the value of the non-market output should be recorded as payable by the central bank and receivable by the general government to cover the purchase of the non-market output of the central bank by government. This is described in paragraph 8.130.~~

~~Provision of market output~~

~~If the financial intermediation services provided by the central bank are significant, and if it is possible and worthwhile to compile data for a separate establishment providing them, these services should be shown as payable by the units to whom they are delivered. Supervisory services treated as market output are recorded similarly.~~

~~7.~~8. Financial services other than those associated with insurance and pension funds

~~7.152~~7.170 A comprehensive discussion of the contribution of financial assets and liabilities to the generation and distribution of income and changes in wealth in an accounting period is given in ~~part 4 of~~ chapter ~~17~~25. What follows is a summary of the main aspects affecting the general measurement of the output of financial services. (See chapter 26 for details on the measurement of financial services in the case of Islamic finance.) There are three types of financial activities; financial intermediation, the services of financial auxiliaries and other financial services. Financial services include monitoring services, convenience services, liquidity provision, risk assumption, underwriting and trading services.

~~7.153~~7.171 Financial intermediation involves financial risk management and liquidity transformation, activities in which an institutional unit incurs financial liabilities for the purpose of acquiring mainly financial assets. Corporations engaged in these activities obtain funds, not only by taking deposits but also by issuing bills, bonds or other securities. They use these funds as well as own funds to acquire mainly financial assets not only by making advances or loans to others but also by purchasing bills, bonds or other securities. Auxiliary financial activities facilitate risk management and liquidity transformation activities. Financial auxiliaries, which are the units primarily engaged in auxiliary financial activities, typically act on behalf of other units and do not put

themselves at risk by incurring financial liabilities or by acquiring financial assets as part of an intermediation service.

7.1547.172 Financial services are produced almost exclusively by financial institutions because of the usually stringent supervision of the provision of those services. Similarly, financial institutions rarely produce other services. If a retailer wishes to offer credit facilities to its customers, for example, the credit facilities are usually offered by a subsidiary of the retailer, the subsidiary being treated as a financial institution in its own right regardless of the classification of the parent. Financial institutions may also create subsidiaries dealing with only particular forms of financial services. For example, a credit card operation may be associated with a given bank but may be institutionally separate.

7.1557.173 Financial services may be paid for explicitly or implicitly. Some transactions in financial assets may involve both explicit and implicit charges. Four main ways in which financial services are provided and charged for may be considered:

- Financial services provided in return for explicit charges;
- Financial services provided in association with interest charges on loans and deposits;
- Financial services associated with the acquisition and disposal of financial assets and liabilities in financial markets;
- Financial services associated with insurance and pension schemes.

The first three types of financial services are discussed below, while the following section deals with the financial services associated with insurance and pension schemes~~s look at each of these in turn~~. In chapter ~~17~~25 there is an overview of the transactions and other flows associated with each type of financial instrument. The recording of investment income is described in chapter ~~7~~8 and the acquisition and disposal of financial assets and liabilities in chapter ~~11~~12. Changes in the value of financial assets and liabilities not arising from transactions are described in chapter ~~12~~13.

Financial services provided in return for explicit charges

7.1567.174 Many services come under this heading and may be provided by different categories of financial institutions. Deposit taking institutions, such as banks, may charge households to arrange a mortgage, manage an investment portfolio, give taxation advice, administer an estate, and so on. Specialized financial institutions may charge non-financial corporations to arrange a flotation of shares or to administer a restructuring of a group of corporations. However, the most pervasive and probably largest direct fee is likely to be that charged by credit card issuers to the units that accept credit cards as a means of payment for the goods and services they provide. The charge is usually calculated as a percentage of the sale; in the case of retailers the sale value corresponds to turnover and not output. Although the percentage is usually small in absolute terms, maybe one or two percent, the fact that it is applied to such large totals means that the total value of the charge is very large. The charge represents output of the credit card companies and intermediate consumption of the corporations that accept credit cards as means of payment. Ignoring the role of the credit card company does not affect the measurement of the expenditure (usually final consumption or exports) on the goods and services concerned but does underestimate the costs of the provider of goods and services and the output of the credit card company. This in turn leads to a misallocation of value added from the credit card company to the provider of the goods and services paid for by credit card.

7.175 The example of the credit card company is one that clearly demonstrates that a financial corporation may provide services that are paid for by different means by different customers or in different circumstances. The fee charged to the corporations accepting a credit card as means of payment has just been discussed. A card holder may also be charged an explicit fee, usually each year, for holding the card. In addition, if a card holder uses the credit facilities offered by the card, he will pay indirect charges associated with interest payable on the outstanding credit (which is treated as a loan in the SNA).

7.176 Some institutional units have the sole or predominant function of holding financial assets on behalf of their owners. For example, some mutual funds, holding companies, trusts, and special purpose entities serve this

purpose. In the process of managing those assets, these enterprises incur administrative expenses such as payments to fund managers, custodians, banks, accountants, lawyers, or their own staff. The expenses can be charged for explicitly as a fee, or implicitly by being paid out of investment income received or out of the assets of the enterprise. The expenses implicitly paid for should be recognized as a service to the owners. For example, a hedge fund may distribute a proportion of the net income of the fund to the entity that manages the fund, which should be recorded as a charge for services. Similarly, a custodian may charge lower fees in exchange for the right to on-lend securities.

7.177 Implicit asset management service charges can be measured at cost. The corresponding entry is to increase the net value of investment income payable to the investor to the gross value before deduction of the expenses. Without the recognition of the output of such services, the costs incurred would lead to negative operating surplus for the asset management enterprises. With this treatment, these enterprises have a net operating surplus of zero.

7.178 Institutional units may be set up for holding and managing assets on behalf of others. They may have employees of their own, but more often engage the services of administrators, trustees and/or portfolio managers to manage the operations of the funds. This is the case for most investment funds. Importantly, the funds themselves are treated as separate institutional units, distinct from the unit managing them. The investment funds pay fees to these service providers, and make use of the required human resources to support the funds operations (buying and selling of securities, providing legal, accounting, and other services required to ensure that the fund is operating efficiently). The fund in turn charges a service fee to investors which is equivalent to the amount of operating expenses and is usually reported as an annual percentage of the assets in the fund. In addition, holders of investment fund shares/units may be charged with fees on specific transactions, such as redemption fees, exchange fees imposed for transferring shares/units within the same fund group or account fees. Both types of fees are treated as services that are provided directly from the original professional providers to the shareholders. Investment funds are thus not treated as providers or consumers of services, and their output and intermediate consumption is equal to zero.

Financial services provided in association with interest charges on loans and deposits

~~7.157~~7.179 One traditional way in which financial services are provided is by means of financial intermediation. This is understood to refer to the process whereby a financial institution such as a bank accepts deposits from units wishing to receive interest on funds for which the unit has no immediate use and lends them to other units whose funds are insufficient to meet their needs. The bank thus provides a mechanism to allow the first unit to lend to the second. Each of the two parties pays a fee to the bank for the service provided, the unit lending funds by accepting a rate of interest lower than that paid by the borrower, the difference being the combined fees implicitly charged by the bank to the depositor and to the borrower. From this basic idea the concept emerges of a "reference" rate of interest. The difference between the rate paid to banks by borrowers and the reference rate plus the difference between the reference rate and the rate actually paid to depositors represent charges for implicit financial ~~intermediation~~ services on loans and deposits~~indirectly measured (FISIM)~~.

~~7.158~~7.180 However, it is seldom the case that the amount of funds lent by a financial institution exactly matches the amount deposited with them. Some money may have been deposited but not yet loaned; some loans may be financed by the bank's own funds and not from borrowed funds. However, the depositor of funds receives the same amount of interest and service whether or not his funds are then lent by the bank to another customer, and the borrower pays the same rate of interest and receives the same service whether his funds are provided by intermediated funds or the bank's own funds. For this reason an indirect service charge is to be imputed in respect of all loans and deposits offered by a financial institution irrespective of the source of the funds. The reference rate applies to both interest paid on loans and interest paid on deposits so that the amounts of interest recorded as such in the SNA are calculated as the reference rate times the level of loan or deposit in question. The difference between these amounts and the amounts actually paid to the financial institution are recorded as service charges paid by the borrower or depositor to the financial institution. For clarity the amounts based on the reference rate recorded in the SNA as interest are described as "SNA interest" and the total amounts actually paid to or by the financial institution are described as "bank interest". The implicit service charge is thus the sum of the bank interest on loans less the SNA interest on the same loans plus the SNA interest on deposits less the bank interest on the same deposits. The service charge is payable by or to the unit in receipt of the loan or owning the deposit as appropriate.

~~7.159~~7.181 By convention within the SNA, these indirect charges in respect of interest apply only to loans and

deposits and only when those loans and deposits are provided by, or deposited with, financial institutions. The financial institutions in question need not be resident; nor need the clients of the financial institution be resident. Thus imports and exports of this type of financial service are possible. Nor need the financial institution necessarily offer deposit-taking facilities as well as making loans. The financial subsidiaries of retailers are examples of financial institutions that make loans without accepting deposits. A money lender who has sufficiently detailed accounts to be treated as an actual or quasi-corporation may receive this sort of charge; indeed since money lenders usually charge especially high rates of interest, their service charges may exceed the SNA interest payments by significant amounts.

