

# National Statistician's Committee for Advice on Standards for Economic Statistics

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# 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 <u>economic</u> 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 <u>economic</u> accounts is to show how <u>resourcesrevenues</u> are received and, after <u>usesexpenditures</u> are deducted, a balancing item is left. Because the production account is the first in the sequence of <u>economic</u> 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 67.1. 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. The uses expenditures recorded on the left-hand side of the account consist of these may also be disaggregated, by distinguishing for which types of output these items are used as an input.

## Table 67.1: The production account – uses expenditures

## Table 67.1 (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 areis 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 be 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, knowledgecapturing 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.

## 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, <u>including the production of electricity through the use of</u> <u>solar panels and wind power plants and the production of heat for heating water or a dwelling through</u> <u>geothermal heat or heat pumps;</u>
  - 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 <u>well-beingwelfare</u>. However, national accounts serve a variety of analytical and policy purposes and are not compiled simply, or even primarily, to produce indicators of <u>well-beingwelfare</u>. 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 <u>may not be directly available</u>. It is therefore <u>extremelyrelatively</u> 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.

7.347.32 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

- 7.367.37 "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.
- 7.377.38 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 ingame 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.
- 7.387.46 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

- 7.397.47 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 2539 discusses measurement of the informal economy within households.
- 7.407.48 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.
- 7.417.49 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.
- 7.427.50 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.
- 7.437.51 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.
- 7.447.52 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.
- 7.457.53 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.
- 7.467.54 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, the whole of the sales value appears as the margin.
- 7.477.55 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.
- 7.487.56 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

- 7.497.57 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.
- 7.507.58 The detailed discussion of taxes related to production appears in section C of chapter 78 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

7.517.59 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.

- 7.527.60Unlike 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.
- 7.537.61 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.
- 7.547.62 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

7.557.63 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.

- 7.567.64 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.
- 7.577.65 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.

7.587.66 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

- 7.597.67 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.
- 7.607.68 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.

7.617.69 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.

- 7.627.70 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.
- 7.637.71 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

7.647.72 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.

7.657.73 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).

- 7.667.74 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.
- 7.677.75 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.
- 7.687.76 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

7.697.77 Figure 47.1 gives an overview of the essential differences between basic, producers' and purchasers' prices.

## Figure 67.1: Basic, producers' and purchasers' prices

## D. Value added and GDP

## 1. Gross and net value added

7.707.78 The balancing item of a current account is the excess of resources 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).

- 7.717.79 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 capitaldepreciation and depletion.
- 7.727.80 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.
- 7.737.81Consumption of fixed capitalDepreciation 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 capitaldepreciation and depletion does 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 capitaldepreciation 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).

#### 7.747.82 As stated above:

- "Gross value added" is defined as the value of output less the value of intermediate consumption;
- <u>"Value added net of depreciation" is defined as the value of output less the value of both intermediate</u> <u>consumption and depreciation;</u>
- <u>"Net value added</u>" 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

7.757.83 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 capitaldepreciation and depletion, taxes on production (less subsidies) and compensationremuneration of employees. The positive or negative balance remaining is the net operating surplus or mixed income.

7.767.84 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

7.777.85 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

- 7.787.86 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.
- 7.797.87 Both this measure of gross value added and that described in the previous <u>sub</u>section 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

- 7.807.88 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 addingless subsidies on production.
- 7.817.89 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)

7.827.90 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.

7.837.91 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

7.847.92 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 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**

7.857.93 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.
- 7.867.95 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.
- 7.877.96In 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.
- 7.887.97 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.
- 7.897.98 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

- 7.907.99 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.
- 7.917.100 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

7.927.101 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.

- 7.937.102 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 capitaldepreciation (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 2017.
- 7.947.103 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.-ineluding 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 ineluded 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

- 7.957.104 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 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.

#### 7.967.105 There is further discussion on economically significant prices in chapter 2230.

7.977.106 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.

7.987.107 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 <u>or the central bank</u> and financed out of funds other than receipts from sales, namely taxation or other <del>government</del> 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

7.997.108 *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**

- 7.1007.109 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.
- 7.1017.110 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**

7.1027.111 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

7.1037.112 Goods or services provided to employees as <u>compensationremuneration</u> 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**

7.1047.113 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

- 7.1057.114 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.
- 7.1067.115 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.
- 7.1077.116 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 <u>1011</u>.

7.1087.117 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.

7.1097.118 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

- 7.1107.119 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.
- 7.1117.120 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.
- 7.1127.121 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 shortterm 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-inprogress 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.
- 7.1137.122 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 2017.

## Output for own final use

7.1147.123 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

7.1157.124 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

7.1167.125 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 compensationremuneration of employees paid, including any compensation in kind such as food or accommodation.

#### Services of owner-occupied dwellings

- 7.1177.126 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.
- 7.1187.128 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

7.1197.129 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<sub>2</sub>-and software products, including data and databases, may be produced on own account.

#### Changes in inventories

7.1207.130 Additions to work-in-progress on structures intended for own use <u>continue to be treated as changes in</u> 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-inprogress 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

- 7.1217.131 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.
- 7.1227.132 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.
- 7.1237.133 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.
- 7.1247.134 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

- 7.1257.135 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.
- 7.1267.136 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;
- <u>CompensationRemuneration</u> of employees;
- Consumption of fixed capital Depreciation (and depletion where relevant);
- A net return to non-financial assets used in production;
- <u>Rent payable on the use of non-produced non-financial assets;</u>
- 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.

7.1277.137 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 partin 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.

7.1287.138 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 <u>compensation</u> remuneration of employees. As explained in chapter  $\frac{78}{28}$ , when labour is provided on a voluntary basis to a producer unit other than the labourer's own household, no imputation for compensationremuneration of employees is made. If labour is provided for a nominal payment, only the nominal payment is recorded as compensationremuneration of employees. The other labour costs are treated as mixed income.

#### Non-market output

7.1297.139 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 910 discusses the difference between expenditure and use in more detail.

7.1307.140 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.

7.1317.141 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<u>Remuneration</u> of employees;
- Consumption of fixed capitalDepreciation (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.

- 7.1327.142 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.
- 7.1337.143 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

- 7.1347.144 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.
- 7.1357.145 When production for own final use is undertaken by a <u>unit in the general government unit, the central bank</u> or <u>an NPISHs sector</u>, 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, <u>the central bank</u> and NPISHs who produce only for own final use.

## F. The output of particular industries

## 1. Introduction

<u>7.146</u> 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.

7.1367.147 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 macroeconomic aggregates, can be found in chapter 23.

## 2. Agriculture, forestry and fishing

- 7.1377.148 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.
- 7.1387.149 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.
- 7.1397.150 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 1011.) 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 2017. Once the plant or animal has reached maturity, it will decline in value and this decline should be recorded as consumption of fixed capitaldepreciation.

## 3. Machinery, equipment and construction

- 7.1407.151 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  $\frac{2017}{2}$ .
- 7.1417.152 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-progressgross 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*

7.1427.155 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

- 7.1437.156 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.
- 7.1447.157 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.

- 7.1457.158 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.
- 7.1467.159 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

- 7.1477.160 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.
- 7.1487.161 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, compensationremuneration 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.

7.1497.162 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.
- 7.1507.163 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.
- 7.1517.164 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 <u>compensationremuneration</u> 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 used to be marked down are obviously less than the normal margins and could be negative. The margins on goods used to pay employees as <u>compensationremuneration</u> 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

- 7.1527.170 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 1725. 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.
- 7.1537.171 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 schemess look at each of these in turn. In chapter 1725 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 78 and the acquisition and disposal of financial assets and liabilities in chapter 1412. Changes in the value of financial assets and liabilities not arising from transactions are described in chapter 1213.

#### 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.

- 7.177Implicit asset management service charges can be measured at cost. The corresponding entry is to increase the<br/>net value of investment income payable to the investor to the gross value before deduction of the expenses.<br/>Without the recognition of the output of such services, the costs incurred would lead to negative operating surplus<br/>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 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

- 7.1577.179 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 <u>implicit</u> financial-intermediation services <u>on loans and deposits</u> indirectly measured (FISIM).
- 7.1587.180 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.

7.1597.181 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
  - <u>a weighted average of the endogenous interest rates on loans and deposits.</u>
- 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 or loans and deposits calculated by assuming that the margin (implicit financial 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 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.

- 7.1607.186 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.
- 7.1617.187 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.
- 7.1627.188 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 1314.

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

- 7.1637.189 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 4725, 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.
- 7.1647.190 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.
- 7.1657.191 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.
- 7.1667.192 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.
- 7.1677.194
   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.

- 7.1687.195\_\_\_\_Five types of activities are covered under this heading: <u>Nn</u>on-life insurance; <u>L</u>ife insurance and annuities; <u>Rr</u>einsurance; <u>So</u>cial insurance schemes; <u>So</u>tandardized guarantee schemes.
- 7.1697.196 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.
- 7.1707.197 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.
- 7.1717.198\_\_\_\_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.
- 7.1727.199 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.
- 7.1737.200 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".
- 7.1747.201 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.
- 7.1757.202 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:

TotalActual 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 8.121.9.0.xx.) 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 <u>actual</u> 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 <u>actual</u> 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 <u>actual</u> 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.

- 7.1837.210 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.
- 7.1847.211 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

- 7.1857.212 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 <u>actual</u> premiums paid or may be dependent on the level of success the insurance corporation has in investing the funds.
- 7.1867.213 The insurance corporation cumulates <u>actual</u> premiums paid until the promised date when benefits become payable and in the meantime uses the reserves to produce investment income <u>and holding gains</u>. Some of the investment income <u>and holding gains</u> 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 <u>and holding gains</u> not allocated to the policyholders is retained by the insurance corporation as its fee for the service they provide.
- 7.1877.214 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 <u>actual</u> premiums are received and when benefits are paid, special allowances must be made for changes in the technical reserves.

7.1887.215 The output of life insurance is derived as:

Actual Ppremiums earned,

plus premium supplements,

less benefits due,

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

7.1897.216 Premiums are defined in exactly the same way for life insurance as for non-life insurance.

- 7.1907.217 Premium supplements are more significant for life insurance than for non-life insurance. They consist of all the investment income allocated toearned 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 primaryallocation of earned income account.
- 7.1917.218 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 entitlementsteehnical 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 entitlementsteehnical reserves less the part of these returns this 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 <u>its</u> employees, <u>either or not establishing a</u> <u>segregate fund to administer the scheme</u>;
- 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 employerindependent 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 <u>administermanage</u> 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 <u>can often beis</u> 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 <u>may need</u> 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

7.1997.226 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 nonproduced 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-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.<u>11.</u> Research and development

7.2007.231 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 incurredineluding 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  $\frac{1011}{10}$ .

### 10.12. The production of originals and copies

- 7.2017.232 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.
- 7.2027.233 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.
- 7.2037.234 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 capitalDepreciation 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.
- 7.2047.235 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.
- 7.2057.236 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 <u>12 and <del>17</del>27</u>.

# G. Intermediate consumption

### 1. Coverage of intermediate consumption

- 7.2067.237 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.
- 7.2077.238 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<u>depreciation</u>. 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.

7.2087.239 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 56.

### 2. The timing and valuation of intermediate consumption

- 7.2097.240 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 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.
- 7.2107.241 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.

- 7.2117.242 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.
- 7.2127.243 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 <u>compensation</u>remuneration of employees

- 7.2137.244 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.
- 7.2147.245 It is immaterial to the employer whether they are treated as intermediate consumption or compensationremuneration 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 primarycarned incomes, and hence GDP as a whole.
- 7.2157.246 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.

7.2167.247 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 78.

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

7.2177.248 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**

7.2187.249 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

- 7.2197.250 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.
- 7.2207.251 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.

7.2217.252 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.
- 7.2227.253 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**

7.2237.254 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

7.2247.255 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**

7.2257.256 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

7.2267.257 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

- 7.2277.258 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.
- 7.2287.259 By convention, nNon-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

7.2297.260 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

7.2307.261 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 1415 and 2836.

# 9. Leasing fixed assets

- 7.2317.262 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 capitaldepreciation 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.
- 7.2327.263 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  $\frac{1727}{27}$ .

# H. Consumption of fixed capital Depreciation

# 2.1. The coverage of consumption of fixed capitaldepreciation

- 7.2337.264 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 current value of the asset.
- 7.2347.265 Consumption of fixed capitalDepreciation 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 capitalDepreciation 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 assets are included in a separate category "depletion", which is discussed in the following section.
- 7.2357.266 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, <u>depreciationeapital consumption</u> needs to be calculated for all types of structures, including those owned and maintained by government units, as well as machinery and equipment.
- 7.2367\_\_\_\_\_Losses of fixed assets due to normal or expected levels of accidental damage are also included under consumption of fixed capitaldepreciation; 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.
- 7.2377.268 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<u>depreciation</u>. 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 <u>and liabilities</u> account. Similarly, although consumption of fixed capital<u>depreciation</u> 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. <u>Consumption of fixed capital Depreciation</u> and rentals on fixed assets

7.2387.269 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 expitaldepreciation) 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 capitaldepreciation, the return to capital is part of value added. The sum of the consumption of fixed capitaldepreciation 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  $\frac{2017}{2017}$ .

- 7.2397.270 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 capitalDepreciation 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 capitaldepreciation is expressed in terms of flows that include an element of inflation, then the discount factor should be used. Either procedure results in a present value expressed in current period prices.
- 7.2407.271 <u>Consumption of fixed capitalDepreciation</u> 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 capitaldepreciation 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 capitaldepreciation must be based on values calculated in this way.

# 4.3. The calculation of consumption of fixed capitaldepreciation

- 7.2417.272 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 capitaldepreciation 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 capitaldepreciation 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, that is, the prices originally paid for them, become quite irrelevant for the calculation of eonsumption of fixed capitaldepreciation as prices change over time.
- 7.2427.273 For these reasons, depreciation as recorded in business accounts may not provide the right kind of information for the calculation of consumption of fixed capitaldepreciation. 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 capitaldepreciation 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.

- 7.2437.274 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<u>7.275</u> 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<u>depreciation</u> are obtained as a by-product of the PIM.

# **5.4.** The perpetual inventory method

7.2457.276 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 2017. Much more guidance on the way to calculate capital stock estimates appears in the OECD mManual on Measuring Capital. 2nd edition (OECD, 2009).

# Calculation of the gross capital stock

7.2467.277 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 raises 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**

- 7.2477.278 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.
- 7.2487.280 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 capitaldepreciation

7.2497.281 Consumption of fixed capitalDepreciation 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 capitaldepreciation 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 capitalDepreciation tends to increase as the asset gets older even though the efficiency and benefits remain constant to the end.

### Values of consumption of fixed capitaldepreciation

7.2507.282 Consumption of fixed capitalDepreciation 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 2017, trying to identify consumption of fixed capitaldepreciation 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

- 7.2517.283 Depletion, in physical terms, represents the decrease in the quantity or value of the stock of a nonproduced 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 67: Separating output due to storage from holding gains and losses

# A. Introduction

A6.1 Paragraphs <u>6.142 to 6.145-7.156 to 7.159</u> 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, compensationremuneration 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 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 2017, 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 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 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.

# Chapter 11: Capital account (OLD Chapter 10: The capital account)

Please note that the order of this chapter in the 2008 SNA has been changed, mainly because of the revised classification of non-financial assets, from distinguishing between produced and non-produced non-financial assets to having a breakdown into (i) produced non-financial assets (excluding natural capital); (ii) non-produced non-financial assets (excluding natural capital); and (iii) natural capital. In addition, the discussion of depreciation (in the 2008 SNA referred to as consumption of fixed capital) has been re-allocated after the discussion of all asset categories, because of the addition of a discussion on depletion. All these re-allocations have not been shown in the form of track changes.