7.182 The reference rate to be used in the calculation of SNA interest is a rate between bank interest rates on deposits and loans. However, because there is no necessary equality between the level of loans and deposits, it cannot be calculated as a simple average of the rates on loans or deposits. ~~The reference rate should contain no service element and reflect the risk and maturity structure of deposits and loans. The rate prevailing for inter bank borrowing and lending may be a suitable choice as a reference rate. However, different reference rates may be needed for each currency in which loans and deposits are denominated, especially when a non-resident financial institution is involved. For banks within the same economy, there is often little if any service provided in association with banks lending to and borrowing from other banks.~~As liquidity transformation services are considered to be part of the implicit financial services on loans and deposits, it is recommended to use a single temporal reference rate, and not two reference rates distinguishing short-term and long-term loans and deposits. The calculation of the single reference rate should be determined according to national circumstances, using any of the following approaches:

- a reference rate based on a single observable exogenous rate for a specific instrument, such as interbank lending rates;
- a reference rate based on a weighted average of observable exogenous rates of maturities with different terms (weighted by the stock of loans and deposits in each maturity); or
- a weighted average of the endogenous interest rates on loans and deposits.

7.183 During periods of volatile movements in reference rates and when liquidity markets begin to disfunction, considerable care should be taken in determining estimates of implicit financial services on loans and deposits. These periods may be characterised by negative estimates of implicit financial services on loans and deposits, particularly for depositors, but also for borrowers. When such incidences occur, countries are encouraged to review the applicability of the underlying reference rate to calculate the implicit financial services on loans and deposits for that period. The first, and simplest approach, is that countries consider taking the simple weighted average of the interest rates on loans and deposits for those years with negative implicit service charges for either depositors or borrowers. The second, and slightly more complicated approach, takes the view that, during periods when markets are dis-functional, banks may offer financial inducements to attract depositors, meaning that part of what is now typically recorded as bank interest may actually consist of a transfer element. In this approach, during periods of negative implicit financial services on loans and deposits calculated using the conventional approach, the implicit service charges should instead be calculated by assuming that the margin (implicit financial services as a per cent of deposits or loans) banks charge on deposits or loans is broadly stable over time.

7.184 As noted before, liquidity transformation is considered to be part of implicit financial services on loans and deposits. Less clarity exists around the inclusion or exclusion of credit default risk. While there is conceptual merit in excluding credit default risk from implicit financial services on loans and deposits, at present many countries are not in a position to do this in a way that ensures reasonable comparability across countries. Having said that, a number of countries have demonstrated that it is feasible, in their cases, to produce meaningful results and these countries have compiled estimates of implicit financial services on loans and deposits on this basis. Recognising that these improvements will take some time to materialise, it is recommended that in the interest of maintaining international comparability, those countries that exclude credit default risk from their estimates of implicit financial services on loans and deposits should also provide supplementary estimates that include credit default risk.

7.185 For international trade in implicit financial services on loans and deposits, different currencies may be involved, and the relevant service charges should be calculated by at least two groups of currencies (national and foreign

currency). Preferably, separate reference rates should be applied for each currency with a significant proportion of loans or deposits. The reference rate for a specific currency need not be the same for providers of implicit financial services on loans and deposits resident in different economies. Although under normal circumstances they should be expected to be relatively close, the rate should be taken, if available, from the financial markets of the home market of the currency, and preferably be the same as the one used by statistical compilers in that economy. In cases where negative implicit financial services on interbank loans occur, and the relevant negative service is received by a resident institution deemed to be the depositor, these should be recorded as liquidity services provided by the resident institution (increasing the institution's output and the economy's exports) and should not be recorded as negative imports. For the counterparty these flows should be recorded as intermediate consumption of liquidity services and imports, and not negative exports/output.

~~7.160~~7.186 Banks may offer loans that they describe as being fixed interest loans. This is to be interpreted as a situation where the level of bank interest is fixed but as the reference rate changes, the level of SNA interest and the service charge will vary.

~~7.161~~7.187 When an enterprise acquires a fixed asset under the terms of a financial lease, a loan is imputed between the lessor and the lessee. Regular payments under the lease are treated as being payments of interest and repayment of capital. When the lessor is a financial institution, the interest payable under the terms of a financial lease corresponds to bank interest and should be separated into SNA interest and financial service charge as for any other loan.

~~7.162~~7.188 Even when a loan is described as non-performing, interest and the associated service charge continue to be recorded in the SNA. There is discussion on the treatment of non-performing loans in chapter ~~13~~14.

Financial services associated with the acquisition and disposal of financial assets and liabilities in financial markets

~~7.163~~7.189 Debt securities such as bills and bonds are other forms of financial assets that give rise to interest payments, interest being payable to the owner of the security by the issuer. As described in chapter ~~17~~25, some of these interest charges may themselves be imputed from changes in the value of securities as they approach maturity. When a financial institution offers a security for sale, a service charge is levied, the purchase price (or ask price) representing the estimated market value of the security plus a margin. Another charge is levied when a security is sold, the price offered to the seller (the bid price) representing the market value less a margin.

~~7.164~~7.190 Prices of securities may change rapidly and to avoid including holding gains and losses in the calculation of the service margins, it is important to calculate the margins on sales and purchases in terms of mid-prices. The mid-price of a security is the average at a given point in time between the bid and ask price. Thus the margin on the purchase of a security is the difference between the ask price and mid-price at the time of the purchase and the margin on a sale is the difference between the mid-price and the bid price at the time of the sale.

~~7.165~~7.191 It is important when measuring interest as the increase in value of a security between the date it is purchased and the date it matures (or is subsequently sold) to measure from one mid-point value to another and to treat the differences between mid-point price and bid or ask price at the time of purchase, sale or redemption as a service margin. Ignoring the margins understates the value of output of financial institutions and may understate interest payments also.

~~7.166~~7.192 Equities and investment fund shares or units give rise to property income other than interest but, like debt securities, they are offered for sale and purchase at different prices. The difference between the buying price and mid-price and the mid-price and selling price should be treated as the provision of financial services as in the case of securities. The same principles as for securities apply for the same reason.

7.193 Although no property income flows are involved, margins between buying and selling prices also apply to purchases of foreign currencies (including transactions denominated in foreign currencies such as payments for imports and exports as well as the acquisition of physical notes and coins of a foreign currency). Again these margins should be treated as the provision of financial services in a manner similar to that described for securities.

~~7.167~~7.194 Factoring is a transaction in which a financial company (factor, which can be a bank, a specialized factoring company, or other financial organisation) buys trade accounts receivable from a supplier at a discount. The discount is equal to the difference between the nominal value of the accounts receivable and the actual

payments by the factor to the supplier, and may consist of three elements: (i) fees; (ii) interest; and (iii) compensation for possible credit defaults. From a conceptual perspective, the output of the factor is represented by the first element only. In practice, however, details about the three elements may not be separately available. The difference between the nominal value of the accounts receivable and the actual payments by the factor may then be considered as a good approximation of output, under the condition that the factoring services are basically restricted to short term financing arrangements with low amounts of (implicit) interest, including credit default risks. However, in situations in which the factor receives a relatively high compensation for risk-free interest (for example, due to conditions of high inflation) and/or possible credit defaults, this convention could lead to unacceptable high amounts of output for the factor and should preferably not be applied. In such cases, compilers should seek to estimate a value for risk-free interest and/or credit default risk to be deducted from the value of output, or alternatively, compilers may consider estimating output by the sum of costs. Furthermore, when separating out an element of interest, no implicit financial services on loans and deposits should be estimated. The main reason for this view is that factoring is quite different from the more traditional type of intermediating funds, which commonly refers to the intermediation between depositors and borrowers, thereby explicitly excluding claims like other accounts receivable/payable. This line of reasoning also applies, even though in the case of factoring the accounts receivable are to be reclassified to loans.

~~8.~~9. Financial services associated with insurance and pension schemes.

~~7.168~~7.195 Five types of activities are covered under this heading: ~~N~~non-life insurance; ~~L~~life insurance and annuities; ~~R~~reinsurance; ~~S~~social insurance schemes; ~~S~~standardized guarantee schemes.

~~7.169~~7.196 All these schemes lead to redistribution of funds, which are recorded in either the ~~secondary distribution of~~transfer income account or the financial account. For non-life insurance and standardized guarantee schemes, most of the redistribution takes place between different units in the same period. Many client units pay relatively small policy premiums or fees and a small number of them receive relatively large claims or payments. For life insurance, annuities and pension schemes, the redistribution is primarily, though not entirely, between different periods for a single client. In fulfilling their responsibilities as managers of these funds, insurance companies and pension funds are involved in both risk management and liquidity transformation, the prime functions of financial institutions.

~~7.170~~7.197 Non-life insurance provides cover to the policyholder against loss or damage suffered as a result of an accident. A premium is paid to the insurance corporation and a claim is paid to the policyholder only if the event insured against occurs. If the event occurs then the maximum amount to be paid is specified in the policy so that the uncertainty concerns whether a payment will take place, not the amount of it.

~~7.171~~7.198 Under a life insurance policy, many small payments are made over a period of time and either a single lump sum or a stream of payments is made at some pre-agreed time in the future. There is little conditionality involved in life insurance, usually the fact that a payment will be made is certain but the amount may be uncertain.

~~7.172~~7.199 Annuities are offered by insurance corporations and are a means for an individual person to convert a lump sum into a stream of payments in the future.

~~7.173~~7.200 Just as an individual may limit their exposure to risk by taking out an insurance policy, so may insurance corporations themselves. Insurance between one insurance corporation and another is called reinsurance. (Insurance other than reinsurance is called direct insurance.) Many reinsurance transactions are with specialized institutions in a few international financial centres. Reinsurers may also take out a further reinsurance policy. This practice is known as “retrocession”.

~~7.174~~7.201 A social insurance scheme is one where a third party, usually an employer or the government, encourages or obliges individuals to participate in a scheme to provide benefits for a number of identified circumstances, including pensions in retirement. Social insurance schemes have much in common with direct insurance and may be run by insurance corporations. This is not necessarily the case, however, and there are special variations in how the payment of contributions (corresponding to premiums in the case of direct insurance) and benefits are recorded.

~~7.175~~7.202 In some circumstances a unit, possibly but not necessarily within general government, may offer very many guarantees of very similar nature. One example is export guarantees and another is student loans. Because

the guarantees are very similar and numerous, it is possible to make robust statistical estimates of the number of defaults the guarantor will have to cover and so these also are treated in a manner similar to direct non-life insurance.

7.1767.203 The detailed recording for each of these activities, including the measurement of output, the recording of flows between the insurance corporations or pension funds on the one hand and policyholders or beneficiaries on the other, and the implications for changes in the balance sheets of both sets of institutions are described in part 3 of chapter 1724. What follows is a summary of the key features of measuring output for the various activities listed above.

Non-life insurance

7.1777.204 Under a non-life insurance policy, the insurance company accepts a premium from a client and holds it until a claim is made or the period of the insurance expires. In the meantime, the insurance company invests the premium and the property income is an extra source of funds from which to meet any claim due. The property income represents income foregone by the client and so is treated as an implicit supplement to the actual premium. The insurance company sets the level of the actual premiums to be such that the sum of the actual premiums plus the property income earned on them less the expected claim will leave a margin that the insurance company can retain; this margin represents the output of the insurance company. Within the SNA, the output of the insurance industry is determined in a manner intended to mimic the premium setting policies of the insurance corporations.

7.1787.205 The basic method for measuring non-life insurance output is the following:

Total Actual premiums earned,

plus premium supplements,

less adjusted claims incurred.

7.1797.206 ***The actual premium is the amount payable to the direct insurer or reinsurer to secure insurance cover for a specific event over a stated time period***. Cover is frequently provided for one year at a time with the premium due to be paid at the outset, though cover may be provided for shorter (or longer) periods and the premium may be payable in instalments, for example monthly.

7.1807.207 ***The actual premium earned is the part of the actual premium that relates to cover provided in the accounting period.*** For example, if an annual policy with a premium of 120 units comes into force on April 1 and accounts are being prepared for a calendar year, the premium earned in the calendar year is 90. ***The unearned actual premium is the amount of the actual premium received that relates to the period past the accounting point***. In the example just given, at the end of the accounting period there will be an unearned actual premium of 30, intended to provide cover for the first three months of the next year. ***A claim (benefit) is the amount payable to the policyholder by the direct insurer or reinsurer in respect of an event covered by the policy occurring in the period for which the policy is valid***. Claims normally become due when the event occurs, even if the payment is made some time later. (The exception to this time of recording is described in paragraph 8.121.)9.xxx.) Claims that become due are described as claims incurred. In some contested cases the delay between the occurrence of the event giving rise to the claim and the settlement of the claim may be several years. ***Claims outstanding cover claims that have not been reported, have been reported but are not yet settled or have been both reported and settled but not yet paid.***

7.1817.208 The insurance corporation has at its disposal reserves consisting of unearned actual premiums and claims outstanding. These reserves are called technical reserves and are used by the insurance company to generate investment income. Because the technical reserves are a liability of the insurance corporation to the policyholders, the investment income they generate is treated as being attributed to the policyholders. However, the amounts remain with the insurance corporation and are in effect a hidden supplement to the apparent actual premium. This income is therefore treated as a premium supplement paid by the policyholder to the insurance corporation.

7.1827.209 In setting the level of actual premiums, which obviously the insurance corporation must do ex ante, it makes an estimate of the level of claims it expects to be faced with. Within the SNA there are two ways in which the appropriate level of claims (described as adjusted claims) can be determined. One is an ex ante method,

described as the expectation method, and estimates the level of adjusted claims from a model based on the past pattern of claims payable by the corporation. The other means of deriving adjusted claims is to use accounting information. Within the accounts for the insurance corporations there is an item called "equalization provisions" that gives a guide to the funds the insurance corporation sets aside to meet unexpectedly large claims. Adjusted claims are derived ex post as actual claims incurred plus the change in equalization provisions. In circumstances where the equalization provisions are insufficient to bring adjusted claims back to a normal level, some contribution from own funds must be added also.

~~7.183~~7.210 On occasion, the levels of technical reserves and of equalization provisions may be altered in response to financial regulation and not because of changes in the expected patterns of premiums and claims. Such changes should be recorded in the other changes in the volume of assets and liabilities account and excluded from the formula to determine output.

~~7.184~~7.211 In circumstances where information is not available for either approach to deriving adjusted claims, it may be necessary to estimate output instead by the sum of costs including an allowance for normal profits.

Life insurance

~~7.185~~7.212 A life insurance policy is a sort of saving scheme. For a number of years, the policyholder pays premiums to the insurance corporation against a promise of benefits at some future date. These benefits may be expressed in terms of a formula related to the actual premiums paid or may be dependent on the level of success the insurance corporation has in investing the funds.

~~7.186~~7.213 The insurance corporation cumulates actual premiums paid until the promised date when benefits become payable and in the meantime uses the reserves to produce investment income and holding gains. Some of the investment income and holding gains is added to the life insurance reserves belonging to the policyholders to meet benefits in future. This allocation is an asset of the policyholders but is retained by the insurance corporation which continues to invest the amounts until benefits become payable. The remainder of the investment income and holding gains not allocated to the policyholders is retained by the insurance corporation as its fee for the service they provide.

~~7.187~~7.214 The method of calculating output for life insurance follows the same general principles as for non-life insurance but because of the time interval between when actual premiums are received and when benefits are paid, special allowances must be made for changes in the technical reserves.

~~7.188~~7.215 The output of life insurance is derived as:

Actual ~~P~~premiums earned,

plus premium supplements,

less benefits due,

less increases (plus decreases) in life insurance ~~technical reserves~~ and annuity entitlements.

~~7.189~~7.216 Premiums are defined in exactly the same way for life insurance as for non-life insurance.

~~7.190~~7.217 Premium supplements are more significant for life insurance than for non-life insurance. They consist of all the ~~investment~~ income allocated to~~earned on the reserves of~~ the life insurance policyholders as property income, whether or not this income originates from investment income or from holding gains (or losses). The amount involved is earnings forgone by the policyholders by putting the funds at the disposal of the insurance corporation and are thus recorded as property income in the ~~distribution of primary~~allocation of earned income account.

~~7.191~~7.218 Benefits are recorded as they are awarded or paid. There is no need under life insurance to derive an adjusted figure since there is not the same unexpected volatility in the payment due under a life policy. It is

possible for the insurance corporation to make robust estimates of the benefits due to be paid even years in advance.

7.1927.219 Life insurance and annuity entitlementstechnical reserves increase each year because of new actual premiums paid, new investment income allocated to the policyholders (but not withdrawn by them) and decrease because of benefits paid. It is thus possible to express the level of output of life insurance as the difference between the total investment income and holding gains earned on the life insurance and annuity entitlementstechnical reserves less the part of these returnsthis investment income actually allocated to the policyholders and added to the insurance technical reserves.

Reinsurance

7.1937.220 The method of calculating the output of reinsurance is exactly the same as for non-life insurance, whether it is life or non-life policies that are being reinsured.

Social insurance schemes

7.1947.221 There are four different ways in which social insurance may be organized.

- Some social insurance is provided by government under a social security scheme;
- An employer may organize a social insurance scheme for its employees, either or not establishing a segregate fund to administer the scheme;
- An employer may have an insurance corporation run the scheme for the employer in return for a fee;
- An insurance corporation may offer to run a scheme for several employers (i.e., a multi-employer scheme) or an employer-independent scheme, in return for any property income and holding gains they may make in excess of what is owed to the participants in the scheme. The resulting arrangement is called a multiemployer scheme;.
- A separate institutional unit may be established to run a multi-employer schemes or an employer-independent scheme, either or not using services provided by insurance corporations.

The output for each of these modes of running a social insurance scheme is calculated in a different manner.

7.1957.222 Social security schemes are run as part of the operation of general government. If separate units are distinguished, their output is determined in the same way as all non-market output as the sum of costs. If separate units are not distinguished, the output of social security is included with the output of the level of government at which it operates.

7.1967.223 When an employer operates its own social insurance scheme, the value of the output is also determined as the sum of costs including an estimate for a return to any fixed capital used in the operation of the scheme. Even if the employer establishes a segregated pension fund to manage the scheme, the value of output is still measured in the same way.

7.1977.224 When an employer uses an insurance corporation to administermanage the scheme on his behalf, the value of the output is the fee charged by the insurance corporation.

7.1987.225 For a multiemployer scheme or an employer-independent scheme, the value of output can often beis measured as the sum of costs, or in the case the scheme is administered by an insurance corporation, the fees charged by the insurance corporation. However, in certain cases, the formula for life insurance policies may need to be applied; see chapter 24 for more details; it is the excess of the investment income receivable by the schemes less the amount added to the reserves to meet present and future pension entitlements.