# A. Introduction

- 11.1 The capital account is the first of four accounts dealing with changes in the values of assets held by institutional units. It records transactions in non-financial assets. The financial account records transactions in financial assets and liabilities. The other changes in the volume of assets account records changes in the value of both non-financial and financial assets that result from neither transactions nor price changes. The effects of price changes are recorded in the revaluation account. These four accounts enable the change in the net worth of an institutional unit or sector between the beginning and end of the accounting period to be decomposed into its constituent elements by recording all changes in the prices and volumes of assets, whether resulting from transactions or not. The impact of all four accounts is brought together in the balance sheets. The immediately following chapters describe the other accounts just mentioned.
- 11.2 The purpose of the capital account, shown in table <u>1011</u>.1, is to record the values of the non-financial assets that are acquired, or disposed of, by resident institutional units by engaging in transactions and to show the change in net worth due to saving and capital transfers. The transactions may be either with other institutional units, both resident and non-resident, or internal transactions in which units retain products that they have produced themselves for use as capital formation.
- 11.3 When compiling balance sheets, it is customary to record assets on the left-hand side and liabilities and net worth on the right-hand side. The same convention is followed in the accumulation accounts, where changes in assets are recorded on the left-hand side and other items on the right-hand side. As in the current accounts, the balancing item of the capital account, net lending or net borrowing, is recorded on the left-hand side. Consumption of fixed capital isDepreciation and depletion are also recorded on the left-hand side of the capital account.
- 11.4 The right-hand side of the capital account records the resources revenues available for the accumulation of assets. These consist of net saving, the balancing item carried forward from the use of income account, and capital transfers. Capital transfers payable are recorded with a negative sign.

# **1.** The definitions of ownership and assets

- 11.5 Ownership and assets are defined in chapter <u>34</u> but it is helpful to recall some of the key features of the definitions here. It is important to distinguish between legal ownership and economic ownership. The legal owner of <u>entitiesitems</u> such as goods and services, natural resources, financial assets and liabilities is the institutional unit entitled in law and sustainable under the law to claim the benefits associated with the <u>entitiesitems</u>. By contrast, the economic owner of <u>entitiesitems</u> such as goods and services, natural resources, financial assets and liabilities is the institutional unit entitled to claim the benefits associated with the use of the entity in question in the course of an economic activity by virtue of accepting the associated risks.
- 11.6 Every entity has both a legal owner and an economic owner, though in many cases the economic owner and the legal owner of an entity are the same. Where they are not, the legal owner has handed responsibility for the risk involved in using the entity in an economic activity to the economic owner along with associated benefits. In return the legal owner accepts another package of risks and benefits from the economic owner.

- <u>11.7</u> When government claims legal ownership of an entity on behalf of the community at large, the benefits also accrue to the government on behalf of the community at large. Thus government is regarded as both the legal and economic owner of these <u>entitiesitems</u>.
- 11.8 Especially in relation to natural resources, a government is typically the legal owner and grants rights or permissions to exploit the resources to another institutional unit. In such cases, the benefits may be shared between the government and the exploiter of the resources, and the economic ownership of the resources is split between the two entities involved, in line with the shares of resource rent each entity appropriates. (See chapter 27 for more details.)
- 11.7
   11.9 In the case of multinational enterprise groups, the economic ownership of intellectual property products may be difficult to determine. Various arrangements, including the routing via special purpose entities, exist. The use of a decision tree is recommended for the appropriate allocation and recording of these assets across the MNE group. See chapter 23 for more information.
- 11.8<u>11.10</u> An asset is a store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another. All assets in the integrated framework of national accountsSNA are economic assets.

# 2. Non-financial assets

- 11.9
   TwoThree
   different categories of non-financial assets are distinguished from each other: produced assets (excluding natural capital), and natural capital).

   Natural capital encompasses both natural resources and ecosystem assets. The latter assets are not recognised in the integrated framework of national accounts. For more details on ecosystem assets, see chapter 35 as well as the System of Environmental-Economic Accounting (SEEA) Ecosystem Accounting.
  - a. Produced assets (excluding natural capital) are non-financial assets that have come into existence as outputs from production processes that fall within the production boundary of the integrated framework of national accounts SNA.
  - b. Non-produced assets (excluding natural capital) are non-financial assets that have come into existence in ways other than through processes of production.
  - b.c. Natural capital, or more precisely in the context of the SNA, natural resources consist of assets that naturally occur, such as land, water resources, timber and fish stocks, and mineral and energy resources that have an economic value and over which ownership may be enforced and transferred. A significant part of natural resources is non-produced, although biological resources may be the result of human involvement, and have thus come into existence as outputs from production processes.

# Produced assets (excluding produced natural capital)

- **11.10** There are three main types of produced assets: fixed assets, inventories and valuables. Both fixed assets and inventories are assets that are held only by producers for purposes of production. Valuables may be held by any institutional unit and are primarily held as stores of value.
- **Fixed assets are produced assets that are used repeatedly or continuously in production processes for more than one year.** The distinguishing feature of a fixed asset is not that it is durable in some physical sense, but that it may be used repeatedly or continuously in production over a long period of time, which is taken to be more than one year. Some goods, such as coal, may be highly durable physically but cannot be fixed assets because they can be used once only. Fixed assets include not only structures, machinery and equipment but also various intellectual property products used in production, such as software, data and databases or artistic originals. eCultivated assets such as trees or animals that are used repeatedly or continuously to produce other products such as fruit or dairy products <u>are excluded, and instead included in (produced) natural capital</u>. They also include intellectual property products such as software or artistic originals used in production.

- 11.12 Inventories are produced assets that consist of goods and services, which came into existence in the current period or in an earlier period, and that are held for sale, use in production or other use at a later date. Inventories consist of stocks of outputs that are still held by the units that produced them prior to their being further processed, sold, delivered to other units or used in other ways and stocks of products acquired from other units that are intended to be used for intermediate consumption or for resale without further processing. Inventories of services consist of work-in-progress or finished products, for example architectural drawings, which are in the process of completion or are completed and waiting for the building to which they relate to be started. Inventories held by government include, but are not limited to, inventories of strategic materials, and grain and other commodities of special importance to the nation. Work-in-progress related to cultivated biological resources, such as the growth of single-use plants, trees and livestock that produce an output once only, is excluded, and instead included in (produced) natural capital. The same holds for biological resources yielding repeat products which have not yet matured.
- 11.1311.15 Valuables are produced goodsassets of considerable value that are not used primarily for purposes of production or consumption but are held as stores of value over time. Valuables are expected to appreciate or at least not to decline in real value, nor to deteriorate over time under normal conditions. They consist of precious metals and stones, jewellery, works of art, etc. Valuables may be held by all sectors of the economy.

# Non-produced assets (excluding non-produced natural capital)

- <u>11.14</u><u>11.16</u> Non-produced assets consist of three categories: natural resources; contracts, leases and licences; crypto assets without a corresponding liability designed to act as a medium of exchange; and purchased goodwill and marketing assets.
- 11.15
- 11.16 Natural resources consist of naturally occurring resources such as land, water resources, uncultivated forests and deposits of minerals that have an economic value.
- 11.17 Contracts, leases and licences are treated as assets only when two conditions are both satisfied.
  - a. The terms of the contract, lease or licence specify a price for the use of an asset or provision of a service that differs from the price that would prevail in the absence of the contract, lease or licence.
  - b. One party to the contract must be able legally and practically to realize this price difference.

The second condition presupposes that a market for the contract exists. It is recommended that in practice contracts, leases and licences should only be recorded in the accounts when the holder does actually exercise his right to realize the price difference.

- 11.18 Contracts, leases and licenses may also include non-fungible tokens that grant limited commercial rights to another asset or product from which the owner of the NFT can derive economic benefits (e.g., some form of royalties).
- <u>11.19</u> Crypto assets without a corresponding liability designed to act as a medium of exchange relate to crypto assets for which there is no issuer. They may be designed to act as a general medium of exchange, or designed to act as medium of exchange within a platform only.
- <u>11.20</u> Purchased goodwill and marketing assets represent the whole or part of the net worth of an institutional *unit*. They are recorded only when a unit is purchased in its entirety or an identifiable marketing asset is sold to another unit.

# Natural capital

11.21 As noted above, in the context of the SNA, natural capital is restricted to natural resources. These resources can be broken down into the following categories: land; mineral and energy resources, both non-renewable and renewable resources; biological resources; water resources; and a residual category containing, for

example, radio spectra. As noted before, natural capital includes both produced and non-produced assets.

11.18Environmental assets refer to a broader concept and are defined as "naturally occurring living and<br/>non-living components of the Earth, together constituting the biophysical environment, which may provide<br/>benefits to humanity" (SEEA 2012 Central Framework). In macroeconomic statistics, environmental assets<br/>are only recognised in as far they meet the asset boundary, by providing monetary benefits to their owners,<br/>either individually or collectively. Assets over which ownership rights have not, or cannot, be enforced, such<br/>as open seas or air, are excluded, unless exclusive right on the resources are established, for example in the<br/>form of quota regimes for capturing fish.

# Table 10.1 11.1 The capital account - concise form - changes in assets

Table **10.1**<u>11.1</u> (cont): The capital account - concise form - changes in liabilities and net worth

# 3. The structure of the capital account

### Saving

11.1911.23 The right-hand side of the capital account represents changes in liabilities and net worth. The first item recorded on the right-hand side is the balancing item carried down from the use of disposable income account, net saving. When positive, net saving represents that part of disposable income that is not spent on consumption goods and services and must, therefore, be used to acquire non-financial or financial assets of one kind or another, including cash, or to repay liabilities. When negative, net saving measures the amount by which final consumption expenditure exceeds disposable income: the excess must be financed by disposing of assets or incurring new liabilities.

# **Capital transfers**

- Capital transfers are unrequited transfers, either in cash or in kind, in which the ownership -where either the party making the transfer realizes the funds involved by disposing of an asset (other than cash or inventories) changes from one party to another; or that oblige one or both parties to acquire or dispose of an asset (other than cash or inventories); or where a liability is forgiven by the creditor, relinquishing a financial claim (other than accounts receivable) or the party receiving the transfer is obliged to acquire an asset (other than cash) or both conditions are met. Capital transfers are often large and irregular but neither of these are necessary conditions for a transfer to be considered a capital rather than a current transfer. If there is doubt about whether a transfer should be treated as current or capital, it should be treated as current.
- 11.21 Capital transfers receivable represent an increase in net worth and so are shown on the right-hand side of the account for the recipient. By convention, the matching amounts payable are also shown on the right-hand side of the account but as a negative entry (that is, a decrease in net worth) for the payer.

# Changes in net worth due to saving and capital transfers

11.2211.26 The total of the entries on the right-hand side of the account is explicitly shown and described as changes in net worth due to saving and capital transfers. It is not a balancing item. Changes in net worth due to saving and capital transfers represent the positive or negative amount available to the unit or sector for the acquisition of non-financial and financial assets.

# Acquisitions less disposals of non-financial assets

11.2311.27 The left-hand side of the capital account records how much of the change in net worth due to saving and capital transfers is used to acquire non-financial assets and how much is left to be explained by the

acquisition of financial assets or liabilities in the financial account. Resources<u>Revenues</u> coming from the disposal of existing assets appear as negative entries on the left-hand side of the account also. As well as purchases and sales of assets, non-financial assets acquired (or disposed of) via barter or by means of production for own use are included.

- <u>11.24</u><u>11.28</u><u>ThreeThe following</u> headings for the net change in the value of non-financial assets are shown in the capital account:
  - a. <u>Gross capital formation; Acquisitions less disposals of produced non-financial assets (excluding</u> <u>natural capital), broken down by:</u>
  - Gross fixed capital formation
  - Depreciation
  - Changes in inventories
  - Acquisitions less disposals of valuables

11.25

### Consumption of fixed capital;

- b. Acquisitions less disposals of non-produced non-financial assets (excluding natural capital)-
- c. Acquisitions less disposals of natural capital, broken down by:
- Gross fixed capital formation
- Depreciation
- Changes in inventories
- Acquisitions less disposals of non-produced non-financial assets
- <u>Depletion</u>

The treatment given to each of these categories of changes in assets is described in later sections of this chapter.

- 11.26<u>11.29 Gross capital formation shows the The sum of acquisitions</u> less disposals of produced assets, including produced natural capital, for purposes of fixed capital formation, inventories or valuables is referred to as gross capital formation. It is possible (if uncommon) for the gross capital formation of an individual institutional unit or sector to be negative if it sells off enough of its existing assets to other units or sectors.
- <u>11.30</u> <u>Consumption of fixed capital Depreciation</u> is the decline, during the course of the accounting period, in the current value of the stock of fixed assets, <u>including cultivated biological resources</u>, owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage. <u>Section E provides more details on depreciation</u>.
- 11.31 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. Section E provides more details on depletion.
- 11.27<u>11.32</u> When, as recommended in the SNA, the balancing item carried down from the use of income account is net saving, it already reflects the fact that net worth has been reduced by the amount of consumption of fixed capitaldepreciation and depletion, the amount by which the relevantfixed assets are reduced in the period. Since the capital account is designed to show the way in which net worth is augmented by the acquisition of non-financial assets, depreciationthis amount has to be offset from the value of new acquisitions of fixed assets so the addition to the capital stock of fixed assets is a net amount. For this reason, consumption of fixed capitaldepreciation is recorded as a negative change in assets on the left-hand side of

the capital account. In the case of depletion, the relevant (non-produced) assets typically come into existence via newly exploited resources, which are recorded as other changes in the volume of assets.

11.28 If it is not feasible to measure consumption of fixed capital because of lack of data, the saving figure carried forward from the use of income account has to be gross. In this case, there is no entry for consumption of fixed capital in the capital account. If consumption of fixed capital has to be omitted from both sides of the account, the balancing item of the account is not affected; net lending or borrowing can be derived residually whether or not consumption of fixed capital can be estimated. However, if consumption of fixed capital is not estimated, the accounts do not record all changes between two successive balance sheets.

11.29

- <u>11.33</u> The remainingOne of the items on the left-hand side of the capital account refers to the acquisitions less disposals of non-produced non-financial assets (excluding natural capital). The total value of the acquisitions less disposals of non-produced non-financial these assets may also be positive or negative. Since natural resources are owned by units that are either actually or notionally resident, this part will generally be zero for the economy as a whole. (An exception exists for land purchased by a foreign government for an embassy or military base.) However, as there may be transactions in contracts, leases and licences, crypto assets without a corresponding liability designed to act as a medium of exchange, or marketing assets with non-resident units.
- 11.30The last item on the left-hand side of the capital account refers to acquisitions less disposals of<br/>natural capital. This item combines the acquisitions less disposals of both produced and non-produced natural<br/>resources. Since non-produced natural resources are owned by units that are either actually or notionally<br/>resident, this part will generally be zero for the economy as a whole. (An exception exists for land purchased<br/>by a foreign government for an embassy or military base.)

# Net lending

- **11.31**<u>11.35</u> The balancing item of the capital account, net lending, is defined as the difference between changes in net worth due to saving and capital transfers and net acquisitions of non-financial assets (acquisitions less disposals of non-financial assets, less consumption of fixed capitaldepreciation and depletion). If the amount is negative it represents net borrowing. It shows the amount of the resources revenues remaining for purposes of lending or that need to be borrowed. Even if funds are not actively lent but are retained in cash, or in a bank deposit, the holder of the counterpart obligations represented by these financial assets has in effect borrowed from the unit holding the cash or bank deposit.
- 11.32<u>11.36</u> The identity between the balancing items of the capital account and the financial account is an important feature of the set of the accounts as a whole. What is borrowed by one unit must be lent by another and vice versa. The conceptual identity between the balancing items provides a check on the numerical consistency of the set of accounts as a whole, although the two balancing items are likely to diverge in practice because of errors of measurement.
- 11.3311.37 In general in the SNA, and especially in balancing items, the prefix net means excluding the consumption of fixed capitaldepreciation and depletion. For net lending this is not the case; it represents the difference between those assets giving rise to making funds available to other units and those drawing funds from other units.

# **B.** <u>Gross capital formationAcquisitions less disposals of produced non-</u><u>financial assets (excluding natural capital)</u>

 11.34
 Gross capital formation is Acquisitions less disposals of produced non-financial assets (excluding natural capital) are measured by the total value of the gross fixed capital formation (excluding natural capital), changes in inventories (excluding natural capital) and acquisitions less disposals of valuables. Before discussing in detail the entries to be recorded under each of these items, it is necessary to clarify the coverage of the item and the application of accounting rules such as valuation, time of recording and the identification of ownership. This section focuses on gross capital formation excluding capital formation related to natural

capital. The latter is discussed in section D.

# 1. Gross fixed capital formation (excluding natural capital)

11.3511.39 Gross fixed capital formation (excluding natural capital) is measured by the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain specified expenditure on services that adds to the value of non-produced assets. In order to ensure that the coverage of gross fixed capital formation is precisely defined, it is necessary first to define what does and what does not constitute a fixed asset and what activities are treated as adding to the value of non-produced assets.

# The asset boundary

- All goods and services supplied to the economy by means of production, imports or the disposal of produced assets must be used for exports, consumption (intermediate or final) or as part of capital formation. The boundary line between those products that are retained in the economy and are used for consumption and those products that are used for capital formation is known as the asset boundary. The asset boundary for fixed assets consists of goods and services that are used in production for more than one year.
- 11.41 Two exclusions from the asset boundary should be noted at the outset. The first is that consumer durables are not treated as fixed assets. The services these durables produce are household services outside the production boundary of the integrated framework of national accountsSNA. If, for example, a washing machine were to be treated as a fixed asset, the production boundary would have to be extended to include all laundry services, whether undertaken by machine or by hand. As it stands, the production boundary restricts laundry services to those services provided to other units but includes services provided by both machine and by hand. However, owner-occupied dwellings are not treated as consumer durables but are included within the asset boundary. The owner-occupiers are treated as owners of unincorporated enterprises producing housing services for their own consumption. For more information on an extended set of accounts which includes all unpaid household services produced for own final use, see chapter 34.
- 11.37<u>11.42</u> It is possible though that an asset is used for consumption purposes as well as for the purpose of producing goods and services. An example relates to the dual use of a car owned by a household for own travel and for providing taxi services to third parties. Such instances have become more frequent with the digitalisation of the economy, which has enhanced the possibilities to provide such market services. In these cases, the asset in question needs to be partitioned, with one part recorded as final consumption expenditure and the other part recorded as gross fixed capital formation.
- **11.38**<u>11.43</u> The second exclusion is pragmatic rather than conceptual and concerns small tools. Some goods may be used repeatedly, or continuously, in production over many years but may nevertheless be small, inexpensive and used to perform relatively simple operations. Hand tools such as saws, spades, knives, axes, hammers, screwdrivers and spanners or wrenches are examples. If expenditures on such tools take place at a fairly steady rate and if their value is small compared with expenditures on more complex machinery and equipment, it may be appropriate to treat the tools as materials or supplies used for intermediate consumption. Some flexibility is needed, however, depending on the relative importance of such tools. In countries in which they account for a significant part of the value of the total stock of an industry's durable producers' goods, they may be treated as fixed assets and their acquisition and disposal by producers recorded under gross fixed capital formation.
- 11.3911.44 Not all goods included within the asset boundary must be newly produced. Since assets have a long life, they may change hands but continue to function as fixed assets for their new owners. Thus it is important to define what existing fixed assets are and how they are treated in measuring gross fixed capital formation.
- 11.4011.45 Nor are all services included within the asset boundary immediately recognizable. Important classes of services are included in the asset boundary because of the impact they have on the value of new or existing assets. These are improvements to existing assets and the cost of ownership transfer of assets. These are described below after defining existing fixed assets.

### Existing fixed assets

- 11.41<u>11.46</u> Because assets have service lives that may range up to 50 years or more for dwellings or other structures, their ownership may change several times before they are eventually scrapped, demolished or abandoned. An existing fixed asset is one whose value was included in the stock of fixed capital of at least one producer unit in the domestic economy at some earlier point in time either in the current period or in the immediately previous accounting period. In many countries, well-organized markets exist to facilitate the buying and selling of many kinds of existing fixed assets, notably automobiles, ships, aircraft, dwellings and other structures. Indeed, the number of existing dwellings bought and sold within a given time period may considerably exceed the number of new dwellings. In practice, most existing fixed assets will have been used in production by their current owners, but an existing capital good might be sold by its owner before it has actually been used.
- 11.4211.47 In general, sales or other disposals of existing goods, whether fixed assets or not, are recorded as negative expenditures or negative acquisitions. Thus, when the ownership of an existing fixed asset is transferred from one resident producer to another, the value of the asset sold, bartered or transferred is recorded as negative gross fixed capital formation by the former and as positive gross fixed capital formation by the latter. The value of the positive gross fixed capital formation recorded for the purchaser exceeds the value of the negative gross fixed capital formation recorded for the seller by the value of the costs of ownership transfer incurred by the purchaser. The treatment of these costs is explained in more detail in a later section.
- 11.4311.48 When the sale takes place between two resident producers, the positive and negative values recorded for gross fixed capital formation cancel out for the economy as a whole except for the costs of ownership transfer. Similarly, if an existing immovable fixed asset, such as a building, is sold to a non-resident, by convention the latter is treated as purchasing a financial asset that is the equity of a notional resident unit while the notional resident unit is deemed to purchase the asset, so that the sale and purchase of the asset takes place between resident units. However, if an existing movable fixed asset, such as a ship or aircraft, is exported, no positive gross fixed capital formation is recorded elsewhere in the economy to offset the seller's negative gross fixed capital formation.
- 11.44<u>11.49</u> Some durable goods, such as vehicles, may be classified as fixed assets or as consumer durables depending upon the owner and the purpose for which they are used. If, therefore, the ownership of such a good were transferred from an enterprise to a household to be used for final consumption, negative gross fixed capital formation is recorded for the enterprise and positive consumption expenditure by the household. If a vehicle owned by a household were to be acquired by an enterprise, it would be recorded as an acquisition of a "new" fixed asset by the enterprise, even though it is an existing good, and as negative consumption expenditure by the household. A similar treatment is applied to imports of used products acquired by resident producers as assets.
- 11.4511.50 Thus, it is perfectly possible for gross fixed capital formation to be negative as a result of the sale or disposal of existing fixed assets, although aggregate gross fixed capital formation is unlikely to be negative for large groups of units such as subsectors, sectors or the economy as a whole.

### Improvements to existing assets

11.4611.51 Gross fixed capital formation may take the form of improvements to existing fixed assets, such as buildings or computer software, that increase their productive capacity, extend their service lives, or both. By definition, such gross fixed capital formation does not lead to the creation of new assets that can be separately identified and valued, but to an increase in the value of the asset that has been improved.

Accordingly, it is the improved asset that is henceforth relevant to the <u>integrated framework of national</u> <u>accounts</u><u>SNA</u> and on which <u>consumption of fixed capitaldepreciation</u> must be calculated subsequently.

11.47<u>11.52</u> A different treatment is applied to improvements to land in its natural state. In this case the improvements are treated as the creation of a new fixed asset and are not regarded as giving rise to an increase in the value of the natural resource. If land, once improved, is further improved, then the normal treatment of improvements to existing fixed assets applies.

- 11.48
   11.53
   The distinction between ordinary maintenance and repairs that constitute intermediate consumption and those that are treated as capital formation is not clear cut. As explained in paragraphs 6.2267.226 to 6.229.7.229, ordinary maintenance and repairs are distinguished by two features:
  - They are activities that must be undertaken regularly in order to maintain a fixed asset in working order over its expected service life. The owner or user of the asset has no choice about whether or not to undertake ordinary maintenance and repairs if the asset in question is to continue to be used in production;
  - Ordinary maintenance and repairs do not change the fixed asset's performance, productive capacity or expected service life. They simply maintain it in good working order, if necessary by replacing defective parts by new parts of the same kind.
- 11.49<u>11.54</u> On the other hand, improvements to existing fixed assets that constitute gross fixed formation must go well beyond the requirements of ordinary maintenance and repairs. They must bring about significant changes in some of the characteristics of existing fixed assets. They may be distinguished by the following features:
  - The decision to renovate, reconstruct or enlarge a fixed asset is a deliberate investment decision that may be taken any time, even when the good in question is in good working order and not in need of repair. Major renovations of ships, buildings or other structures are frequently undertaken well before the end of their normal service lives;
  - Major renovations, reconstructions or enlargements increase the performance or productive capacity
    of existing fixed assets or significantly extend their previously expected service lives, or both.
    Enlarging or extending an existing building or structure constitutes a major change in this sense, as
    does the refitting or restructuring of the interior of a building or ship or a major extension to or
    enhancement of an existing software system.
- **11.50** It is difficult to provide simple objective criteria that enable improvements to be distinguished from repairs because any repair may be said to improve the performance or extend the working life of the unrepaired asset. For example, machines may cease to function at all because of the failure of one small part. The replacement of such a part does not, however, constitute gross fixed capital formation. Thus, improvements have to be identified either by the magnitude of the changes in the characteristics of the fixed assets such as size, shape, performance, capacity, or expected service lives, or by the fact that improvements are not the kinds of changes that are observed to take place routinely in other fixed assets of the same kind, as part of ordinary maintenance and repair programmes.

### Costs incurred on acquisition and disposal of assets

- 11.51 11.56 Purchasing a fixed asset is often a complicated procedure that may involve using lawyers to establish legal title to the asset, engineers to certify that it is in satisfactory working order and so on. There may also be taxes to be paid occasioned by the change of ownership of the item. Further, in the case of highly complex machinery there may be significant costs associated with delivery and installation that were not included in the purchase price.
- 11.5211.57 The benefits to be derived from the use of the asset in production have to cover these costs as well as the initial price of the asset. Costs incurred on acquisition of an asset are treated as an integral part of the value of that unit's gross fixed capital formation. The value at which the asset enters the balance sheet of its new owner therefore includes these costs. This applies to both new and existing assets.
- 11.5311.58 Just as there may be costs incurred on the acquisition of an asset, there may also be costs incurred on the disposal of an asset. Some of these may be parallel to those costs incurred on acquisition, for example legal fees and disinstallation costs. However, in the case of some significantly large and important assets, such as oil rigs and nuclear power stations, there may also be major costs associated with the decommissioning of the asset at the end of its productive life. For some land sites, such as those used for landfill, there may be large costs associated with rehabilitation of the site. These are referred to collectively as terminal costs.

- 11.54<u>11.59</u> All these costs associated with acquiring and disposing of assets may be described as costs of ownership transfer. *The costs of ownership transfer consist of the following kinds of items:* 
  - a. All professional charges or commissions incurred by both units acquiring or disposing of an asset such as fees paid to lawyers, architects, surveyors, engineers and valuers, and commissions paid to estate agents and auctioneers;
  - b. Any trade and transport costs separately invoiced to the purchaser;
  - c. All taxes payable by the unit acquiring the asset on the transfer of ownership of the asset;
  - d. Any tax payable on the disposal of an asset;
  - e. Any delivery and installation or disinstallation costs not included in the price of the asset being acquired or disposed of; and
  - f. Any terminal costs incurred at the end of an asset's life such as those required to render the structure safe or to restore the environment in which it is situated. <u>Although incurred at the end</u> of the asset's life, such terminal costs are added to the acquisition value of the assets (see paragraphs 11.228 to 11.230).
- All these costs of ownership transfer are treated as gross fixed capital formation. They are attributed to the purchaser or seller of the asset according to which unit bears the responsibility of meeting the costs. The time of recording of these costs is discussed below. The costs are written off via consumption of fixed capital depreciation over the period the new owner expects to hold the asset, as discussed in the section on consumption of fixed capital depreciation except for the terminal costs that should be written off over the whole life of the asset.

### Time of recording

- 11.5611.61 The general principle for the time of recording of acquisitions less disposals of fixed assets is when the ownership of the fixed assets is transferred to the institutional unit that intends to use them in production. Except in two special cases, this time is not generally the same as the time at which the fixed assets are produced. Nor is it necessarily the time at which they are put to use in the production of other goods or services.
- 11.57<u>11.62</u> The two exceptions cover assets that take some time to produce such as construction projects. intellectual property products and the like and some cultivated biological resources. In general, incomplete construction projects and immature animals and plantations are treated as work-in-progress. They are reclassified from inventories to fixed capital when complete and delivered to the unit intending to use them as fixed assets. The same principles apply for However, when the assets are being produced on own account, i.e., the partially completed products are recorded as work-in-progress until completion. As this may be more difficult to apply in practice, particularly in the case of fixed assets such as intellectual property products, the partially completed products produced on own account may need to be recorded directly as fixed capital formation as work takes place. The same principles as the ones for construction projects apply to some cultivated biological resources yielding repeat products (see section D).
- 11.5811.63 When assets are developed under a contract of sale, the producer records work-in-progress as normal. However, in the case of an effective transfer of ownership, a transfer of the partially completed product to the final owner should be recorded. Such acquisitions of partially completed products are recorded as work-in-progress in the accounts of the final owner until the completion of the fixed asset. In the case of stage payments, any differences between the value of the stage payments and the value of the effective transfer of ownership cannot be determined in practice, stage payments could be used as a proxy for the transfer of ownership. but when stage payments are made, these are regarded as purchase of [part of] a fixed asset or as a trade advance if the value of the stage payment exceeds the value of the work put in place. In the latter case, work is recorded as fixed capital delivered to the final owner as work proceeds until the trade credit is exhausted. When there is no contract of sale agreed in advance, the output produced by the enterprise must be recorded as work-in-progress or as additions to the producers' inventories of finished goods, depending

on whether the product is completed. For example, finished dwellings built speculatively remain as additions to the producers' inventories of finished goods until they are sold or otherwise acquired by users.

### **Ownership of assets**

- 11.5911.64 In most cases, the ownership of fixed assets is straightforward; it is the unit that acquires the asset for use in production. There are however, three exceptions to be noted. One concerns assets subject to a financial lease; the second concerns assets produced by communal effort; the third concerns immovable assets owned by non-residents.
- **11.60**<u>11.65</u> A financial lease is a contract between a lessor and a lessee whereby the lessor legally owns the good but the terms of the lease are such that the lessee takes over both the economic risks and rewards of using the asset in production. In effect, therefore, the lessee becomes the economic owner of the asset even if the lessor remains the legal owner. In these cases, the asset is recorded as being acquired by the lessee in return for a loan extended by the lessor to the lessee. The asset is then recorded on the balance sheet of the lessee and not the lessor. The payments due under the lease arrangement are treated as forming a repayment of the principal of the loan and a payment of interest and possibly a service charge. More details of these arrangements are given in chapter  $\frac{1727}{2}$ .
- 11.6111.66 Certain structures may be produced for own communal use by groups of households: for example, buildings, roads, bridges, etc. After they are finished, the ownership of such structures may then be transferred to some government unit that assumes responsibility for their maintenance. When the transfer occurs, the gross fixed capital formation on own account originally attributed to the group of households is cancelled by their negative gross fixed capital formation resulting from the capital transfer in kind made to the government unit. The final gross fixed capital formation remaining is that of the government unit resulting from its acquisition of the asset through the capital transfer in kind. If no such transfer exists and the structure remains the communal property of the group of households responsible for its construction, an NPISH providing collective services should be created.
- All buildings and other structures within the economic territory are deemed, by convention, to be owned by resident units. If the economic owner (or lessee under a financial lease) would not otherwise qualify as a resident unit, a notional resident unit is created for this purpose. The notional resident unit is assumed to purchase (or lease) the building or structure. The legal owner (or lessor) is deemed to hold equivalent equity in the notional resident unit. If a building or structure is owned in part by a resident unit and in part by one or several non-residents, there is one notional resident unit established with each of the owners having a proportionate share of the equity of the notional resident unit.
- 11.6311.68 A further consideration to be taken into account in determining ownership concerns assets built under a <u>public-private partnership (PPP)</u>, such as a private finance initiative (PFI), sometimes also described as a public private partnership (PPP) or a build, own, operate, transfer (BOOT) scheme or some other similar shorthand. Such schemes are under accounting scrutiny at the time of writing. Provisional<u>More</u> guidance on how to ascribe the ownership of such schemes is given in chapter 22<u>30</u>.

### Valuation

**<u>11.64</u>** The various components of acquisitions and disposals of fixed assets are listed below:

- a. Value of fixed assets purchased;
- b. Value of fixed assets acquired through barter;
- c. Value of fixed assets received as capital transfers in kind;
- d. Value of fixed assets retained by their producers for their own use, including the value of any fixed assets being produced on own account <u>for which it cannot be determined whether or not they are fullythat are not yet</u> completed or <del>fully</del>-mature;

less

- e. Value of existing fixed assets sold;
- f. Value of existing fixed assets surrendered in barter;
- g. Value of existing fixed assets surrendered as capital transfers in kind.

Acquisitions of partially completed fixed assets are recorded as work-in-progress until the asset has been completed; see also paragraphs 11.62 and 11.63. Items (a) to (d) include new assets, existing assets, the value of improvements to assets and the cost of ownership transfers in respect of these assets. Items (e), (f) and (g) include disposals of assets that may cease to be used as fixed assets by their new owners: for example, vehicles sold by enterprises to households for their personal use, assets that are scrapped or demolished by their new owners and assets that are exported.