Standardized guarantee schemes

~~7.199~~7.226 If a standardized guarantee scheme operates as a market producer, the value of output is calculated in the same way as non-life insurance. If the scheme operates as a non-market producer, the value of output is calculated as the sum of costs.

10. Crypto-assets without a corresponding liability designed to act as a medium of exchange

7.227 Crypto assets without a corresponding liability designed to act as a medium of exchange are considered as non-produced non-financial assets. The miners solving cryptographic puzzles for validating the transactions in these assets on the blockchain, and (partly) receiving crypto assets in return, are considered to be producers of validation services, not as producers of the assets themselves. Their output should be measured as the sum of both explicit validation fees and implicit fees in the form of new crypto asset coins.

7.228 Most mineable crypto assets without a corresponding liability come into circulation via the work of miners that solve cryptographic puzzles (proof-of-work) and validate transactions on the blockchain. The work of these "miners" in most cases requires the use of solutions developed using intellectual property in developing algorithmic solutions to the cryptographic puzzles, the use of specialized computing equipment, considerable amounts of energy to run and cool these machines, and a lot of time to solve the puzzles. Non-mineable crypto asset without a corresponding liability enter into circulation in two different ways. They may be released via an explicit sale and/or as payment to validators that validate transactions in different ways than via proof-of-work (e.g., via proof of stake or proof of authority). In the end, the designer of the overall framework choses the method in which new crypto assets enter into circulation (e.g., via explicit sales, proof-of-stake, proof-of-work, etc.).

7.229 The activities related to the emergence of new crypto assets without a corresponding liability are regarded as production activities, as the operation of miners and validators require the input of intermediate goods and services, labour and capital. The key difference between crypto asset without a corresponding liability generated through mining (proof-of-work) and other validation (e.g., proof-of-stake) processes is that the intermediate inputs associated with the validation process of non-mineable crypto assets are significantly less than those which are required by mineable crypto assets. The validation process does not always require specialized computing equipment and the level of energy required is generally less than in the mining processes.

7.230 The owners of existing crypto assets without a corresponding liability (i.e., coins that have already been brought into circulation) are considered to be the ones consuming the services provided by validators. These concern multiple institutional units that may be spread across a wide range of countries. They are the ones benefiting from the new crypto assets being brought into circulation and from the associated validation services. It ensures the increased use of the crypto assets and the chances of them being accepted as general medium of exchange, both adding to the serviceability of the existing crypto assets. The associated (imputed) financial payment would correspond to the dilution in the value of existing coins, which would be recorded as a financial transaction between the producers and the community.

~~9.~~11. Research and development

~~7.200~~7.231 Research and development is creative work undertaken on a systematic basis to increase the stock of knowledge, and use this stock of knowledge for the purpose of discovering or developing new products, including improved versions or qualities of existing products, or discovering or developing new or more efficient processes of production. Research and development is not an ancillary activity, and a separate establishment should be distinguished for it when possible. The research and development undertaken by market producers on their own behalf should, in principle, be valued on the basis of the estimated basic prices that would be paid if the research were subcontracted commercially, but in practice is likely to have to be valued on the basis of the total production costs incurred~~including the costs of fixed assets used in production~~. Research and development undertaken by specialized commercial research laboratories or institutes is valued by receipts from sales, contracts, commissions, fees, etc. in the usual way. Research and development undertaken by government units, universities, non-profit research institutes, etc. is non-market production and is valued on the basis of the total production costs incurred. The activity of research and development is different from teaching and is classified separately in ISIC. In principle, the two activities ought to be distinguished from each other when undertaken within a university or other institute of higher education, although there may be considerable practical difficulties when the same staff divide their time between both activities. There may also be interaction between teaching and research which

makes it difficult to separate them, even conceptually, in some cases. The treatment of R&D as capital formation is discussed in chapter ~~10~~11.

~~10.~~12. The production of originals and copies

~~7.201~~7.232 The production of books, recordings, films, software, tapes, disks, etc. is a two-stage process of which the first stage is the production of the original and the second stage the production and use of copies of the original. The output of the first stage is the original itself over which legal or de facto ownership can be established by copyright, patent or secrecy. The value of the original depends on the actual or expected receipts from the sale or use of copies at the second stage, which have to cover the costs of the original as well as costs incurred at the second stage.

~~7.202~~7.233 The output of the first stage is a fixed asset that belongs to the producer of the original (author, film company, program writer, etc.). It may be produced for sale or for own-account gross fixed capital formation by the original producer. As the asset may be sold to another institutional unit the owner of the asset at any given time need not be the original producer, although they are often one and the same unit. If the original is sold when it has been produced, the value of the output of the original producer is given by the price paid. If it is not sold, its value may be estimated on the basis of its production costs with a mark-up. However, the size of any mark-up must depend on the discounted value of the future receipts expected from using it in production, so that it is effectively this discounted value, however uncertain, that determines its value.

~~7.203~~7.234 The owner of the asset may use it directly to produce copies in subsequent periods. The value of the copies made is also recorded as production separately from the production involved in the making of the original. ~~Consumption of fixed capital~~Depreciation is recorded in respect of the use of the asset in the making of the copies the same way as for any other fixed asset used in production.

~~7.204~~7.235 The owner may also license other producers to make use of the original in production. The latter may produce and sell copies, or use copies in other ways, for example, for film or music performances. The copier undertakes production in making the copies. Part of the cost of making the copies is the fee paid by the licensee to the owner or licensor. This fee represents both intermediate consumption of the licensee and output of the owner that is recorded as a service sold to the licensee. The payments made for the licences may be described in various ways, such as fees, commissions or royalties, but however they are described they are treated as payments for services rendered by the owner.

~~7.205~~7.236 In certain circumstances the licence to make copies may also be treated as an asset, distinct from the original. The conditions under which this applies and the consequences are discussed in greater detail in chapters 12 and ~~17~~27.

G. Intermediate consumption

1. Coverage of intermediate consumption

~~7.206~~7.237 ***Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as ~~consumption of fixed capital~~depreciation***. The goods or services may be either transformed or used up by the production process. Some inputs re-emerge after having been transformed and incorporated into the outputs, for example, grain may be transformed into flour which in turn may be transformed into bread. Other inputs are completely consumed or used up, for example, electricity and most services.

~~7.207~~7.238 Intermediate consumption does not include expenditures by enterprises on valuables consisting of works of art, precious metals and stones and articles of jewellery fashioned out of them. Valuables are assets acquired as stores of value: they are not used up in production and do not deteriorate physically over time. Expenditures on valuables are recorded in the capital account. Intermediate consumption also does not include costs incurred by the gradual using up of fixed assets owned by the enterprise: the decline in their value during the accounting period is recorded as ~~consumption of fixed capital~~depreciation. However, intermediate consumption does include the rentals paid on the use of fixed assets, whether equipment or buildings, that are leased from other institutional units under an operating lease, and also fees, commissions, royalties, etc., payable under licensing arrangements,

as explained above.

~~7.208~~7.239 Where ancillary services are not shown as the output of a separate establishment, intermediate consumption includes the value of all the goods or services used as inputs into ancillary activities such as purchasing, sales, marketing, accounting, data processing, transportation, storage, maintenance, security, etc. In this case, the goods and services consumed by these ancillary activities are not distinguished from those consumed by the principal (or secondary) activities of a producing establishment. When a unit provides only ancillary services, it continues to be shown as a separate unit as long as the necessary information is available. There is more discussion of the treatment of ancillary activities in chapter ~~5~~6.

2. The timing and valuation of intermediate consumption

~~7.209~~7.240 The intermediate consumption of a good or service is recorded at the time when the good or service enters the process of production, as distinct from the time it was acquired by the producer. In practice, establishments do not usually record the actual use of goods in production directly. Instead, they keep records of purchases of materials and supplies intended to be used as inputs and also of any changes in the amounts of such goods held in inventories. An estimate of intermediate consumption during a given accounting period can then be derived by subtracting the value of changes in inventories of materials and supplies from the value of purchases made. Changes in inventories of materials and supplies are equal to entries less withdrawals and recurrent losses on goods held in inventories. Thus, by reducing the value of changes in inventories, recurrent losses increase intermediate consumption. Even if they are consistently large, as long as they occur regularly, losses are treated as increasing intermediate consumption. Goods entering and leaving inventories are valued at the purchasers' prices prevailing at the times the entries, withdrawals or recurrent losses take place. This is exactly the same method as that used to value changes in inventories of goods produced as outputs from the production process. Thus, the earlier discussion of the properties and behaviour of the PIM applies to inventories of inputs.

~~7.210~~7.241 A good or service consumed as an intermediate input is normally valued at the purchaser's price prevailing at the time it enters the process of production; that is, at the price the producer would have to pay to replace it at the time it is used. As explained in more detail in section C, the purchaser's price can be regarded as being composed of three elements:

- The basic price received by the producer of the good or service;
- Any transportation costs paid separately by the purchaser in taking delivery of a good at the required time and location plus the cumulative trade margin on a good that passes through the chain of wholesale or retail distribution;
- Any non-deductible tax on the product payable on the good or service when it was produced or while in transit to the purchaser less any subsidy on the product.

For purposes of the input-output tables, it may be necessary to distinguish all three elements but this is not necessary in the accounts for institutional sectors or the central supply and use table.

~~7.211~~7.242 Intermediate inputs treated as being acquired from other establishments belonging to the same enterprise should be valued at the same prices as were used to value them as outputs of those establishments plus any additional transport charges not included in the output values.

~~7.212~~7.243 When goods or services produced within the same establishment are fed back as inputs into the production within the same establishment, they are only recorded as part of the intermediate consumption if they have been recorded as part of the output of that establishment. There is discussion on when this might be appropriate in section E. Deliveries of goods and services between different establishments belonging to the same enterprise are recorded as outputs by the producing establishments and intermediate inputs by the receiving establishments only when the receiving establishment effectively assumes all risks for completing the production process.

3. The boundary between intermediate consumption and ~~compensation~~remuneration of employees

~~7.213~~7.244 Certain goods and services used by enterprises do not enter directly into the process of production itself but are consumed by employees working on that process. In such cases it is necessary to decide whether the goods and services are intermediate consumption or, alternatively, remuneration in kind of employees. In general, when the goods or services are used by employees in their own time and at their own discretion for the direct satisfaction of their needs or wants, they constitute remuneration in kind. However, when employees are obliged to use the goods or services in order to enable them to carry out their work, they constitute intermediate consumption.

~~7.214~~7.245 It is immaterial to the employer whether they are treated as intermediate consumption or ~~compensation~~remuneration of employees because they are both costs from the employer's viewpoint and the net operating surplus is the same. However, reclassifying such goods and services from remuneration in kind to intermediate consumption, or vice versa, changes value added and balance of ~~primary~~earned incomes, and hence GDP as a whole.

~~7.215~~7.246 The following types of goods and services provided to employees must be treated as part of intermediate consumption:

- Tools or equipment used exclusively, or mainly, at work;
- Clothing or footwear of a kind that ordinary consumers do not choose to purchase or wear and which are worn exclusively, or mainly, at work; for example, protective clothing, overalls or uniforms;
- Accommodation services at the place of work of a kind that cannot be used by the households to which the employees belong: barracks, cabins, dormitories, huts, etc.;
- Special meals or drinks necessitated by exceptional working conditions, or meals or drinks provided to servicemen or others while on active duty;
- Transportation and hotel services including allowances for meals provided while the employee is travelling on business;
- Changing facilities, washrooms, showers, baths, etc. necessitated by the nature of the work;
- First aid facilities, medical examinations or other health checks required because of the nature of the work.

Employees may sometimes be responsible for purchasing the kinds of goods or services listed above and be subsequently reimbursed in cash by the employer. Such cash reimbursements must be treated as intermediate expenditures by the employer and not as part of the employee's wages and salaries.

~~7.216~~7.247 The provision of other kinds of goods and services, such as ordinary housing services, the services of vehicles or other durable consumer goods used extensively away from work, transportation to and from work, etc. should be treated as remuneration in kind, as explained more fully in chapter ~~7~~8.

4. The boundary between intermediate consumption and gross fixed capital formation

~~7.217~~7.248 Intermediate consumption measures the value of goods and services that are transformed or entirely used up in the course of production during the accounting period. It does not cover the costs of using fixed assets owned by the enterprise nor expenditures on the acquisition of fixed assets. The boundary between these kinds of expenditures and intermediate consumption is explained in more detail below.

Small tools

~~7.218~~7.249 Expenditures on durable producer goods that are small, inexpensive and used to perform relatively simple operations may be treated as intermediate consumption when such expenditures are made regularly and are very small compared with expenditures on machinery and equipment. Examples of such goods are hand tools such as saws, spades, knives, axes, hammers, screwdrivers, and so on. However, in countries where such tools account for a significant part of the stock of producers' durable goods, they may be treated as fixed assets.

Maintenance and repairs

~~7.219~~7.250 The distinction between maintenance and repairs and gross fixed capital formation is not clear-cut. The ordinary, regular maintenance and repair of a fixed asset used in production constitute intermediate consumption. Ordinary maintenance and repair, including the replacement of defective parts, are typical ancillary activities but such services may also be provided by a separate establishment within the same enterprise or purchased from other enterprises.

~~7.220~~7.251 The practical problem is to distinguish ordinary maintenance and repairs from major renovations, reconstructions or enlargements that go considerably beyond what is required simply to keep the fixed assets in good working order. Major renovations, reconstructions, or enlargements of existing fixed assets may enhance their efficiency or capacity or prolong their expected working lives. They must be treated as gross fixed capital formation as they add to the stock of fixed assets in existence.

~~7.221~~7.252 Ordinary maintenance and repairs are distinguished by two features:

- They are activities that owners or users of fixed assets are obliged to undertake periodically in order to be able to utilize such assets over their expected service lives. They are current costs that cannot be avoided if the fixed assets are to continue to be used. The owner or user cannot afford to neglect maintenance and repairs as the expected service life may be drastically shortened otherwise;
- Maintenance and repairs do not change the fixed asset or its performance, but simply maintain it in good working order or restore it to its previous condition in the event of a breakdown. Defective parts are replaced by new parts of the same kind without changing the basic nature of the fixed asset.

~~7.222~~7.253 On the other hand, major renovations or enlargements to fixed assets are distinguished by the following features:

- The decision to renovate, reconstruct or enlarge a fixed asset is a deliberate investment decision that may be undertaken at any time and is not dictated by the condition of the asset. Major renovations of ships, buildings or other structures are frequently undertaken well before the end of their normal service lives;
- Major renovations or enlargements increase the performance or capacity of existing fixed assets or significantly extend their previously expected service lives. Enlarging or extending an existing building or structure obviously constitutes a major change in this sense, but a complete refitting or restructuring of the interior of a building, or ship, also qualifies.

Research and development

~~7.223~~7.254 Research and development is treated as capital formation except in any cases where it is clear that the activity does not entail any economic benefit for its owner in which case it is treated as intermediate consumption.

Mineral exploration and evaluation

~~7.224~~7.255 Expenditures on mineral exploration and evaluation are not treated as intermediate consumption. Whether successful or not, they are needed to acquire new reserves and so are all classified as gross fixed capital formation.

Military equipment

~~7.225~~7.256 Expenditures on military equipment, including large military weapons systems, are treated as fixed capital formation. Expenditure on durable military goods such as bombs, torpedoes and spare parts are recorded as inventories until used when they are recorded as intermediate consumption and a withdrawal from inventories.

5. Services provided by government to producers

~~7.226~~7.257 Government may provide services to producers. To the extent that a charge is made for these services, the charges form part of the intermediate consumption of the producer. However, when the charge does not represent an economically significant price, the value of the service to the producer is greater than the cost. However, no estimation of this benefit is made and the costs of the services not covered by the charges made are included in collective consumption of government.

6. Social transfers in kind

~~7.227~~7.258 Expenditures by government or NPISHs on goods or services produced by market producers that are provided directly to households, individually or collectively, without any further processing constitute final consumption expenditures by government or NPISHs and not intermediate consumption. The goods and services in question are treated as social transfers in kind and enter into the actual consumption of households.

~~7.228~~7.259 ~~By convention, n~~Non-financial and financial corporations do not make social transfers in kind, nor engage in final consumption, with the exception of the central bank providing non-market services for the society as a whole.

7. Services of business associations

~~7.229~~7.260 Non-profit institutions in the form of business associations that exist to protect the interests of their members and are financed by them are market producers. The subscriptions paid by the businesses constitute payments for services rendered. These services are consumed as intermediate inputs by the members of the association and are valued by the amounts paid in subscriptions, contributions or dues.

8. Outsourcing

~~7.230~~7.261 It is increasingly common for producers to change the way in which a production activity is completed. Different stages in the process or different support activities such as office cleaning or assembly of electronic components may be contracted out to another producer, in the same country or abroad. This changes the pattern of intermediate inputs even though the underlying technology may be the same. The impact of this on input-output tables is discussed in chapters ~~14~~15 and ~~28~~36.

9. Leasing fixed assets

~~7.231~~7.262 The decision to rent buildings, machinery or equipment under an operating lease, rather than purchase them, can have a major impact on the ratio of intermediate consumption to value added and the distribution of value added between producers. Rentals paid on buildings or on machinery or equipment under an operating lease constitute purchases of services that are recorded as intermediate consumption. However, if an enterprise owns its buildings, machinery and equipment, most of the costs associated with their use are not recorded under intermediate consumption. The ~~consumption of fixed capital~~depreciation on the assets forms part of gross value added while interest costs, both actual and implicit, have to be met out of the net operating surplus. Only the costs of the materials needed for maintenance and repairs appear under intermediate consumption. Decisions to rent rather than purchase may be influenced by factors quite unrelated to the technology of production, such as taxation, the availability of finance, or the consequences for the balance sheet.

~~7.232~~7.263 There is a significant difference between rentals of fixed assets under an operating lease and the acquisition of an asset under a financial lease. Under an operating lease, the lessor has a productive activity that involves the equipment in question and is responsible for the production risks associated with the operational status of the asset. Payments by the lessee are treated as payments for a service. Under a financial lease, the lessee accepts all risks and rewards associated with the use of the asset in production. A financial lease is thus treated as a loan by the lessor to the lessee and purchase of the equipment by the lessee. Subsequent payments are treated

as payments of interest and repayments of principal by the lessee to the lessor. Further details on the treatment of operating and financial leases are given in chapter ~~17~~27.