- H.6511.70 Fixed assets acquired through barter are valued at their estimated purchasers' prices plus any costs of ownership transfer. In practice, neither taxes on products nor transportation costs may apply, in which case the purchasers' prices will not differ from the basic prices of the product. Fixed assets produced for own gross fixed capital or assets transferred in kind are valued at their estimated basic prices, or by their costs of production when satisfactory estimates of their basic prices cannot be made.
- 11.6611.71 Special considerations apply to fixed assets produced by communal construction by households. If the value of the asset must be estimated on the basis of costs, and some or all of the labour is provided free, as may happen, an estimate of what the cost of paid labour would be must be included in the estimated total production costs using wage rates for similar kinds of labour in the vicinity or region. Otherwise, the value of the finished structure will be seriously underestimated. However, this estimate is not treated as compensationremuneration of employees but as gross mixed income. This income accrues to the households concerned who are then assumed to use it to "purchase" the final construction. If the construction is then handed over to government, there is negative gross fixed capital formation recorded by the community offsetting their previously recorded acquisition of the asset and positive gross fixed capital formation from the community to government, along with a capital transfer of the value of the construction from the community to government.

### **Transactions in fixed assets**

- H.67<u>11.72</u> Gross fixed capital formation in a particular category of fixed asset consists of the value of producers' acquisitions of new and existing products of this type less the value of their disposals of fixed assets of the same type. Gross fixed capital formation is not recorded until the ownership of the fixed assets is transferred to the unit that intends to use them in production. In the case of transfers of partially completed fixed assets, the asset is to be recorded as work-in-progress until the completed asset has been transferred.unless it is being constructed to order under a contract agreed in advance. Thus, nNew assets that have not yet been transferredsold form part of additions to inventories of finished goods held by the producers of the assets. Similarly, an imported product is not recorded as gross fixed capital formation until it is acquired by the unit that intends to use it.
- 11.6811.73 Table 110.2 shows the changes in assets side of table 110.1 expanded to show the entries for transactions in fixed assets, excluding those related to natural capital. It will be noted that the integrated framework of national accountsSNA recommends showing acquisitions of certain categories of these assets separately from disposals of those assets when this provides analytically useful data.
- 11.6911.74 In presentations of the capital account, gross fixed capital formation is usually shown by type of asset, where the accounting principles of the last-paragraph 11.72 are applied to each category of fixed asset in turn. Table 110.2 also incorporates the classification of fixed assets (excluding natural capital) used in the integrated framework of national accountsSNA. Each of the main categories of fixed assets is defined and described in turn below.
- <u>11.70</u> The integrated framework of national accountsSNA does not formally include a division between tangible and intangible assets in the classification. However, the categories of dwellings, other buildings and structures, machinery and equipment, and weapons systems (and cultivated biological resources; see section <u>D</u>) can be taken to correspond to tangible assets and the other categories to intangible assets.

### **Dwellings**

- 11.711.76 Dwellings are buildings, or designated parts of buildings, that are used entirely or primarily as residences, including any associated structures, such as garages, and all permanent fixtures customarily installed in residences. Houseboats, barges, mobile homes and caravans used as principal residences of households are also included, as are public monuments identified primarily as dwellings.
- 11.72
   Examples include products included in CPC 2 class 5311, residential buildings and part of CPC 2.group 387. The former class includes single and multiple dwelling buildings as well as residential buildings for communities, retirement homes, hostels, orphans etc. The latter class includes prefabricated buildings, including those intended for housing or for buildings associated with housing such as garages.
- <u>11.73</u> The costs of clearing and preparing the site for construction are part of the costs of new dwellings (and other buildings and structures) and are therefore included in the value of the buildings.
- 11.7411.79 Incomplete dwellings are recorded as work-in-progress until completion, even if are included to the extent that the ultimate user is deemed to have taken ownership, either because the construction is on own-account or as evidenced by the existence of a contract of sale or purchase. In the latter case, the work-in-progress is recorded in the accounts of the purchaser.
- 11.7511.80 Dwellings acquired for military personnel are included because they are used for the production of housing services, in the same way as dwellings acquired by civilian units.

### Other buildings and structures

<u>11.7611.81</u> Other buildings and structures comprise non-residential buildings, other structures and land improvements. These are described in turn below.

### Buildings other than dwellings

- 11.77<u>11.82</u> Buildings other than dwellings include whole buildings or parts of buildings not designated as dwellings. Fixtures, facilities and equipment that are integral parts of the structures are included. For new buildings, costs of site clearance and preparation are included. Public monuments identified primarily as non-residential buildings are also included.
- 11.7811.83 Examples include products included in CPC 2.0 class 5312, non-residential buildings, such as warehouses and industrial buildings, commercial buildings, buildings for public entertainment, hotels, restaurants, schools, hospitals, prisons etc. Prisons, schools and hospitals are regarded as buildings other than dwellings despite the fact that they may shelter institutional households.

### Other structures

- 11.79
   Other structures include structures other than buildings, including the cost of the streets, sewer,

   etc.
   The costs of site clearance and preparation are also included. Public monuments for which identification as dwellings or non-residential buildings is not possible are included as are shafts, tunnels and other structures associated with mining mineral and energy resources, and the construction of sea walls, dykes, flood barriers etc. intended to improve the quality and quantity of land adjacent to them. The infrastructure necessary for aquaculture such as fish farms and shellfish beds is also included.
- 11.8011.85 Examples include products included in CPC 2.0 group 532, civil engineering works, such as highways, streets, roads, railways and airfield runways; bridges, elevated highways, tunnels and subways; waterways, harbours, dams and other waterworks; long-distance pipelines, communication and power lines; local pipelines and cables, ancillary works; constructions for mining and manufacture; and constructions for sport and recreation.

### Table <u>10.211.2</u>: The capital account - the classification of fixed assets

11.8111.86 The construction of new public monuments constitutes gross fixed capital formation and similarly, major improvements to existing public monuments are also included in gross fixed capital formation. Public monuments are identifiable because of particular historical, national, regional, local, religious or symbolic significance. They are accessible to the general public, and visitors are often charged for admission to the monuments or their vicinity. Their owners, who may be government units, non-profit institutions serving households (NPISHs), corporations or households, typically use public monuments to produce cultural or entertainment-type services. In principle, the gross fixed capital formation in public monuments should be included in dwellings, non-residential buildings, and other structures as appropriate; in practice, it may be desirable to classify them with other structures. Consumption of fixed capitalDepreciation on new monuments, or on major improvements to existing monuments, should be calculated on the assumption of appropriately long service lives.

Land improvements

- 11.82 Land improvements are the result of actions that lead to major improvements in the quantity, quality or productivity of land, or prevent its deterioration. Activities such as land clearance, land contouring, creation of wells and watering holes that are integral to the land in question are to be treated as resulting in land improvements. Activities such as the creation of seawalls, dykes, dams and major irrigation systems which are in the vicinity of the land but not integral to it, which often affect land belonging to several owners and which are often carried out by government, result in assets that are to be classified as structures.
- **11.83** Land improvements represent a category of fixed assets distinct from the non-produced land asset as it existed before improvement. Land before improvements are effected remains a non-produced asset and as such is subject to holding gains and losses separately from price changes affecting the improvements. In cases where it is not possible to separate the value of the land before improvement and the value of those improvements, the land should be allocated to the category that represents the greater part of the value.
- **11.84**<u>11.89</u> The costs of ownership transfer on all land are to be included with land improvements.

### Machinery and equipment

- **11.85**<u>11.90</u> *Machinery and equipment cover transport equipment, machinery for information, communication and telecommunications (ICT) equipment, and other machinery and equipment.* As explained above, machinery and equipment under a financial lease are treated as acquired by the user (lessee) rather than as acquired by the lessor. Tools that are relatively inexpensive and purchased at a relatively steady rate, such as hand tools, may be excluded. Also excluded are machinery and equipment integral to buildings that are included in dwellings and non-residential buildings. Machinery and equipment other than weapons systems acquired for military purposes are included; weapons systems form another category.
- 11.8611.91 Machinery and equipment such as vehicles, furniture, kitchen equipment, computers, communications equipment, etc. that are acquired by households for purposes of final consumption are not fixed assets and their acquisition is not treated as gross fixed capital formation. However, houseboats, barges, mobile homes and caravans that are used as the principal residences of households are treated as dwellings, so that their acquisition by households is included in gross fixed capital formation.

Transport equipment

11.87<u>11.92</u> Transport equipment consists of equipment for moving people and objects. Examples include products other than parts included in CPC 2.0 division 49, transport equipment, such as motor vehicles, trailers and semi-trailers; ships; railway and tramway locomotives and rolling stock; aircraft and spacecraft; and motorcycles, bicycles, etc.

### ICT equipment

11.8811.93 Information, computer and telecommunications (ICT) equipment consists of devices using electronic controls and also the electronic components forming part of these devices. Examples are products within CPC 2.0 categories 452 and 472. In practice, this narrows the coverage of ICT equipment mostly to computer hardware and telecommunications equipment.

Other machinery and equipment

**Other machinery and equipment consists of machinery and equipment not elsewhere classified.** Examples include products other than parts and items identified in other categories of fixed capital formation included in CPC 2.0 divisions 43, general purpose machinery; 44, special purpose machinery; 45, office, accounting and computing equipment; 46, electrical machinery and apparatus; 47, radio, television and communication equipment and apparatus; and 48, medical appliances, precision and optical instruments, watches and clocks. Other examples are products other than parts included in CPC 2.0 groups 337, fuel elements (cartridges) for nuclear reactors; 381, furniture; 383, musical instruments; 384, sports goods; and 423, steam generators except central heating boilers.

### Weapons systems

11.9011.95 Weapons systems include vehicles and other equipment such as warships, submarines, military aircraft, tanks, missile carriers and launchers, etc. Most single-use weapons they deliver, such as ammunition, missiles, rockets, bombs, etc., are treated as military inventories. However, some single-use items, such as certain types of ballistic missile with a highly destructive capability, may provide an ongoing service of deterrence against aggressors and therefore meet the general criteria for classification as fixed assets.

### Costs of ownership transfer on non-produced assets

The costs of ownership transfer on non-produced assets represent produced assets but their value cannot be integrated with the value of another produced asset. They must therefore be shown as a separate category of gross fixed capital formation. An exception is made in the case of land where costs of ownership transfer are treated by convention as land improvements. Costs of ownership transfer are defined in paragraphs 11.560.48 to 11.600.52.

### Intellectual property products

- **11.92**<u>11.97</u> Examples of intellectual property products are the results of research and development, mineral exploration and evaluation, computer software (including artificial intelligence), data and databases, and entertainment, literary or artistic originals. They are characterized by the fact that most of their value is attributable to intellectual endeavour. They can be described in general terms in the following way. Intellectual property products are the result of research, development, investigation or innovation leading to knowledge or the creation of artificial intelligence systems that the developers can market or use to their own benefit in production because use of the knowledge is restricted by means of legal or other protection. The knowledge may be embodied in a free-standing product or may be embodied in another. When the latter is the case, the product embodying the knowledge has an increased price relative to a similar product without this embodied knowledge. The knowledge remains an asset as long as its use can create some form of monopoly profits for its owner. When it is no longer protected or becomes outdated by later developments, it ceases to be an asset.
- 11.93 Some intellectual property products are used solely by the unit responsible for their development or by a single unit to whom the product is transferred. Mineral exploration and evaluation is an example. Other products, such as computer software <u>(including data and databases)</u> and artistic originals, are used in two forms. The first is the original or "master copy". This is frequently controlled by a single unit but exceptions

exist as explained below. The original is used to make copies that are in turn supplied to other units. The copies may be sold outright or made available under a licence.

- 11.99 A copy sold outright may be treated as a fixed asset if it satisfies the necessary conditions, that is, it will be used in production for a period in excess of one year. A copy made available under a licence to use may also be treated as a fixed asset if it meets the necessary conditions, that is, it is expected to be used in production for more than one year and the licensee assumes all the risks and rewards of ownership. A good, but not necessary, indication is if the licence to use is purchased with a single payment for use over a multiyear period. If the acquisition of a copy with a licence to use is purchased with regular payments over a multiyear contract and the licensee is judged to have acquired economic ownership of the copy, then it should be regarded as the acquisition of an asset. If regular payments are made for a licence to use without a long-term contract, then the payments are treated as payments for a service. If there is a large initial payment followed by a series of smaller payments are treated as payments for a service. If the licence allows the licensee to reproduce the original and subsequently assume responsibility for the distribution, support and maintenance of these copies, then this is described as a licence to reproduce.
- 11.100 Intellectual property products such as software may be hosted in a cloud computing datacentre. This does not change the ownership of the license as a software asset. A user of remotely accessed software may purchase a license from a software publisher as a software asset and separately purchase the cloud computing infrastructure services of the processing time and storage needed to utilise the hosted software. Cloud computing users who do not have their own software license incur pay-per-use software license charges when they run software in the cloud. The entire fee for accessing the software developer or because it has acquired all rights to the software) or has purchased a license from the software original or software copy is a fixed asset of the cloud computing enterprise. In other cases, the cloud computing provider passes on a portion of the pay-per-use software license fees to the software publisher and receives margin income from reselling software services supplied by the software publisher. However, it may be more practical to treat the cloud computing enterprise as purchasing intermediate inputs of services from the software services on margin.
- 11.101 Subscriptions from software publishers are not cloud computing or hosting services even if the publisher delivers the software via remote access over a network. Software publishers often take advantage of remote access to distribute regular updates, making the product seem like software-as-a-service. Software-as-a-service would be normally recorded as intermediate consumption, but if the user has purchased a long-term software license, the subscription should be recorded as a software asset of the license holder (i.e., the user of the software), and the periodic software over a period lasting more than a year would be recorded as the acquisition of a fixed asset even if the software is frequently updated during the term of the license. For more information on the impact of digitalization on the measurement of the economy, see chapter 22.
- <u>11.102</u> When copies are distributed by the owner free of charge, then no flows between the owner and recipients are recorded in the SNA. If, despite making copies freely available, the owner still expects to obtain benefits, then the present value of those benefits should be recorded in its balance sheet. It may be that when the information was distributed freely it was incomplete and the owner intends to make more detailed information available at a price later. Software distributed freely at the beta test stage is one example. Alternatively, the owner justifies the expenditure on the basis of the benefits to its own production and may make copies available for marketing purposes, generating goodwill or in cases it considers deserving.
- 11.9411.103 A more prominent example in the age of digitalisation concerns open-source software which is developed, maintained, and supplied through the contributions of developers from universities, government research institutions, non-profit institutions, private corporations and individuals. The contributions by developers provided for free may be motivated by the future use of the resulting software. The value of such open-source software produced by programmers employed by corporations, government, or NPISHs is usually already included in measures of own-account software investment as estimated by the sum-of-costs method, unless the developer is an individual not being employed and remunerated. Again, for more

### information, see chapter 22.

11.9511.104 It is often the case for some intellectual property products that some of the benefits accrue to units other than the owner to the extent they stimulate the production of other intellectual property products by other units. Examples of such spillovers include a breakthrough in the development of a new class of drug leading other enterprises to develop competing drugs of the same type, and the success or failure of mineral exploration in a particular zone informing other units with exploration rights in a neighbouring zone. These are treated in the same way as other externalities in the SNA. Unless there is a quantifiable monetary impact for one or both parties, nothing is recorded in the <u>integrated framework of national accountsSNA</u>. More detailed guidance can be found in the<u>A</u> Handbook on Deriving Capital Measures of Intellectual Property Products (Organisation for Economic Co- operation and Development, <u>2009forthcoming</u>) is under preparation.

### Research and development

- 11.9611.105 Intellectual property products include the results of research and development (R&D). Research and [experimental] development consists of the value of expenditures on creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and use of this stock of knowledge to devise new applications. This does not extend to including human capital as assets within the SNA. The value of research and development (R&D) should be determined in terms of the economic benefits it is expected to provide in the future. This includes the provision of public services in the case of R&D acquired by government. In principle, R&D that does not provide an economic benefit to its owner does not constitute a fixed asset and should be treated as intermediate consumption. Unless the market value of the R&D is observed directly, it may, by convention, be valued at the sum of costs, including the cost of unsuccessful R&D, as described in chapter <u>76</u>.
- 11.97<u>11.106</u> R&D should be recognized as part of capital formation. In order to achieve this, several issues have to be addressed. These include deriving measures of research and development, price indices and service lives. Specific guidelines, together with handbooks on methodology and practice, will-provide a useful way of working towards solutions that give the appropriate level of confidence in the resulting measures.
- 11.98<u>11.107</u> With the inclusion of R&D expenditure as capital formation, patented <u>entitiesitems</u> no longer feature as assets in the SNA. The patent agreement is to be seen instead as the legal agreement concerning the terms on which access to the R&D is granted. The patent agreement is a form of licence to use which is treated as giving rise to payments for services or the acquisition of an asset.