H. ~~Consumption of fixed capital~~Depreciation

~~1.~~

~~2.~~1. The coverage of ~~consumption of fixed capital~~depreciation

~~7.233~~7.264 ~~Consumption of fixed capital~~Depreciation is the decline, during the course of the accounting period, in the current value of the stock of fixed assets, including (cultivated) biological resources yielding repeat products, owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage. It also includes the decline of the regenerative potential of the underlying asset of cultivated biological resources yielding once-only products (e.g., forest land in the case of the growth of trees for the production of timber).~~The term depreciation is often used in place of consumption of fixed capital but it is avoided in the SNA because in commercial accounting the term depreciation is often used in the context of writing off historic costs whereas in the SNA consumption of fixed capital is dependent on the current value of the asset.~~

~~7.234~~7.265 ~~Consumption of fixed capital~~Depreciation is calculated for all fixed assets owned by producers, but not for valuables (precious metals, precious stones, etc.) that are acquired precisely because their value, in real terms, is not expected to decline over time. Fixed assets must have been produced as outputs from processes of production as defined in the SNA. ~~Consumption of fixed capital~~Depreciation does not, therefore, cover the depletion or degradation of non-produced natural ~~assets~~resources such as land, mineral or other deposits, coal, oil, or natural gas, or contracts, leases and licences. It also does not cover the depletion or degradation of non-produced biological resources yielding once-only products. These declines in the value of non-produced assets are included in a separate category "depletion", which is discussed in the following section.

~~7.235~~7.266 The value of produced assets may decline not merely because they deteriorate physically but because of a decrease in the demand for their services as a result of technical progress and the appearance of new substitutes for them. In practice, many structures, including roads and railway tracks, are scrapped or demolished because they have become obsolete. Even though the estimated service lives may be very long for some structures, such as roads, bridges, dams, etc., they cannot be assumed to be infinite. Thus, depreciation~~capital consumption~~ needs to be calculated for all types of structures, including those owned and maintained by government units, as well as machinery and equipment.

~~7.236~~7.267 Losses of fixed assets due to normal or expected levels of accidental damage are also included under ~~consumption of fixed capital~~depreciation; that is, damage caused to assets used in production resulting from their exposure to the risk of fires, storms, accidents due to human error, etc. When these kinds of accidents occur with predictable regularity they are taken into account in calculating the average service lives of the goods in question. For an individual unit, or group of units, any difference between the average and the actual normal accidental damage within a given period is recorded in the other changes in the volume of assets and liabilities account. However, at the level of the economy as a whole, the actual normal accidental damage within a given accounting period may be expected to be equal, or close, to the average.

~~7.237~~7.268 On the other hand, losses due to war or to major natural disasters that occur very infrequently, such as major earthquakes, volcanic eruptions, tidal waves or exceptionally severe hurricanes, are not included under ~~consumption of fixed capital~~depreciation. There is no reason for such losses to be charged in the production account as costs of production. The values of the assets lost in these ways are recorded in the other changes in the volume of assets and liabilities account. Similarly, although ~~consumption of fixed capital~~depreciation includes reductions in the value of fixed assets resulting from normal, expected rates of obsolescence, it should not include losses due to unexpected technological developments that may significantly shorten the service lives of a group of existing fixed assets. Such losses are treated in the same way as losses due to above average rates of normal accidental damage.

~~3.~~2. ~~Consumption of fixed capital~~Depreciation and rentals on fixed assets

~~7.238~~7.269 It is possible to draw a comparison between ~~consumption of fixed capital~~depreciation and rental of assets

under an operating lease. The rental is the amount payable by the user of a fixed asset to its owner, under an operating lease or similar contract, for the right to use that asset in production for a specified period of time. The rental needs to be large enough to cover (i) any direct costs incurred by the owner including the costs of maintaining the asset, (ii) the reduction in the value of the asset over that period (the ~~consumption of fixed capital~~depreciation) and (iii) the interest costs on the value of the asset at the start of the period. The interest costs may consist either of actual interest paid on borrowed funds or the loss of interest incurred as a result of investing own funds in the purchase of the fixed asset instead of a financial asset. Whether owned or rented, the full cost of using the fixed asset in production is measured by the actual or imputed rental on the asset and not by ~~consumption of fixed capital~~depreciation alone. When the asset is actually rented under an operating lease or similar contract, the rental is recorded under intermediate consumption as the purchase of a service produced by the lessor. When the user and the owner are one and the same unit, the direct costs are recorded as intermediate consumption. The ~~consumption of fixed capital~~depreciation represents the second element of the cost of using the asset. The third part of the cost, referred to above as the interest cost, is also known as the return to fixed capital. Like ~~consumption of fixed capital~~depreciation, the return to capital is part of value added. The sum of the ~~consumption of fixed capital~~depreciation and the value of the return to capital is known as the capital services rendered by the asset. Capital services are discussed in more detail in chapter ~~20~~17.

~~7.239~~7.270 The value of a fixed asset to its owner at any point of time is determined by the present value of the future capital services (that is, the sum of the values of the stream of future rentals less operating costs discounted to the present period) that can be expected over its remaining service life. ~~Consumption of fixed capital~~Depreciation is measured by the decrease, between the beginning and the end of the current accounting period, in the present value of the remaining sequence of expected future benefits. The extent of the decrease will be influenced not only by the amount by which the efficiency of the asset may have declined during the current period but also by the shortening of its service life and the rate at which its economic efficiency declines over its remaining service life. The decrease is expressed in the average prices of the current period for an asset of exactly the same quality and should exclude holding gains and losses. When the flow of future benefits that determines the present values used to derive ~~consumption of fixed capital~~depreciation is expressed in terms of flows that include an element of inflation, then the discount factor should be nominal. When the flows are expressed in terms of current period prices, then a real discount rate should be used. Either procedure results in a present value expressed in current period prices.

~~7.240~~7.271 ~~Consumption of fixed capital~~Depreciation is a forward-looking measure that is determined by future, and not past, events namely, the benefits that institutional units expect to derive in the future from using the asset in production over the remainder of its service life. Unlike depreciation as usually calculated in business accounts, ~~consumption of fixed capital~~depreciation is not, at least in principle, a method of allocating the costs of past expenditures on fixed assets over subsequent accounting periods. The value of a fixed asset at a given moment in time depends only on the remaining benefits to be derived from its use and ~~consumption of fixed capital~~depreciation must be based on values calculated in this way.

~~4.~~3. The calculation of ~~consumption of fixed capital~~depreciation

~~7.241~~7.272 Fixed assets may have been purchased in the past at times when both relative prices and the general price level were very different from prices in the current period. In order to be consistent with the other entries in the same production account, ~~consumption of fixed capital~~depreciation must be valued with reference to the same overall set of current prices as that used to value output and intermediate consumption. ~~Consumption of fixed capital~~Depreciation should reflect underlying resource costs and relative demands at the time the production takes place. It should therefore be calculated using the actual or estimated prices and rentals of fixed assets prevailing at that time and not at the times the goods were originally acquired. The "historic costs" of fixed assets, that is, the prices originally paid for them, become quite irrelevant for the calculation of ~~consumption of fixed capital~~depreciation as prices change over time.

~~7.242~~7.273 For these reasons, depreciation as recorded in business accounts may not provide the right kind of information for the calculation of ~~consumption of fixed capital~~depreciation. If data on depreciation are used, they must, at the very least, be adjusted from historic costs to current prices. However, depreciation allowances for tax purposes have often been grossly manipulated in quite arbitrary ways to try to influence rates of investment and are best ignored altogether in many cases. It is recommended that independent estimates of ~~consumption of fixed capital~~depreciation should be compiled in conjunction with estimates of the capital stock. These can be built up

from data on gross fixed capital formation in the past combined with estimates of the rates at which the efficiency of fixed assets decline over their service lives.

~~7.243~~7.274 Whenever possible, the initial value of a new fixed asset should be that prevailing on the market when the asset is acquired. If assets of all ages and specifications were regularly traded on markets, these prices should be used to value every asset as it ages. However, there is scarce information on the prices of second-hand assets and faced with this lack, a more theoretical approach to determining the price of an asset as it ages must be adopted.

~~7.244~~7.275 Conceptually, market forces should ensure that the purchaser's price of a new fixed asset is equivalent to the present value of the future benefits that can be derived from it. Given the initial market price, therefore, and knowledge of the characteristics of the asset in question, it is possible to project the stream of future benefits and continually update the remaining present value of these. This method of building up estimates of the capital stock and changes in the capital stock over time is known as the perpetual inventory method, or PIM. Estimates of ~~consumption of fixed capital~~depreciation are obtained as a by-product of the PIM.

~~5.~~4. The perpetual inventory method

~~7.245~~7.276 A brief explanation of how ~~consumption of fixed capital~~depreciation may be calculated as a by-product of the perpetual inventory method of calculating the capital stock is given in this section. An overview of the link between the calculation of ~~consumption of fixed capital~~depreciation, the return to capital and the stock of assets is given in chapter ~~20~~17. Much more guidance on the way to calculate capital stock estimates appears in the OECD ~~m~~Manual on Measuring Capital. 2nd edition (OECD, 2009).

Calculation of the gross capital stock

~~7.246~~7.277 The perpetual inventory method requires an estimate to be made of the stock of fixed assets in existence and in the hands of producers. The first step is to estimate how many of the fixed assets installed as a result of gross fixed capital formation undertaken in previous years have survived to the current period. Average service lives, or survival functions, based on observations or technical studies may be applied to past investments for this purpose. Fixed assets purchased at different prices in the past have then to be revalued at the prices of the current period by utilizing appropriate price indices for fixed assets. The construction of suitable price indices covering long periods of time may raise~~s difficult~~ conceptual and practical problems, but these technical problems of price measurement must be faced in any case in developing balance sheet values of assets. The stock of fixed assets surviving from past investment and revalued at the purchasers' prices of the current period is described as the gross capital stock. The gross capital stock can also be measured at the prices of a given base year if it is desired to have annual time series for the gross capital stock in volume terms.