Mineral exploration and evaluation

- 11.9911.108 Mineral exploration and evaluation consists of the value of expenditures on exploration for petroleum and natural gas and for non-petroleum deposits and subsequent evaluation of the discoveries made. These expenditures include prelicence costs, licence and acquisition costs, appraisal costs and the costs of actual test drilling and boring, as well as the costs of aerial and other surveys, transportation costs, etc., incurred to make it possible to carry out the tests. Re-evaluations may take place after commercial exploitation of the reserve has started and the cost of these re-evaluations is also included in gross fixed capital formation.
- **11.100** Mineral exploration is undertaken in order to discover new deposits of minerals or fuels that may be exploited commercially. Such exploration may be undertaken on own account by enterprises engaged in mining or the extraction of fuels. Alternatively, specialized enterprises may carry out exploration either for their own purposes or for fees. The information obtained from exploration influences the production activities of those who obtain it over a number of years. The expenditures incurred on exploration within a given accounting period, whether undertaken on own account or not, are therefore treated as expenditures on the acquisition of an intellectual property product and included in the enterprise's gross fixed capital formation.
- 11.101<u>11.110</u> The expenditures included in gross fixed capital formation include not only the costs of actual test drillings and borings, but also the costs incurred to make it possible to carry out tests, for example, the costs of aerial or other surveys, transportation costs, etc. The value of the resulting asset is not measured by the

value of new deposits discovered by the exploration but by the value of the resources allocated to exploration during the accounting period. When the activities are carried out by contractors, the prices charged by these contractors, including their operating surplus, become part of the value of the expenditures incurred. Consumption of fixed capital Depreciation may be calculated for such assets by using average service lives similar to those used by mining or oil corporations in their own accounts.

### Computer software, data and databases

11.10211.111 Computer software, data and databases are grouped together because a computerized database, including the relevant data, cannot be developed independently of a database management system (DBMS), which is itself computer software.

### Computer software, including artificial intelligence

- 11.10311.112 Computer software consists of computer programs, program descriptions and supporting materials for both systems and applications software. <u>It also includes artificial intelligence systems</u>. Gross fixed capital formation in computer software includes both the initial development and subsequent extensions of software as well as acquisition of copies that are classified as assets.
- 11.104<u>11.113</u> The development of computer software represents the development of an intellectual property product. It is treated as an asset if it is to be used in production by its owner for more than one year. The software may be intended only for own use or may be intended for sale by means of copies. If copies of the software are sold on the market, their treatment follows the principles described in paragraph <u>11.99 to</u> <u>11.101.40.100</u>. Software purchased on the market is valued at purchasers' prices, while software developed in-house is valued at its estimated basic price, or at its costs of production if it is not possible to estimate the basic price.

# Data and databases

- <u>11.114</u> Data and databases consist of <u>electronic</u> files of data, <u>including the information content</u>, organized in such a way as to permit resource-effective access and use of the data, <u>either</u>. Databases may be developed exclusively for own use <u>in production for more than one year</u>, or for sale as an entity or for sale by means of a licence to access the information contained. The standard conditions apply for when an own-use database, a purchased database or the licence to access a database constitutes an asset.
- 11.10511.115 Data and databases are conceptually distinct types of intellectual property products, but they are produced using similar inputs and measuring them separately is often difficult. Moreover, transactions in databases generally include the value of the data stored in the database. Data and databases are therefore combined into a single detailed class of intellectual property product. The creation of data and databases will generally have to be estimated by a sum-of-costs method.
- 11.116 The creation of a database will generally have to be estimated by a sum of costs approach. The cost of the database management system (DBMS) used should not be included in the costs of creating a database, but be treated as a computer software asset unless it is used under an operating lease. The cost of preparing data in the appropriate format is included in the cost of the database but not the cost of acquiring or producing the data(see below). Other costs will include staff time estimated on the basis of the amount of time spent in developing the database, an estimate of the capital services of the assets used in developing the database and costs of items used as intermediate consumption.
- 11.117 The main cost elements related to data consist of the costs of planning, preparing, and developing a data production strategy; the costs associated with accessing, recording, and storing information embedded in observable phenomena, which may include, but is not limited to, explicit purchases related to accessing observable phenomena or already produced data; and the costs associated with processing, cleaning, and organising the data to allow for use in productive activities.
- 11.10611.118 Data and data bases for sale should be valued at their market price, which includes the value of the
information content. If the value of a software component is available separately, it should be recorded as the sale of software.

Entertainment, literary and artistic originals

- 11.107 11.119 Entertainment, literary and artistic originals consist of the original films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied. Such works are frequently developed on own account. Subsequently they may be sold outright or by means of licences. The standard conditions on when the originals and copies are recognized as fixed assets apply. If an original is acquired as a valuable, its production does not count as own account production of a fixed asset but it may have been classified as work-in-progress.
- 11.120 An original purchased on the market is valued at the purchaser's price. One developed in-house is valued at its estimated basic price or at its costs of production if it is not possible to estimate the basic price.
- 11.121
   Households may produce user-generated content on digital platforms, which has an expected service life of more than one year. If the household receives remuneration from the content that it creates and uploads (e.g., advertising or subscription revenue), the investment in the relevant entertainment, literary or artistic original is within the production boundary of the integrated framework of national accounts, and the asset could be valued either at the net present value of the benefits generated with the asset, or as the sum of costs needed to produce the asset.
- 11.108Creation of entertainment, literary and artistic originals for personal enjoyment a common leisure<br/>activity is outside the production boundary. A complicating factor is that online platforms may benefit from<br/>user-generated content. For example, when personal posts attract the user's followers to the platform, they<br/>provide economic benefits, for example in the form of advertising revenue, to the platform. However, user-<br/>generated content cannot be considered an asset of the platform. The benefits accruing to the platform are<br/>externalities, positive spillovers of the user's production of leisure services. For more information on the<br/>impact of digitalisation on the measurement of the economy, see chapter 22.

Other intellectual property products

11.109<u>11.123</u> Other intellectual property products include any such products that constitute fixed assets but are not captured in one of the specific items above.

# 2. Changes in inventories (excluding natural capital)

- 11.11011.124 Changes in inventories are measured by the value of the entries into inventories less the value of withdrawals and less the value of any recurrent losses of goods held in inventories during the accounting period. Some of these acquisitions and disposals are attributable to actual purchases or sales, but others reflect transactions that are internal to the enterprise.
- 11.11111.125 It is useful to distinguish between two functions performed by an enterprise: its function as a producer of goods and services and its function as an owner of assets. When a good is entered into inventories it is acquired as an asset by the enterprise in its capacity as owner either by purchase (or barter) or by an internal transaction with itself as the producer. Conversely, a good leaving inventories represents the disposal of an asset by the owner either by sale or other use, by an internal transfer to the producer or possibly as a result of recurrent losses (recurrent wastage, accidental damage or pilfering).

# Storage and stocks of inventories

11.112<u>11.126</u> Most goods going into inventories simply remain there until they are withdrawn in the same state as when they entered. Not infrequently, the price of the goods will have increased while they are in inventories, but these increases are not due to production but are simply holding gains. There are some goods,

though, where the passage of time in store changes the character of the goods. In such cases, the increase in value due to storage is to be treated as production and not as holding gains, though holding gains (or losses) may occur as well.

- 11.11311.127 The indication that storage is being undertaken as a production activity is that the price of the good stored, relative to the general level of prices, is expected to increase by a certain amount over a predetermined time. For example, winter wheat may be expected, on the basis of past experience, to fetch a given multiple of its price at harvest. Similarly, wine that is several years old is more valuable than the current year's vintage by a predictable factor.
- 11.114<u>11.128</u> The activity of storage may be undertaken by any institutional unit, not just the original producer of the product or may be undertaken by several units in succession if the ownership of the goods changes during storage.
- 11.11511.129 The goods in storage are classified as work-in-progress and not finished goods. The increase in value during the accounting period up to the expected level at that time is treated as production of storage; any difference from this level is treated as a holding gain or loss. The method of valuing storage is described in the annex to chapter 67. The expected level of price increase for items being stored for more than one year, though, needs to be calculated in accordance with the principles of valuing work-in-progress described below.

# Valuation

- 11.11611.130 The enterprise in its capacity as a producer may obtain goods or services for intermediate consumption either by purchasing them on the market for immediate use or by internal transfers out of inventories. In order to ensure that all the goods and services used for intermediate consumption are consistently valued at current prices, the goods transferred out of inventories are valued at purchasers' prices current at the time of the withdrawal from inventories.
- 11.11711.131 Similarly, the output produced by the producer may either be sold or otherwise disposed of or be transferred to inventories as finished products or work-in-progress. In order to ensure that output is consistently valued, finished goods transferred into inventories are valued as if they were sold at that time, while additions to work-in-progress are given the value they have at the time they are added to inventories.

# Table 10.311.3: The capital account - changes in inventories and valuables

## Valuation of work-in-progress

- 11.118\_11.132 \_\_\_\_\_\_Much work-in-progress is of short duration and occurs only because production is a continuous process and some goods will be incomplete at the end of one accounting period but will be completed long before the end of the next. For output with a production period of a year or less, and assuming that prices and costs remain stable during the period of production, the value of the additions to work-in-progress for non-agricultural products within a given accounting period can be approximated by calculating the proportion of the total production costs incurred in that period and applying that ratio to the basic price realized by the finished product. Thus, the value of the output of the finished product is distributed over the accounting periods in which it was produced in proportion to the costs incurred in each period. If the average levels of prices and costs change from period to period, the output should be allocated initially using the prices and costs at the time the production is finished, and then the values of the work-in-progress thus calculated for earlier periods should be recalculated in proportion to the change in average cost levels from period to period.
- **11.119**<u>11.133</u> For agricultural products, this method of allocating output over multiple periods may not be satisfactory. A disproportionate share of the costs may be incurred in sowing a crop with little if any costs being incurred until harvest. Prorating the output to the physical growth of the crop may be considered a possibility but in cases where there is serious risk of climatic damage just before the crop is harvested, this may give over-optimistic indications of probable output. Pragmatic distributions over quarters based on past experience may have to be used, or where multi\_cropping is the norm, to allow the whole output of each crop to be counted in the period when it is harvested.

- 11.12011.134 There are important activities, such as construction of buildings, structures and complex machinery, where the production process may take several years. In these cases, the valuation of the partially complete product requires careful consideration especially since such large projects are by their nature very costly.
- 11.12111.135 Even if one fifth of the work involved is put in place annually over a period of five years, it does not follow that one fifth of the value (assuming zero inflation for simplicity) should be recorded in each year. The work put in place in the first year cannot be used for four more years and so the value of it must be discounted to allow for this delay. In the second year, the value of the work put in place in the first year will increase by one discount factor and this should be added to the value of the work put in place in the second year and so on. This case is discussed in more detail in chapter 2017.

# **Transactions in inventories**

11.12211.136 The transactions in the capital account relating to inventories show the change in the level of inventories of each type. The changes comprise the additions less withdrawals and less regular losses from inventories. Table 1011.3 shows the expansion of table 1011.1 to incorporate changes in inventories. Each of the categories is described and defined below.

## Materials and supplies

- 11.12311.137 Materials and supplies consist of all products that an enterprise holds in inventory with the intention of using them as intermediate inputs into production. Not all necessarily get used in this way, however, as some may be lost as a result of physical deterioration, or recurrent accidental damage or pilfering. Such losses of materials and supplies are recorded and valued in the same way as materials and supplies actually withdrawn to be used up in production.
- 11.12411.138 Enterprises may hold a variety of quite different kinds of goods under the heading of materials and supplies, the most common types being fuels, industrial raw materials, agricultural materials, semi-processed goods, components for assembly, packaging materials, foodstuffs, office supplies, etc. Every enterprise, including non-market producers owned by government units, may be expected to hold some inventories of materials and supplies, if only inventories of office supplies.
- 11.12511.139 Materials and supplies do not include works of art or stocks of precious metals or stones acquired by enterprises as valuables. However, there are some producers that do use gold, diamonds, etc. as intermediate inputs into the production of other goods or services, for example, manufacturers of jewellery or dentists. Stocks of gold, diamonds, etc., intended for use in production are recorded under materials and supplies.

# Work-in-progress

- 11.12611.140 Work-in-progress consists of output produced by an enterprise that is not yet sufficiently processed to be in a state in which it is normally supplied to other institutional units. Work-in-progress occurs in all industries, but is especially important in those in which some time is needed to produce a unit of finished output, for example, in agriculture, or in industries producing complex fixed assets such as ships, dwellings, software or films. Work-in-progress can therefore take a wide variety of different forms ranging from growing crops to partially completed film productions or computer programs. Although work-in-progress is output that has not reached the state in which it is normally supplied to others, its ownership ismay nevertheless be transferable, if necessary. For example, the ownership of a partially completed asset may be transferred to the ultimate owner, or it may be sold under exceptional circumstances such as the liquidation of the enterprise.
- 11.12711.141 Work-in-progress must be recorded for any output that is not complete at the end of the accounting period. This is a particular problem for output taking a long time to complete, such as construction. The shorter the accounting period, the more important work-in-progress is likely to be relatively to finished output. In particular, it is likely to be more significant for quarterly accounts than annual accounts, if only

because the production of many agricultural crops is completed within a year but not necessarily within a quarter. The only exceptions to recording iIncomplete work is recorded as work-in-progress are for partially completed projects for which the ultimate owner is deemed to have taken ownership, either because the production is for own use or as evidenced by the existence of a contract of sale or purchase.

- 11.12811.142 Reductions in work-in-progress take place when the production process is completed. At that point, all work-in-progress is reclassified as a finished product. This reclassification appears in the other changes in the volume of assets account.
- <u>11.129</u><u>11.143</u> If prices and costs have risen, work-in-progress carried forward from previous periods must be revalued using the prices and costs of the period in which the production is finished.
- 11.13011.144 Current losses from work-in-progress resulting from physical deterioration or recurrent accidental damage or pilfering should be deducted from the additions to work-in-progress accruing as a result of the production carried out in the same period.
- 11.131
   11.145
   Work-in-progress can beis subdivided between work-in-progress on cultivated assetsbiological resources, as discussed under natural capital, and other work-in-progress, as defined below. Other work-in-progress consists of output (other than on cultivated biological resources) that is not yet sufficiently processed to be in a state in which it is normally supplied to other institutional units.

#### 11.132 Other work-in-progress

#### 11.133

# Finished goods

- 11.13411.146 Finished goods consist of goods produced as outputs that their producer does not intend to process further before supplying them to other institutional units. A good is finished when its producer has completed his intended production process, even though it may subsequently be used as an intermediate input into other processes of production. Thus, inventories of coal produced by a mining enterprise are classified as finished products, although inventories of coal held by a power station are classified under materials and supplies. Inventories of batteries produced by a manufacturer of batteries are finished goods, although inventories of the same batteries held by manufacturers of vehicles and aircraft are classified under materials and supplies.
- 11.13511.147 Inventories of finished goods may be held only by the enterprises that produce them. Finished goods entering inventories are valued at the basic prices of those goods at the times the entries take place; finished goods withdrawn from inventories are valued at the basic prices at the time when their withdrawals take place. Current losses of finished goods resulting from physical deterioration or recurrent accidental damage or pilfering should be valued at the prices at the time when the losses occur.

#### Military inventories

11.13611.148 Military inventories consist of single-use items, such as ammunition, missiles, rockets, bombs, etc., delivered by weapons or weapons systems. As noted above in the discussion of weapons systems as fixed capital, most single-use items are treated as inventories but some types of missiles with highly destructive capability may be treated as fixed capital because of their ability to provide an ongoing deterrence service against aggressors.

## Goods for resale

11.137<u>11.149</u> Goods for resale are goods acquired by enterprises, such as wholesalers or retailers, for the purpose of reselling them to their customers. Goods for resale are not processed further by the enterprises that purchase them, except for presenting them for resale in ways that are attractive to their customers. Thus, goods for resale may be transported, stored, graded, sorted, washed, packaged, etc. by their owners but are not otherwise transformed.

- 11.13811.150 Goods for resale entering the inventories of the enterprises are valued at their actual or estimated purchasers' prices. These prices include any additional transportation charges paid to enterprises other than the suppliers of the goods, but not the costs of any transport services produced on own account by the enterprise taking delivery. In principle, goods acquired by barter are valued at their estimated purchasers' prices at the time of acquisition. However, because there are no taxes or margins on bartered goods, the purchaser's price is the same as the basic price.
- **11.139**<u>11.151</u> Goods for resale withdrawn from inventories are valued at the purchasers' prices at which they can be replaced at the time they are withdrawn as distinct from the purchasers' prices that may have been paid for them when they were acquired. Reductions in inventories are valued in this way whether the goods withdrawn are sold at a profit or at a loss, or even not sold at all as a result of physical deterioration or recurrent accidental damage or pilfering.
- 11.14011.152 By convention, goods acquired by government for distribution as social transfers in kind but that have not yet been so delivered are also included in goods for resale.

# 3. Acquisitions less disposals of valuables

## The asset boundary

11.14111.153 Valuables include precious metals and stones, antiques and other art objects and other valuables. However, not all items that may be described by one of these titles should necessarily be included as a valuable in the balance sheet of the owner. The intent of the heading is to capture those items that are often regarded as alternative forms of investment. At various times, investors may choose to buy gold rather than a financial asset and pension funds have been known to buy "old master" paintings when the prices of financial assets were behaving in a volatile manner. Individuals (households in SNA terminology) may also choose to acquire some of these items knowing that they may be sold if there is a need to raise funds.

# Valuation

11.142<u>11.154</u> Costs of ownership transfer, such as valuers' and auctioneers' margins, are often incurred when valuables are exchanged. As with other non-financial assets, these costs are treated as gross capital formation and included in the value of the items when recorded in the balance sheet.

# **Transactions in valuables**

11.14311.155 A possible categorization of valuables is: precious metals and stones; antiques and other art objects; and other valuables. This list should be regarded as indicative and supplementary rather than a standard breakdown. The context of each category is described to assist in identifying and valuing valuables.

# Precious metals and stones

11.144<u>11.156</u> Precious metals and stones are treated as valuables when they are not held by enterprises for sale or use as inputs into processes of production nor are held as monetary gold and are not held as a financial asset in the form of unallocated metal accounts.

## Antiques and other art objects

11.145<u>11.157</u> Paintings, sculptures, etc., recognized as works of art and antiques are treated as valuables when they are not held by enterprises for sale. In principle, museum exhibits are included under valuables.

# Other valuables

11.14611.158 Other valuables not elsewhere classified include such items as collections of stamps, coins, china, books etc. that have a recognized market value, and fine jewellery, fashioned out of precious stones, and metals of significant and realizable value. It may also include non-fungible tokens (NFTs) that only allow for personal use of another product or asset (usually a digital valuable). Some of these NFTs may initially be recorded as final consumption expenditure, but over time gain more features of a valuable. NFTs that grant limited commercial rights are recorded as part of contracts, leases and licenses; see paragraph 11.170.

# C. Acquisitions less disposals of non-produced non-financial assets (excluding natural capital)

- 11.14711.159 Excluding non-produced natural capital (see section D), Tthere are three distinct types of non-produced non-financial assets in the SNA: natural resources, contracts, leases and licences, crypto assets without a corresponding liability designed to act as a medium of exchange, and purchased goodwill and marketing assets. These three types of assets have little in common except that they are all non-produced and non-financial. A separate section discusses each of the three.
- 11.148<u>11.160</u> Table 1011.4 shows table 1011.1 expanded to show the standard detail of non-produced non-financial assets. Each of the categories is discussed under the appropriate section.

 Table 10.411.4:
 The capital account - non-produced non-financial assets

# 1. Contracts, leases and licences (excluding natural capital)

# The asset boundary

- 11.149<u>11.161</u> Contracts, leases and licences are treated as assets only when both the following conditions are satisfied.
  - a. The terms of the contract, lease or licence specify a price for the use of an asset or provision of a service that differs from the price that would prevail in the absence of the contract, lease or licence.
  - b. One party to the contract must be able legally and practically to realize this price difference.

The second condition presupposes that a market for the contract exists. It is recommended that in practice contracts, leases and licences should only be recorded in the accounts when the holder does actually exercise <u>the</u>-right to realize the price difference.

- 11.15011.162 Part 5 of eChapter 2717 discusses the whole question of the treatment of leases within the integrated framework of national accountsSNA and should be consulted if there is doubt about whether a contract, lease or licence should be treated as an asset.
- 11.151<u>11.163</u> As with natural resources, t<u>T</u>he costs of ownership transfer on the acquisition and disposal of contracts, leases and licences should be shown separately as gross capital formation.

## Types of assets included in contracts, leases and licences

11.15211.164 There are four classes of contracts, leases and licences considered to be assets in the SNA: marketable operating leases, permits to use natural resources, permits to undertake specific activities, and entitlement to future goods and services on an exclusive basis, and non-fungible tokens.

# Marketable operating leases

**11.153**<u>11.165</u> Marketable operating leases are third-party property rights relating to fixed assets. An example is where a tenant of a building has a fixed rental but the building could fetch a higher rental in the absence of the lease. If, in these circumstances, the tenant is able both legally and practically to sublet the building, then he has an asset of the type of a marketable operating lease.

### Permits to undertake specific activities

<u>11.15411.166</u> A permit to undertake a specific activity is one where:

- a. the permits are limited in number and so allow the holders to earn monopoly profits,
- b. the monopoly profits do not come from the use of an asset belonging to the permit-issuer,
- c. a permit holder is able both legally and practically to sell the permit to a third party.
- Such permits are issued mainly by government but may also be issued by other units.
- 11.15511.167 When governments restrict the number of cars entitled to operate as taxis or limit the number of casinos permitted by issuing licences, they are in effect creating monopoly profits for the approved operators and recovering some of the profits as the fee. The incentive to acquire such a licence is that the licensee believes that he will thereby acquire the right to make monopoly profits at least equal to the amount he-that was paid for the licence. This stream of future income is treated as an asset if the licensee can realize this by on-selling the asset. The type of asset is described as a permit to undertake a specific activity. The value of the asset is determined by the future stream of monopoly profits.
- 11.15611.168 It is less common for units other than government to be able to limit the participation in a given activity. One instance may be where the owner of property limits the numbers of units allowed to operate on the his property, for example a hotel with a policy of only allowing one taxi firm to pick up guests. In this sort of case, the permits are treated as giving rise to payments for services. There is no reason in principle why such permits could not be treated as assets if they were marketable though this may not be a common situation.

## Entitlement to future goods and services on an exclusive basis

11.169 Entitlement to future goods and services on an exclusive basis relates to the case where one party which has contracted to purchase goods or services at a fixed price at a time in the future is able to transfer the obligation of the second party to the contract to a third party. Examples are footballers' contracts, a publisher's exclusive right to publish new works by a named author or issue recordings by named musicians.

# Non-fungible tokens

 11.157
 11.170
 Non-fungible tokens relate to digital records hosted on a blockchain that are associated with a digital or physical asset or product but that are distinct from that asset or product. In some cases, these non-fungible tokens grant limited commercial rights from which the owner can derive economic benefits (e.g., some form of royalties). These tokens should be recorded as non-produced non-financial assets. Acquisitions of these assets should be valued at their exchange values.

# 2. Crypto assets without a corresponding liability designed to act as a medium of exchange

 11.171
 Crypto assets without a corresponding liability designed to act as a medium of exchange are crypto assets for which there is no issuer. They consist of crypto assets without a corresponding liability designed to act as a general medium of exchange and those designed to act as medium of exchange within a platform only. Different from similar assets issued by, for example, a central bank, crypto assets without a corresponding

liability are recorded as non-produced non-financial assets, and not as financial assets, mainly because a counterpart liability cannot be established. In addition, it can be noted that many of these crypto assets do not yet act as a medium of exchange; instead they are often looked upon as a store of value.

- 11.172 The recording as non-produced non-financial assets means that purchases of goods or services using these assets are considered to be barter transactions. The valuation of these transactions, similar to direct acquisitions or disposals of crypto assets, can be determined by the market price of the relevant crypto assets at the date of exchange.
- 11.173 Crypto assets more generally are a relatively new phenomenon, certainly at the time of writing these standards. As a consequence, the role of crypto assets without a counterpart liability designed to act as a medium of exchange may change in the future, and such crypto assets may qualify as money, to be recorded as financial assets. Important conditions for such a classification are that these assets are (i) authorised by government, (ii) generally accepted as a means of payments, including paying taxes with such assets; (iii) serving as a unit of account; and (iv) widely used as a medium of exchange. In respect of these future developments, the classification of crypto assets without a counterpart liability designed to act as a medium of exchange has been put on the research agenda (see Annex 5)

# 2.3. Purchased Ggoodwill and marketing assets

- 11.15811.174 Potential purchasers of an enterprise are often prepared to pay a premium above the net value of its individually identified and valued assets and liabilities. This excess is described as "goodwill" and reflects the value of corporate structures and the value to the business of an assembled workforce and management, corporate culture, distribution networks and customer base. It may not have value in isolation from other assets, but it enhances the value of those other assets. Looked at another way, it is the addition to the value of individual assets because they are used in combination with each other.
- 11.15911.175 Purchased Ggoodwill cannot be separately identified and sold to another party. The value has to be derived by deducting from the sale value of the corporation the value of assets and liabilities classified elsewhere within the asset boundary of the SNA. (In practice, since it is estimated as a residual, an estimate of goodwill will also reflect errors and omissions in the valuation of other assets and liabilities.)
- 11.16011.176 As well as residual errors, the value of purchased goodwill may include the value to the corporation of items known as marketing assets. *Marketing assets consist of items such as brand names, mastheads, trademarks, logos and domain names.* A brand can be interpreted as far more than just a corporate name or logo. It is the overall impression a customer or potential customer gains from their experience with the company and its products. Interpreted in that wider sense it can also be seen to encompass some of the characteristics of goodwill such as customer loyalty.
- 11.16111.177 The value of purchased goodwill and marketing assets is defined as the difference between the value paid for an enterprise as a going concern and the sum of its assets less the sum of its liabilities, each item of which has been separately identified and valued. Although goodwill is likely to be present in most corporations, for reasons of reliability of measurement it is only recorded in the integrated framework of national accountsSNA when its value is evidenced by a market transaction, usually the sale of the whole corporation. Exceptionally, identified marketing assets may be sold individually and separately from the whole corporation in which case their sale should also be recorded under this item.

# D. <u>Acquisitions less disposals of natural capital</u>

- <u>11.178</u> Natural capital consists of two distinct classes of assets: natural resources and ecosystem assets. The former are recognised in the integrated framework of national accounts, and the latter are not.
- 11.179Natural resources are assets that naturally occur, such as land, water resources, timber and fish stocks, and<br/>mineral and energy resources that have an economic value and over which ownership may be enforced and<br/>transferred (see below for a more detailed discussion). In monetary terms, the asset boundaries of the SEEA<br/>2012 Central Framework and the integrated framework of national accounts are the same. In physical terms,<br/>the asset boundary of the SEEA 2012 Central Framework is broader and includes all natural resources and

areas of land of an economic territory that may provide resources and space for use in economic activity. Thus, the scope in physical terms is not limited to those assets with economic value.

- 11.180 Ecosystem assets are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions, from which benefits can be derived that are used in economic and other human activity. Ecosystem assets are not recognised in the system of national accounts, mainly because no monetary benefits can be derived from them. An exception may be related to certain provisioning types of services which result in monetary benefits and as such may be implicitly included in the value of natural resources, such as agricultural land or forest land. Ecosystem assets are at the heart of SEEA Ecosystem Accounting.
- 11.181
   For more information on ecosystem assets, and accounting for environmental sustainability more generally, see chapter 35 and the two SEEA standards.
- 11.16211.182 In the integrated framework of national accounts, natural resources are broken down into five asset categories: (i) land; (ii) mineral and energy resources; (iii) biological resources; (iv) water resources; and (v) other natural resources. In the discussion below, a distinction is made between biological resources and the other types of natural resources. The main reason for this is that biological resources are a mixture of produced and non-produced assets, while the other categories exclusively consist of non-produced nonfinancial assets.

# 1. Land, mineral and energy resources, water resources and other natural resources

## The asset boundary

- 11.163<u>11.183</u> As noted before, Nnot all environmental resourcesassets qualify as economic assets. It is useful, therefore, to delineate those naturally occurring resources that fall within the asset boundary of the integrated framework of national accountsSNA from those that do not.
- 11.16411.184 In the first place, it must be noted that the accounts and balance sheets of the integrated framework of national accountsSNA are compiled for institutional units or groups of units and can only refer to the values of assets that belong to the units in question. Only those naturally occurring resources over which ownership rights have been established and are effectively enforced can therefore qualify as economic assets and be recorded in balance sheets. They do not necessarily have to be owned by individual units, and may be owned collectively by groups of units or by governments on behalf of entire communities. Certain naturally occurring resources, however, may be such that it is not feasible to establish ownership over them: for example, air, or the oceans. In addition, there may be others that cannot be treated as economic assets because they do not actually belong to any particular units. These include not only those whose existence is unknown but also those, including uncultivated forests, that may be known to exist but remain so remote or inaccessible that, in practice, they are not under the effective control of any units.
- **11.165**<u>11.185</u> Secondly, in order to comply with the general definition of an economic asset, natural assets must not only be owned but must also be capable of bringing economic benefits to their owners, given the technology, scientific knowledge, economic infrastructure, available resources and set of relative prices prevailing on the dates to which the balance sheet relates or expected to do so in the near future. Thus, known deposits of minerals that are not commercially exploitable in the foreseeable future are not included in the balance sheets of the SNA, even though they may possibly become commercially exploitable at a later date as a result of major, unforeseen advances in technology or major changes in relative prices.
- 11.16611.186 In the case of mineral and energy resources, SEEA 2012 Central Framework distinguishes three classes based on the United Nations Framework Classification (UNFC) for Fossil Energy and Mineral Resources: class A: commercially recoverable resources; class B: potentially commercially recoverable resources; and class C: non-commercial and other known deposits. The measurement of monetary estimates is typically restricted to the first class, which in practice could be approximated by those resources for which permissions to exploit have been granted, and/or those for which the existence is explicitly recognised by (past) monetary transactions. Potential mineral and energy resources where it is not foreseen that they will be exploited in the near future are thus explicitly excluded.

# **Ownership** of assets

- **11.167**<u>11.187</u> All owners and purchasers of land and immovable natural resources within the economic territory are deemed to have a centre of economic interest in the economy. If an owner or purchaser would not otherwise qualify as a resident unit, a notional resident unit is created for this purpose. The notional resident unit is deemed to purchase the land while the non-resident is deemed to purchase the equity of the notional unit and thus acquires a financial instead of a non-financial asset. Thus, all purchases and sales of land normally take place between resident units. The one exception is when the boundaries of the economic territory itself are changed, for example, when a foreign government, or international organization, purchases or sells land that is added to, or taken away from, the enclave in which its embassy or offices are located.
- 11.16811.188 Moreover, as purchases and sales of land and natural resources are recorded excluding costs of ownership transfer for both buyers and sellers, the total value of the purchases and sales of land and natural resources must be equal to each other at the level of the total economy, although not at the level of individual sectors or subsectors.
- <u>11.189</u> Similarly, it is assumed that extraction of subsoil resources can only be undertaken by resident institutional units. As soon as an enterprise starts to prepare to establish for extraction, for example by obtaining the requisite licences, it is assumed to become resident at that point.
- 11.190 In the case of mineral and energy resources, a government is often the legal owner of the resources. Once a decision is taken to extract the resources, a license is given to a user/extractor to exploit the resources. In return for the license, the extractor typically pays an annual rent to the government. Any payments made by the user/extractor of a natural resource to the owner of the natural resource, which are linked to the use/extraction of that resource, in particular to the quantity and/or value of that resource, should be recorded as rent. These would include, for example, royalties, sur-taxes, and permits. However, payments that are paid by the user/extractor on the same basis as other corporations who are not users/extractors of natural resources (e.g., standard rate corporation taxes, dividends, payments for services) should not be recorded as rent.
- 11.169The full resource rent can be estimated using the residual value method, by deducting from outputall costs related to the extractions of the resources, including services related to the capital used in production(for more details, see the annex to chapter 4). The government often does not appropriate the full resourcerent which can be derived from the exploitation of mineral and energy resources. If this is the case, the assetshould be allocated to government and the extractor in line with the estimated appropriation of future resourcerents. The coming into existence of the relevant resources is recorded as an other change in the volume ofassets and liabilities, and is therefore not recorded on the capital account.