Relative efficiencies

~~7.247~~7.278 The inputs into production obtained from the use of a given fixed asset tend to diminish over time. The rate at which the efficiency declines may vary from one type of asset to another. The simplest case to consider is one where the efficiency of the asset remains constant until it disintegrates, like a light bulb. Other simple cases include the case where the efficiency declines linearly or exponentially over its life. Other methods employ a hyperbolic rate of efficiency loss with relatively little decline in the initial years but increasingly steeper decline as time progresses. However, in practice calculations are not undertaken asset by asset individually but for cohorts of assets of similar ages and characteristics. Individual assets within the cohort will retire at different moments but the efficiency-retirement profile for the cohort as a whole is typically convex to the origin.

7.279 The efficiency profiles of fixed assets determine the profiles of the benefits they command over their service lives. Once the profiles of the benefits over the service lives of the fixed asset have been determined, it becomes possible to calculate the ~~consumption of fixed capital~~depreciation, period by period.

~~7.248~~7.280 In general, it is recommended, as a default option, to use geometric depreciation method according to which a constant fraction of the capital stock is depreciated; however, other depreciation profiles may be

considered more suitable for certain types of assets. Linear depreciation is not considered as a suitable method in most circumstances.

Rates of ~~consumption of fixed capital~~depreciation

~~7.249~~7.281 ~~Consumption of fixed capital~~Depreciation is derived as the reduction in the present value of the remaining benefits, as explained earlier. This reduction, and the rate at which it takes place over time, must be clearly distinguished from the decline in the efficiency of the capital assets themselves. Although the efficiency, and hence the benefit, of an asset with the efficiency characteristics of a light bulb may remain constant from period to period until it disintegrates, the value of the asset declines over time. It also follows that the ~~consumption of fixed capital~~depreciation is not constant. It can easily be shown in this case that the decline in the present value of the remaining benefits from period to period is considerably lower earlier in the life of the asset than when the asset is approaching the end of its life. ~~Consumption of fixed capital~~Depreciation tends to increase as the asset gets older even though the efficiency and benefits remain constant to the end.

Values of ~~consumption of fixed capital~~depreciation

~~7.250~~7.282 ~~Consumption of fixed capital~~Depreciation should not be estimated in isolation from the derivation of a set of capital stock data. Such data are needed for the balance sheet and, as shown in chapter ~~20~~17, trying to identify ~~consumption of fixed capital~~depreciation in isolation from the level of the stock of the asset and its patterns of price and efficiency decline is likely to be error prone.

I. Depletion

1. The coverage of depletion

~~7.251~~7.283 ***Depletion, in physical terms, represents the decrease in the quantity or value of the stock of a non-produced natural resource over an accounting period that is due to the extraction of the natural resource by economic units occurring at a level greater than that of regeneration; in monetary terms, it corresponds with the decline in future income, due to extraction, that can be earned from a resource, the value of which is based on the physical flows of depletion using the price of the natural resource in situ***.

7.284 For non-renewable natural resources, such as mineral and energy resources, depletion is equal to the quantity of resource that is extracted because the stock of these resources cannot regenerate on human time-scales. Increases in the stock of non-renewable natural resources (e.g., through discoveries) may permit the ongoing extraction of the resources. However, these increases in volume are not considered regeneration, and hence do not offset measures of depletion. The increases should be recorded as other changes in the volume of assets and liabilities.

7.285 For non-cultivated biological resources yielding once-only products, such as fish resources in open seas, the equality in physical terms between depletion and extraction does not hold. The ability for these resources to reproduce and grow naturally means that in certain management and extraction situations, the quantity of resources extracted may be matched by a quantity of resources that are reproduced and, in this situation, there is no overall physical depletion of the environmental asset. Only the amount of extraction that is above the level of growth is recorded as depletion; in the case the amount of extraction is below the level of growth, it is recorded as negative depletion. In the case of cultivated biological resources yielding once-only products, such as forest land underlying the growth of trees for timber production, the relevant amounts are recorded as fixed capital formation and depreciation.

7.286 Thus, in the estimation of depletion for biological resources, it is necessary to consider both the extraction and the growth of these resources. While the rates of extraction can be observed directly, measurement of the rates of growth can be complex and usually requires consideration of biological models. These models will usually account for both the structure and the size of biological resource populations; and exhibited by their general form, when the stock or population of the specific type of resource is small, the rate of growth will be small but, as the population increases, the rate of growth will also increase. Eventually, as the population within a given area reaches the carrying capacity of the area, i.e., as the density reaches a maximum, the rate of growth in the

population will slow substantially.

7.287 Based on this general model, for any given population, it is possible to calculate the number of animals or volume of plants by age or size class that may be removed from the population without affecting the capacity of the population to reproduce itself (i.e., opening stock equals closing stock). In effect, there is a "surplus" or excess that can be harvested from the existing stock. In biological models, this surplus is known as the sustainable yield. The level of the sustainable yield rises and falls in line with the overall size and structure of the population. For example, in populations where the growth rates are low, the sustainable yields are also low. It is noted that the same level of extraction will have a different relationship to the sustainable yield depending on the population size.

7.288 Land and renewable energy resources are generally not subject to depletion.

7.289 Depletion is not recorded when there is a reduction in the quantity of an environmental asset owing to unexpected events such as losses due to extreme weather or pandemic outbreaks of disease. These reductions are recorded as catastrophic losses (i.e., other changes in the volume of assets and liabilities), whereas depletion is the consequence of the extraction of natural resources by economic units.

7.290 Depletion can also be measured in monetary terms by valuing the physical flows of depletion using the price of the natural resource in situ. The monetary value of depletion is equal to the change in the value of the natural resource that is due to physical depletion. The next subsection explains how this can be calculated..

2. The calculation of depletion

7.291 For the compilation of monetary estimates for the depletion of non-renewable mineral and energy resources, it is necessary to decompose the net present value of future resource rents into a quantity component and a price component. The relevant quantity is the quantity of the resource which is expected to be extracted in the course of the life of the asset. This quantity is the same as that used for the valuation of the asset. The implicit price of the asset can then be derived by dividing the monetary value of the asset by this quantity indicator, and basically represents a discounted series of future resource rents per unit. The monetary value of depletion can then be calculated by multiplying the resources extracted during a year with the average price of the asset at the beginning and the end of the year.

7.292 For the estimation of depletion for non-cultivated biological resources yielding once-only products, a similar procedure as the one for non-renewable mineral and energy resources can be followed, albeit that in the case of biological resources depletion may be positive or negative, depending on whether or not the growth of the resources is higher or lower than sustainable yields.

7.293 More extensive information on the estimation of depletion in physical and monetary terms can be found in the System of Environmental-Economic Accounting (SEEA) 2012 Central Framework, in particular chapter 5 (section 5.4.2 and Annex A5.1).

Annex to chapter ~~6~~7: Separating output due to storage from holding gains and losses

A. Introduction

A6.1 Paragraphs ~~6.142 to 6.145~~ 7.156 to 7.159 recommend that, in some cases, the increase in value of goods held in inventories may be regarded as output due to storage rather than to holding gains. This annex explores the topic further and gives examples of when it is appropriate to treat any of the increase in value of a product as due to production and how this may be separated from any remaining holding gains and losses.

1. Storage costs and holding gains and losses

A6.2 Holding products in inventories always involves costs whether they are being held by the original producer or a subsequent wholesaler or retailer. These costs include those associated with providing the physical storage capacity, maintaining information on levels and types of inventories, costs of supplying withdrawals to customers and costs associated with renewing the level of inventories by acquiring replacement goods (other than the cost of the goods themselves). These costs form part of the basic price charged by a manufacturer or are recovered in the margins charged by wholesalers and retailers. The costs incurred are included in intermediate consumption, ~~compensation~~remuneration of employees and the cost of capital. It may also be the case that specialist storage producers provide a service to other producers and again their costs are included in intermediate consumption.

A6.3 For most products, called "type I" products, this is the only aspect of storage that is relevant. All the costs associated with storage are included in production costs. The value of the goods as they are withdrawn from inventories is valued at the costs of producing or acquiring replacement items at that time. As a consequence, output is measured excluding any change in the value of products held in inventories; this change in value is treated as a holding gain or loss, as illustrated in the following example.

A6.4 Suppose a wholesaler buys and sells 100 packets of washing powder every period and in order to allow for marginal variations in demand keeps an inventory of 10 packets. At the beginning of a period the price paid per packet is 2, so the value of his inventories is 20. During the period the acquisition cost per packet increases to 2.1. The value of the 10 packets in inventories rises to 21 but the increase in value of 1 reflects the fact only that if the 10 packets were withdrawn from inventories for sale and replaced by identical products, the new products would cost 21 to acquire. Because output is measured with all units, whether newly produced or withdrawn from inventories, valued at the new price of 2.1, the 1 increase in the value of inventories does not enter the measures of production but appears only in the revaluation account explaining how the value of a stock of 10 packets at the beginning of the period, valued at 20, is replaced by a similar stock of 10 packets at the end of the period now valued at 21.