## Valuation

11.17011.192 Since land, mineral and energy resources, water resources and the likenatural resources are nonproduced, the costs of ownership transfer, which are part of fixed capital formation, must be shown separately in the capital account and not as part of the value of the transaction in the non-produced asset. For land, the costs of ownership transfer are treated, by convention, as being included with land improvements.

# Transactions in natural resources

11.171<u>11.193</u> Transactions in natural resources are shown as acquisitions less disposals of the asset in question, according to the classification given in table <u>1011</u>.4.

#### Land

11.17211.194 Land consists of the ground, including the soil covering and any associated surface waters, over which ownership rights are enforced and from which economic benefits can be derived by their owners by holding or using them. The value of land excludes any buildings or other structures situated on it or running through it; cultivated crops, trees and animals; mineral and energy resources; non-cultivated biological resources and water resources below the ground. The associated surface water includes any inland waters (reservoirs, lakes, rivers, etc.) over which ownership rights can be exercised and that can, therefore, be the subject of transactions between institutional units. However, water bodies from which water is regularly extracted, against payment, for use in production (including for irrigation) are included not in water associated with land but in water resources.

- **11.173**<u>11.195</u> As explained above, land improvements and the costs of ownership transfer on land are treated as fixed assets and shown separately. In consequence, acquisitions and disposals of natural land are recorded at the same value for both the purchaser and the seller. Since both parties to the transaction must be residents, it follows that, for the economy as a whole, the aggregate value of total purchases of land must equal the aggregate value of total sales, although this is not generally true at lower levels of aggregation, such as individual sectors or subsectors. The value of acquisitions less disposals of land is thus zero for the economy as a whole (excluding transactions that change the boundary of the economic territory itself, as noted in paragraph-10.17011.186.
- 11.196 Buildings, or other structures, and plantations are often purchased or sold together with the land on which they are situated, without separate valuations being placed on the structures and the land. Even if it is not feasible to obtain separate valuations, as may be the case for existing structures, it may be possible to determine which out of the land or the structure accounts for most of their combined value and to classify the transaction as the purchase of land or of a structure depending upon which has the greater value. If it is not possible to determine whether the land or the structure is the more valuable, by convention, the transaction should be classified as the purchase of a structure, that is, as gross fixed capital formation. A similar convention holds for plantations.
- 11.197 Similar considerations apply in the case of mineral and energy resources and biological resources. The value of land may be higher due to the availability of subsoil resources, or the possibility to exploit renewable energy by having permission to put, for example, wind turbines or fields of solar panels on the land. In addition to the relevant structures, the value will also be affected by the net present value of future resource rents derived from exploiting these mineral and energy resources. In the case of biological resources, it may also be difficult to delineate the value of land from the value of plantations yielding repeat products as well as from the net present value of future resource rents related to the exploitation of forests for timber production (excluding work-in-progress). In all these cases, the transaction should preferably be recorded in line with the asset classification. As this may show to be difficult to apply in practice, the transaction is to be recorded as a purchase of land or the purchase of a natural resource depending upon which has the greater value. If it is not possible to determine whether the land or the natural resource is the more valuable, by convention, the transaction should be classified as (the purchase of) land. In all cases, potential double-counting, under land as well as the relevant natural resource, should be avoided.
- 11.174<u>11.198</u> The <u>integrated framework of national accounts</u>SNA does not specify a disaggregation of land but it is recommended that if a disaggregation is required, it should be according to that used in the SEEA.

#### Mineral and energy resources

- 11.17511.199 The first group of Mmineral and energy resources consists of non-renewable mineral and energy reserves located on or below the earth's surface that are economically exploitable, given current technology and relative prices. Ownership rights to the mineral and energy resources are usually separable from those to the land itself. Non-renewable Mmineral and energy resources consist of knowncommercially recoverable reserves of coal, oil, gas or other fuels and metallic ores, and non-metallic minerals, etc., that are located below or on the earth's surface, including reserves under the sea. The transactions recorded in the capital account refer only to those mineral and energy resources over which ownership rights have been established. In most cases, mineral and energy resources may be owned separately from land below which they are located, but in other cases the law may stipulate that the ownership of the mineral and energy resources is inseparably linked to that of the land.
- 11.200 The second group of mineral and energy resources relates to renewable energy resources captured through the exploitation of wind, sun, etc. Although these resources as such are generally not scarce, the exploitation of these resources may be restricted to certain economic agents, for example by needing permissions to put wind turbines on land, or having ownership of particular pieces of land which are highly favourable for exploiting renewable resources.

- <u>11.201</u> The transactions in mineral and energy resources recorded in the capital account refer to acquisitions or disposals of deposits of mineral and energy resources in which the ownership of such assets passes from one institutional unit to another. In the case of the establishment of a license agreement between a legal owner (usually government) and a user/extractor to exploit natural resources, the user/extractor may appropriate part of the value of the assets. This is to be recorded as an other change in the volume of assets; see paragraph 11.190. Reductions in the value of known reserves of mineral and energy resources resulting from their depletion as a result of extracting the assets for purposes of production are notalso recorded in the capital account, in line with the allocation of the relevant assets to the original owner and the extractor (see section E)-but in the other changes in the volume of assets account. Depletion does not apply to renewable energy resources.
- 11.176<u>11.202</u> Again if a disaggregation is required for certain types of analysis, it is recommended to follow that in the SEEA.distinguish the following categories of non-renewable energy resources: (i) oil and gas resources; (ii) coal resources; (iii) mineral resources and (iv) other non-renewable mineral and energy resources. For renewable energy resources, the following breakdown is recommended: (i) wind energy resources; (ii) solar energy resources; (iii) water energy resources; (iv) geothermal energy resources; and (v) other renewable energy resources.

#### Water resources

11.177<u>11.203</u> Water resources consist of surface and groundwater resources used for extraction to the extent that their scarcity leads to the enforcement of ownership or use rights, market valuation and some measure of economic control. If it is not possible to separate the value of surface water from the associated land, the whole should be allocated to the category representing the greater part of the total value.

Other natural resources

11.178<u>11.204</u> The category other natural resources currently includes radio spectra. Given the increasing move to carry out environmental policy by means of market instruments, it may be that other natural resources will come to be recognized as economic assets. If so, this is the category to which they should be allocated.

# 2. Biological resources

# The asset boundary

- 11.17911.205 Naturally occurring assets in the form of biota (trees, vegetation, animals, birds, fish, etc.) are renewable. The growth and regeneration of trees, crops or other vegetation or the rearing of animals, birds, fish, etc., may take place under the direct control, responsibility and management of institutional units. In this situation, the assets are cultivated, and the activity is treated as falling within the production boundary of the integrated framework of national accountsSNA. The growth of animals, birds, fish, etc., living in the wild, or growth of uncultivated vegetation in forests, is not an economic process of production so that the resulting assets cannot be classed as produced assets. Nevertheless, when these uncultivated biological resources forests or the animals, birds, fish, etc. are actually owned by institutional units and are a source of benefit to their owners, they constitute economic assets. When wild animals, birds, fish, etc. live in locations such that no institutional unit is able to exercise effective ownership rights over them they fall outside the asset boundary. Similarly, the forests or other vegetation growing in such regions are not counted as economic assets. On the other hand, fish stocks in the high seas which are subject to international agreement on how much may be caught by individual countries may be counted as falling within the asset boundary.
- 11.206 In practice, it may be difficult to make a clear distinction between cultivated and non-cultivated biological resources. Here, the treatment of biological resources yielding repeat products (breeding stocks, dairy cattle, fruit trees, etc.) is more straightforward than the treatment of certain biological resources yielding once-only products. The former resources generally take place under the direct control, responsibility and management of institutional units, and are treated as assets, apart from some rather insignificant resources, such as wild shrubs for berry picking. Some biological resources yielding once-only products are also easy to classify as

being under the direct control, responsibility and management of institutional units, the most obvious examples being animals for slaughter and plants and crops which are produced on farms (including fish farms).

11.18011.207 The distinction between cultivated and non-cultivated biological resources becomes more complicated for biological resources yielding once-only products that are often not directly owned by individual institutional units. In these cases, it is recommended to distinguish between resources where the control, responsibility and management does not go beyond the establishment of quota regimes (e.g. migrating wild animals and fish in open waters) versus resources where one can observe a continuum from intensive to extensive forms of control, responsibility and management (e.g., the growth of trees for timber production). In the latter case, ownership rights are usually in place. The relevant assets may not be owned by individual economic agents, but in those cases a government typically exerts collective ownership. It is recommended to treat these resources as cultivated assets, with all growth of trees which in the future are intended to be used for the purpose of producing timber considered as being established under some form of human involvement, instead of applying a discretionary choice between either managed and controlled or not managed and controlled by economic agents. In the former case if assets where the human involvement does not go beyond the establishment of quota regimes, the resources are typically treated as non-cultivated assets.

# **Ownership of assets**

 11.181
 Ownership of assets is generally clear, with the exception of biological resources yielding once-only

 products
 that are often not directly owned by individual institutional units. In these cases, it is recommended

 to allocate the assets to the legal owner and the exploiter of the resources in line with the appropriation of

 future resource rents, similar to the recording of non-renewable mineral and energy resources.

# **Valuation**

- 11.209 The valuation of transactions in biological resources can generally be based on the actual exchange values. For biological resources yielding once-only products that are often not directly owned by individual institutional units, transactions usually do not take place, unless rights to exploit the resources are transacted. Here, one can distinguish three cases: (i) the owner may permit the resource to be used to extinction; (ii) the owner may allow the resource to be used for an extended period of time in such a way that in effect the user controls the use of the resource during this time with little if any intervention from the legal owner; and (iii) the owner can extend or withhold permission to continued use of the asset from one year to the next. When the resource access rights are freely traded, it is possible to estimate the value of the relevant biological resource (after deducting all costs, including the services related to capital used in production). Moreover, if the access rights provide very long term or indefinite access to the assets, the market value of the rest value of the case to the assets, the market value of the rest value of the rights may provide a direct estimate of the total value of the underlying asset.
- H1.18211.210 However, in practice, in many cases governments may give the access rights to extractors for free or do so at a price that is less than the true market value. Further, trading of the rights may be restricted or prohibited. In these cases, there is no directly observable market valuation, and the net present value of future resource rents should be used. The establishment of license arrangements or quota regimes, including the related appropriation of future resource rents, would be recorded as other changes in volume of assets and liabilities, unless the relevant assets are actually transacted. In the latter case of the assets being transacted, the price paid may also be well below the net present value of future resource rents, because the rights are not traded in a free market, while trading is restricted or prohibited. In this case, the difference is to be recorded as a capital transfer from government to the one purchasing the resources. For more details, see chapter 27.

# Cultivated bBiological resources vielding repeat products

- **11.18311.211** <u>Cultivated bB</u>iological resources <u>yielding repeat products</u> are typically cultivated resources and cover <u>both</u> animal resources <u>yielding repeat products</u> and tree, crop and plant resources yielding repeat products, whose natural growth and regeneration are under the direct control, responsibility and management of institutional units.
- 11.18411.212 In general, when the production of fixed assets takes a long time to complete, those assets whose production is not yet completed at the end of the accounting period are recorded as work-in-progress. This also holds for However, when the assets are produced on own account, they are treated as being acquired by their users at the same time as they are produced and not as work in progress. These general principles also apply to the production of cultivated assets such as animals or trees that may take a long time to reach maturity. Two cases need to be distinguished from each other: the production of cultivated assets by their users.

In the case of the specialist producers, animals or trees whose production is not yet complete and are not ready for sale or delivery are recorded as work in progress. Examples are one year-old horses bred for sale as two year-old race horses, or young fruit trees that need further growth before being marketable. Such work in progress is recorded and valued in exactly the same way as that originating in any other kind of production.

However, when animals or trees intended to be used as fixed assets are produced on own account by farmers or others, incomplete assets in the form of immature animals, trees, etc. that are not ready to be used in production are treated not as work in progress but as gross fixed capital formation by the producing unit in its capacity as eventual user.

#### Animal resources yielding repeat products

- 11.18511.213 Animal resources yielding repeat products cover animals whose natural growth and regeneration are under the direct control, responsibility and management of institutional units. They include breeding stocks, dairy cattle, draft animals, sheep or other animals used for wool production and animals used for transportation, racing or entertainment. Animals raised for slaughter, including poultry, are not included herefixed assets but inventories. Immature cultivated assets <u>yielding repeat products</u> are recorded as workin-progressexcluded unless produced for own use.
- 11.18611.214 This heading may also includes aquatic resources yielding repeat products, consisting of aquatic resources maintained for controlled reproduction. In all but exceptional cases, though, these will be small and may be ignored unless of significant importance.
- **11.18711.215** Gross fixed capital formation in livestock that are cultivated for the products they yield year after year (dairy cattle, draught animals, etc.) is measured by the value of acquisitions less disposals, taking account of the treatment just described of immature livestock reared on own account. It is therefore equal to the total value of all mature animals and immature animals produced on own account acquired by users of the livestock, including all mature animals produced on own account, less the value of their disposals. Disposals consist of animals sold or otherwise disposed of, including those sold for slaughter, plus those animals slaughtered by their owners. Exceptional losses of animals due to major outbreaks of disease, contamination, drought, famine, or other natural disasters are recorded in the other changes in the volume of assets account and not as disposals. Incidental losses of animals due to occasional deaths from natural causes form part of consumption of fixed capitaldepreciation. Consumption of fixed capitalDepreciation of an individual animal is measured by the decline in its value as it gets older.

Tree, crop and plant resources yielding repeat products

- 11.18811.216 Tree, crop and plant resources yielding repeat products cover plants whose natural growth and regeneration are under the direct control, responsibility and management of institutional units. They include trees (including vines and shrubs) cultivated for fruits and nuts, for sap and resin and for bark and leaf products. Trees grown for timber that yield a finished product once only when they are ultimately felled are not fixed assets, just as cereals or vegetables that produce only a single crop when they are harvested cannot be fixed assets.
- 11.18911.217 Gross fixed capital formation in plantations, orchards, etc., consists of the value of the acquisitions less disposals of mature trees, shrubs, etc., including acquisitions of immature trees, shrubs, etc., produced on own account. As explained aboveImmature products are recorded as work-in-progress, the value of which the latter may be approximated, if necessary, by the value of costs incurred in their production during the period: for example, the costs of preparing the ground, planting, staking, protection from weather or disease, pruning, training, etc., <u>Onceuntil</u> the trees reaches maturity and starts to yield a product, they are transferred from work-in-progress to gross fixed capital formation. Disposals consist of trees, shrubs, etc., sold or otherwise transferred to other units plus those cut down before the end of their service lives. All agricultural output is at the mercy of the weather. Expected output must take account of normal variations in climatic conditions and exceptional losses of trees due to drought or other natural disasters such as gales, or hurricanes or forest fires, these being recorded in the other changes in the volume of assets account.

Work-in-progress on cultivated biological resources vielding repeat products

<u>11.218</u> Work-in-progress on cultivated biological resources <u>yielding repeat products</u> consists of output that is not yet sufficiently mature to be in a state in which it is normally supplied to other institutional units, or to be <u>used in production</u>. In the present context it is necessary to distinguish single-use plants, trees and livestock that produce an output once only (when the plants or trees are cut down or uprooted or the livestock slaughtered) from the relevant work-in-progress related to trees (including vines and shrubs) and livestock that are used repeatedly or continuously for more than one year to produce outputs such as fruit, nuts, rubber, milk, wool, power, transportation and entertainment. Work in progress should be recorded for single use resources. For The growth of repeat yield resources, being cultivated on own account, or under an agreed contract with another unit, the growth is <u>also</u> counted as <u>work-in-progressfixed</u> capital formation and so <u>excluded from inventories</u>. Any remaining cultivation of resources with repeat yields should be included in work-in-progress. This may be the case for nurseries and breeders of race horses or other special animals, for example.