B. Goods whose real value changes over time

A6.5 There are three specific cases where the treatment described above is unsatisfactory because other factors intervene in the time while the goods are held in storage. Goods where this is the case are described as "type II" products. The three specific circumstances are the following:

a. Goods that have a very long production process;

b. Goods that change their physical characteristics while in inventories;

c. Goods that have seasonal patterns of supply or demand but not both.

Each of these is discussed in turn below.

1. Goods with a long production period

A6.6 When a product is held in inventories for an extended period of time because of the length of the production process, in principle, discount factors should be used when calculating the value of work put in place each period before the delivery date. For example, if a construction project ultimately worth 200 is put in place steadily over four years, it is unrealistic to count 50 as the contribution to production in the first year. Any purchaser would take account of the fact that he would not be able to realize the value of this production for another three years and discount the value accordingly. As time passes, there is income arising to the unit holding the products as the discount factor unwinds. This case is described in chapter ~~20~~17, with the full details of this numerical example.

A6.7 It is suggested that in practice it is necessary to make an allowance for the discount factor only for goods of a significantly high value and significantly long production process, where goods are recorded as work-in-progress or capital formation on own account for many periods before completion.

2. Goods whose physical characteristics change

A6.8 The second set of circumstances relates to goods whose physical characteristics change during storage because maturing is part of the production process. The goods concerned are those that in the absence of any general or relative change in prices still increase in value because they improve in quality over the time held in storage. Examples are fermentation affecting food products and the ageing of wine and spirits. When the product is withdrawn from storage, it is physically different from a new item entering the maturing phase and so it is not appropriate to use the acquisition cost of the new entry into inventories as the value of the product being withdrawn. The question is how to separate the increase in value due to maturing from the overall price increases of the goods concerned.

A6.9 Suppose a product takes three years to reach a sufficient maturity to be sold and there is final demand for the product until it reaches this state. If the good is traded, even in its immature state, then prices will exist for the immature, newly manufactured product, for the one year old product, the two year old product and the mature product. Supposing the product is well-established, at any point in time there will be a mix of newly manufactured items and those of maturities of one, two and three years. If prices exist for these different maturities, separating the value of storage is not difficult. In the first year the new product is transformed into a product of one year's maturity. If the price when the product is brand new is P0 and when it is one year old is P1, and t is the first year and t+1 the second, the change in value of a quantity Q of the product is Q(P1,t+1 – P0,t). The increase in value is due to two factors, the increase in the price of the new product made last year to the price of a similar new product made this year (Q(P0,t+1 – P0,t)) and the difference between the price of a similar new product made this year and the price of the one year mature product this year (Q(P1,t+1 – P0,t+1)). By applying the price differences to the volumes involved, the first difference gives rise to a holding gain; the second to the value of output due to storage.

A6.10 The identity that:

> the increase in value from period t to period t+1,
>
> *is equal to* the change in value between products of the same maturity (or vintage) from period t to period t+1 (treated as a holding gain),
>
> *plus* the change in value between products of successive maturities (or vintages) in period t+1 treated as the output due to storage,

is true for any two successive time periods. Thus, in the second year the increase in price between the one year mature product at the beginning of the year and the price of a one year mature product at the end of the year gives rise to a holding gain and the difference in price between a one year mature product at the end of the year and the two year mature product at the same time gives the value of output due to storage, and so on.

A6.11 The identity in paragraph A6.10 holds in current values, when each term contains (or consists of) nominal holding gains (or losses) or when each term is deflated by the general level of inflation so that each term contains or consists of real holding gains (or losses). In volume terms, as when there are no price increases, the increase in value is identified with the output due to storage.

A6.12 In practice it is very likely that robust time series of prices at different points in the maturing process do not exist. It is possible that some close equivalent might be available but even this is not very likely. How can storage be separated from holding gains in the absence of these prices?

A6.13 From long experience the producer may be able to make a reasonable prediction about the increase in value due to storage. Suppose in a particular case he expects the value in volume terms after three years to be two and a half times the cost of producing the new product. If the new product is worth 100, the three year old, mature, product is worth 250. This suggests that the volume of output due to storage is 50 in each of the next three years. (Like the long construction product discussed above, in principle, a discount factor should be applied to the initial 100 and the first two tranches of 50 because the product is not ready for sale until the end of the third year.) In the absence of information about the increase in the price of the product relative to the general increase in prices, it may be necessary to assume there are no real holding gains in the product and the actual increase in value must be taken as the value of the output due to storage in current values. Once the price of the fully mature product is known, some adjustment could be made or, pragmatically, the difference between the original prediction and the outturn, adjusted for general inflation, may be taken as a real holding gain or loss.

A6.14 It is not ideal that the output due to storage is assumed to be invariant to fluctuations in relative prices, but in circumstances where most of the price increase will be due to storage and better basic data are not available, this approach gives a pragmatic estimate of output due to storage that is superior to the assumption that the whole of the increase in value is simply a holding gain.

3. Goods with seasonal patterns of supply and demand

A6.15 The third case where there is a change in value that is not attributable solely to holding gains and losses is when goods are placed in storage to take advantage of changes in the pattern of supply and demand over a year. The most common case is storage of a staple crop, such as maize, where there is a relatively short harvest period but demand is fairly constant throughout the year. As a result, the price rises as inventories decrease until the next harvest when an increase in supply causes the price to fall again. It is possible to envisage the opposite case where demand is seasonal but it is cost effective for producers to produce the good for the whole, or most, of the year, even though for much of that time the production goes straight into inventories and stays there until demand peaks.

A6.16 The reason that this type of product is different from a type I product is that, as with the goods that change characteristics due to maturing, the price increases, relative to the general level of inflation, in a more or less predictable way because of the effect of transporting the goods through time, from a period of abundance to one of relative scarcity. This is a quite different motivation from holding items in store for purely speculative reasons when there is no pattern established for the probable increase in prices and no predetermined time over which the goods might be held.

A6.17 The ideal situation is one where there is a well-established and robust seasonal pattern for the expected price increases in the crop. In such a case, the seasonal pattern of the prices can be used to establish the output due to storage and the remaining increase in value represents holding gains and losses that can be separated into real and neutral elements as normal.

A6.18 However, given that the total level of a harvest can be quite different year on year and the actual time of harvest may vary slightly from year to year depending on climatic conditions, establishing a robust seasonal pattern of prices may not be easy. In such a case, the pragmatic suggestion is similar to that for maturing goods when there is imperfect information. The premise is that the increase in price will be attributable to two factors; the first is an increase matching the general increase in prices. The element of increase in the value of inventories corresponding to this should be treated as nominal holding gains and losses. The second factor leading to the increase in prices is a seasonal scarcity value and this element should be treated as giving rise to output due to storage. Assuming that all the increase other than that matching average price increases is due to storage implies that there are no real holding gains.

4. Who benefits from the increase in value of goods in storage?

A6.19 The fact that type II products give rise to production of storage depends only on the type of product, not on the

producer. If a farmer produces a seasonal crop and then stores most of it to sell bit by bit throughout the year, he records the benefits of the increase in value due to storage in his output. However, if he sells all of his crop at harvest time to another unit (for example, a wholesaler) and that unit puts it in inventories and sells it continuously throughout the year, then that unit derives the benefits from holding the crop in storage and records in his output these benefits that would otherwise have been recorded by the farmer as output. However many times a type II good changes hands between its production and sale, the value of output due to storage will be the same. It is likely that every time it changes hands, the associated intermediate consumption will increase so that value added will decrease but the level of output will not be affected. Thus an increase in value accrues to the unit holding the goods, if they are type II goods and the holder is a wholesaler or retailer, he may have output just as the original producer may.

5. When is output due to storage recorded?

A6.20 Output due to storage is produced on a continuous basis. In order to have an articulated set of information on production and inventories, output from storage must be calculated period by period. If the goods that are changing value remain in inventories, the owner of the goods has output that is treated as an addition to inventories. Even though the quantity of the inventories may not change, the quality-adjusted measures do change to reflect the increase in price that is treated as a quality change and not as a holding gain.

Some examples

A6.21 These simple examples show how the approximate approach to calculating storage works under different assumptions.

Example 1

A6.22 Unit A purchases goods to the value of 100 and they rise in value to 110 by the middle of year 2 when he sells them. At the end of the year the value of the goods is 108. There is no general inflation in the period.

A6.23 In year 1, A records output of 8 and additions to inventories of 108 in total. In year 2, A records output of 2, additions to inventories of 2 and sales of the withdrawals from inventories of 110.

Example 2

A6.24 The goods bought in example 1 also increase in line with inflation so that they are worth 115 by the end of year 1 and 120 on disposal.

A6.25 The recordings in year 1 are complemented by holding gains of 7 in year 1. At the end of year 1, it is necessary to re-estimate the expected price level on disposal. If this is estimated to be 117, showing the same absolute increase as previously expected, for example, then a holding gain of 3 will be recorded in year 2.

Example 3

A6.26 The goods in example 1 are sold to unit B for 105 part way through the year. B then holds the goods until selling them at the same point in time in year 2 for 110.

A6.27 In year 1, A has output of 5 and acquisition of inventories of 105. A withdraws inventories of 105 and sells them to B. B has output in year 1 of 3, which is recorded as an addition to inventories. The value of B's total additions to inventories in year 1 is thus 108. In year 2, B has output of 2, additions to inventories of 2 and sales that represent withdrawals from inventories of 110.