Cultivated biological resources yielding once-only products, including work-in-progress

- 11.219 Leaving apart the farming of single-use plants and livestock that produce an output once only, cultivated biological resources yielding once-only products mainly consist of non-migrating resources, the most prominent example being the growth of trees for timber production. As noted before, for this type of resources no distinction is made between cultivated and non-cultivated resources. For those resources over which (collective) ownership can be enforced, all growth of trees intended to be used for the purpose of producing timber is considered as being under some degree of human management and control. Possible benefits derived from the growth of trees not intended for future timber production are not given rise to the recognition of assets.
- 11.220 Two types of assets need to be considered and estimated for this type of cultivated biological resources yielding once-only products: the underlying asset, i.e., the forest land, and the work-in-progress representing the growth of trees. Market prices for forest land are usually not available, and need to be approximated using the net present value of future benefits, after deduction of the value of the work-in-progress (see chapter 14). Any increase in the volume of this underlying asset, which is the result of an increase in the regenerative potential of the forest land, is to be recorded as gross fixed capital formation. Any decline in this regenerative potential should be recorded as depreciation.
- 11.221 Work-in-progress related to cultivated biological resources yielding once-only products represents the accrual accounting of the growth of trees intended for the future production of timber. A distribution of output

over the accounting periods of the growth of the trees in proportion to the costs incurred may not provide satisfactory results when looking at individual generations of trees, as a disproportionate share of the costs may be incurred in the beginning and the end of the period of growth. Given the fact that the growth of trees is a more or less continuous process, with a forest typically consisting of trees in different age categories, an equal distribution of the growth over the life-length of the tress is considered a good approximation. Due to the considerable time it takes before a tree is mature enough for timber production, it is important, however, that the growth of the trees in subsequent periods is appropriately discounted. For the farming of single-use plants and livestock which take more time to mature than the reference period (quarter, year), the guidance for the recording and estimation of work-in-progress is similar to that for other products; see section B2 of this chapter.

Non-cultivated biological resources

11.19011.222 Non-cultivated biological resources consist of animals, birds, fish and plants that yield both onceonly and repeat products over which ownership rights, often collectively by government, are enforced but for which natural growth or regeneration is not under the direct control, responsibility and management of institutional units. Examples are virgin forests and fisheries within the territory of the country. Only those resources that are currently, or are likely soon to be, exploitable for economic purposes should be included.<u>In</u> practice, these resources are restricted to migrating biological resources, such as fish in open seas, which are subject to some form of quota regime.

In the SEEA, this category is further split into aquatic resources, animal resources other than aquatic resources, tree, crop and plant resources. Aquatic resources are further split into aquatic resources in national waters including the exclusive economic zone (EEZ) and those in the high seas.

Permits to use natural resources

*Permits to use natural resources are third-party property rights relating to natural resources.* An example is where a person holds a fishing quota and he is able, again both legally and practically, to sell this to another person.

# E. Consumption of fixed capital Depreciation and depletion

11.191<u>11.223</u> The concept of consumption of fixed capitaldepreciation and depletion has been is first described and defined in chapter <u>76</u> in connection with the difference between gross and net value added and then carries through all subsequent balancing items that may also be shown gross or net of consumption of fixed capitaldepreciation and depletion. The capital account is where the counterpart entriesy to the entriesy in the production account appears though unusually theyit appears on the same side as in the production account but with a negative sign rather than on the opposite side of the account.

# 1. Depreciation

11.19211.224 Consumption of fixed capitalDepreciation constitutes a negative change in the value of the fixed assets used in production. Consumption of fixed capitalDepreciation must be measured with reference to a given set of prices, that is, the average prices of the type of asset of constant quality over the period. It may then be defined as the decline, between the beginning and the end of the accounting period, in the value of the fixed assets owned by an enterprise, as a result of their physical deterioration and normal rates of obsolescence and accidental damage. Consumption of fixed capitalDepreciation may be deducted from gross fixed capital formation to obtain net fixed capital formation to match the balancing item of net saving carried

down from the use of income account.

11.19311.225 Consumption of fixed capitalDepreciation applies to all fixed assets and for every year the asset is in use in production. Because costs of ownership transfer are treated as fixed assets, including terminal costs, they are also subject to consumption of fixed capitaldepreciation. All buildings and other structures are assumed to have finite service lives, even when properly maintained, so that consumption of fixed capitaldepreciation is calculated for all such fixed assets, including railways, roads, bridges, tunnels, airports, harbours, pipelines, dams, etc. Service lives are not determined purely by physical durability, and many pieces of equipment as well as buildings and structures are eventually scrapped because they have become obsolete. However, the service lives for some structures such as certain roads, bridges, dams, etc., may be as long as a century or more.

# Costs of ownership transfer

- 11.19411.226 The costs of ownership transfer on the acquisition and disposal of a fixed asset are treated as gross fixed capital formation and included in the value of the asset on acquisition and disposal as recorded in the capital account and in the value of the asset in the balance sheet. However, although consumption of fixed capitaldepreciation is calculated on the value of the asset excluding the costs of ownership transfer over the whole of its life, the consumption of fixed capitaldepreciation in respect of the costs of ownership transfer is calculated only over the period that the owner expects to hold the asset. In this way there are no remaining costs of ownership transfer included in the value of the asset when it is sold to a new owner, so the amount the old owner receives is equal to the amount the new owner pays except for any costs of ownership transfer inclured by the new owner.
- 11.195<u>11.227</u> In the case of natural resources other than land, the costs of ownership transfer are shown as transactions in gross fixed capital formation in the capital account separately from the acquisition and disposal of natural resources, but the value of the natural resources in the balance sheet includes the value of the costs of ownership transfer. The costs of ownership transfer are still written off according to the expected length of time the owner will hold the asset and treated as <u>consumption of fixed capitaldepreciation</u> in the relevant production account.
- 11.19611.228 In the case of land, costs of ownership transfer are treated as a part of land improvement, which is itself treated as a produced asset. The value of land improvements other than the costs of ownership transfer is written off over a suitably long period but the costs of ownership transfer are written off over the period the owner expects to own the land.

# **Terminal costs**

- 11.19711.229 In principle, the value of consumption of fixed capital depreciation cumulated over the life of an asset, once price changes are taken into account, should be equal to the difference between the acquisition and disposal values. In the case of assets with actual costs at the time of disposal, this means that consumption of fixed capital<u>depreciation</u> should cover anticipated terminal costs. Terminal costs should therefore be written off over the whole life of the asset, regardless of the number of owners during the life of the asset. To avoid a negative value of the asset at the end of its life, the expected terminal costs are added to the value of the asset at the time the asset enters the balance sheet, with a counterparty entry of provisions at the liability side, both to be recorded in the other changes in the volume of assets and liabilities accounts. At the end of the life of the asset, the actual investment expenditures on terminal costs, which lead to a positive change in the value of the asset, are counterbalanced with a reversal of the flows in the beginning of the period, i.e., a decline in the value of assets with a concomitant decline of the related provisions, again recorded as other changes in the volume of assets and liabilities. Immediately before the disposal, the value of the asset will have a negative value which is reduced to zero when the terminal costs incurred are treated as gross fixed capital formation. The apparent oddity of an asset with negative value reflects the fact that the owner not only could not sell it but would have to pay another unit to take over responsibility for the asset.
- 11.198<u>11.230</u> In practice, it may be difficult to predict terminal costs accurately. In that case, cumulated consumption of fixed capital depreciation may not cover all the terminal costs. However, the full costs are

still treated as gross fixed capital formation and any amount not already covered by consumption of fixed capitaldepreciation during the life of the asset is written off at the time the costs are incurred as consumption of fixed capitaldepreciation. This is a pragmatic recommendation and will lead to NDP being overstated over the time the asset is in use and understated in the year when the remaining costs are incurred.

 $\frac{11.19911.231}{\text{chapter 2017}}$  There is further discussion on the treatment of costs of ownership transfer and terminal costs in chapter  $\frac{2017}{7}$ .

# 2. <u>Depletion</u>

- 11.232 In physical terms, depletion refers to 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.
- 11.233 For non-renewable mineral and energy resources, depletion is confined to the decrease of the value on the natural resource due to extraction. Other changes in value, such as those related to the discoveries and upward and downward reappraisals are recorded as other changes in the volume of assets and liabilities. The same holds for transfers of natural resources out of economic activity because of changing technology, or reduced demand for the resulting output or for legislative reasons. However, the stranding of these assets is to be recorded as revaluations. For more details, see chapter 13.
- 11.20011.234 Land in its natural state and renewable energy resources are not subject to depletion. However, in the case the value of land is combined with another asset, the combined asset may be subject to depreciation or depletion. For non-cultivated biological resources yielding once-only products, a decline in the regenerative potential of the underlying asset (e.g., the case where the extraction of fish in open seas is larger than its natural growth) is to be recorded as depletion. A growth in the regenerative potential is to be recorded as depletion. In the case of cultivated biological resources yielding once-only products, the growth and decline of the regenerative potential of the underlying asset (e.g., forest land in the case of the growth of trees for the production of timber) is to be recorded as gross fixed capital formation and depreciation, respectively. Biological resources yielding repeat products are typically classified as fixed assets, and the decline as a result of their physical deterioration and normal rates of obsolescence and accidental damage should be recorded as part of depreciation.

# F. Capital transfers

# 1. Capital versus current transfers

11.20111.235 Capital transfers are unrequited transfers, either in cash of in-kind, in which the ownershipwhere either the party making the transfer realizes the funds involved by disposing of an asset (other than cash or inventories) changes from one party to another; or that oblige one or both parties to acquire or dispose of an asset (other than cash or inventories); or where a liability is forgiven by the creditor, by relinquishing a financial claim (other than accounts receivable) or the party receiving the transfer is obliged to acquire an asset (other than cash or inventories) or both conditions are met. Capital transfers are often large and irregular but neither of these are necessary conditions for a transfer to be considered a capital rather than a current transfer.

Table 110.5: The capital account - capital transfers - changes in liabilities and net worth

11.20211.236 A current transfer reduces the income and consumption possibilities of the first party and increases the income and consumption possibilities of the second party. Current transfers are therefore not linked to, or conditional on, the acquisition or disposal of assets by one or both parties to the transaction.

- 11.20311.237 Some cash transfers may be regarded as capital by one party to the transfer but as current by the other. For example, the payment of an inheritance tax may be regarded as the transfer of capital by the taxpayer but be regarded as a current receipt by government because it receives many such transfers. Similarly, a large country that makes investment grants to a number of smaller countries may regard the grants as current transfers even though they are specifically intended to finance the acquisition of capital assets. In an integrated system of accounts, such as the SNA, it is not feasible, however, to classify the same transaction differently in different places. Accordingly, a transfer should be classified as capital for both parties even if it involves the acquisition or disposal of an asset, or assets, by only one of the parties. By convention, social transfers are always treated as current transfers.
- 11.20411.238 There may be cases in which it is difficult to decide on the evidence available whether to classify a cash transfer as current or capital. When there is serious doubt, the transfer should be classified as current rather than capital. It should be noted, however, that the decision as to which way to classify a transfer has important consequences for the allocation of saving between sectors and subsectors, and possibly between the economy as a whole and the rest of the world. Other things being equal, a current transfer increases the saving of the recipient and reduces that of the donor, whereas a capital transfer does not affect the saving of either party. If, therefore, cash transfers are incorrectly classified between current and capital, the saving behaviour recorded for the units or subsectors involved may be misleading for purposes of economic analysis and policymaking.

# 2. Transfers in cash and in kind

- 11.205\_11.239 As explained in chapter 9, transfers may take place in cash or in kind. A capital transfer in kind necessarily concerns the change of ownership of a product previously recorded as a non-financial asset in the accounts of the donor. In this case, the four entries relating to the transaction are all recorded in the capital account. Two relate to the transfer of wealth implied by a capital transfer; the other two are shown as disposal of the asset being transferred by the donor and its acquisition by the recipient. The treatment of fixed assets produced by communal construction and then transferred to government to maintain is discussed in paragraph 11.66.10.58.
- All other capital transfers have two entries in the capital account and two in the financial account. In the case of debt forgiveness, the two entries in the financial account show the reduction in the debt liability of the recipient towards the donor and the claim of the donor on the recipient. In the case of debt assumption (without an effective claim) the two entries in the financial account are a reduction in the debt liability of the original debtor and a parallel increase in the debt liability of the party assuming the debt. Other capital transfers are recorded as a transfer in cash and show a decrease in cash or deposits of the donor and an increase by the recipient.

## Valuation

11.207<u>11.241</u> The value of a non-financial asset being transferred is the estimated price at which the asset, whether new or used, could be sold on the market plus any transport, installation or other costs of ownership transfer incurred by the donor but excluding any such charges incurred by the recipient. Transfers of financial assets, including the cancellation of debts, are valued in the same way as other acquisitions or disposals of financial assets or liabilities.

# 3. Capital taxes

- 11.208<u>11.242</u> Capital taxes consist of taxes levied at irregular and infrequent intervals on the values of the assets or net worth owned by institutional units or on the values of assets transferred between institutional units as a result of legacies, gifts inter vivos or other transfers. They include capital levies and taxes on capital transfers:
  - a. Capital levies consist of taxes on the values of the assets or net worth owned by institutional units levied at irregular, and very infrequent, intervals of time. Capital levies are treated as exceptional

both by units concerned and by the government. They may be payable by households or enterprises. They include betterment levies: that is, taxes on the increase in the value of agricultural land due to planning permission being given by government units to develop the land for commercial or residential purposes (*GFSM20012014* tax code 1133; OECD 4500));

b. Taxes on capital transfers consist of taxes on the values of assets transferred between institutional units. They consist mainly of inheritance taxes, or death duties, and gift taxes, including gifts inter vivos made between members of the same family to avoid, or minimize, the payment of inheritance taxes. They do not include taxes on sales of assets as these are not transfers (*GFSM20042014* tax code 1134; OECD 4300).

# 4. Investment grants

- 11.209<u>11.243</u> Investment grants consist of capital transfers made by governments to other resident or non-resident institutional units to finance all or part of the costs of their acquiring fixed assets. The recipients are obliged to use investment grants for purposes of gross fixed capital formation, and the grants are often tied to specific investment projects, such as large construction projects. If the investment project continues over a long period of time, an investment grant in cash may be paid in instalments. Payments of instalments continue to be classified as capital transfers even though they may be recorded in a succession of different accounting periods.
- 11.244 Investment grants in kind consist of transfers of transport equipment, machinery and other equipment by governments to other resident or non-resident units and also the direct provision of buildings or other structures for resident or non-resident units. These may be constructed by enterprises owned by the donor government or by other enterprises that are paid directly by the donor government. In such cases, a capital transfer in cash is usually recorded followed by purchase of the items actually transferred in kind. Exceptionally, if the transfer is of an existing asset, and the recipient is resident, the transfer of ownership of the asset may be recorded as negative capital formation by government and positive capital formation by the recipient, but a capital transfer is still also recorded so that the balance sheet of both parties correctly reflects the change in net worth that has taken place.

# 5. Other capital transfers

- 11.21111.245 Other capital transfers consist of all capital transfers except capital taxes and investment grants. One notable category included here is the cancellation of debt by mutual agreement between the creditor and the debtor. Such a cancellation is treated as a capital transfer from the creditor to the debtor equal to the value of the outstanding debt at the time of cancellation. It includes, but is not confined to, the cancellation of debt owed by non-residents to residents, and vice versa. Another example is the assumption of debt where a unit taking over the debt of another unit does not have an effective claim on the original debtor.
- 11.212<u>11.246</u> However, the unilateral writing off of debt is not a transaction between institutional units and therefore does not appear either in the capital account or the financial account of the SNA. If the creditor accepts such a write off or default, it should be recorded in the other changes in the volume of assets account of the creditor and the debtor. Provisions, among which those for bad debt, are treated as bookkeeping entries that are internal to the enterprise and do not appear in the integrated framework of national accountsSNA except in the cases described in chapter 14, where they of expected losses on non-performing loans, which appear as memorandumsupplementary items in the balance sheets. The unilateral repudiation of debt by a debtor is also not a transaction and is not recognized in the SNA.
- 11.21311.247 Capital transfers may take various other forms, of which some examples are given below:
  - <del>a.</del>
  - a. Major payments in compensation for extensive damages or serious injuries not covered by insurance policies. They are typically intended to recover losses over a multi-year period or to replace an asset (financial or non-financial). The payments may be awarded by courts of law or settled out of court. They may be made to resident or non-resident units. They include payments of compensation for

damages caused by major explosions, oil spillages, the side effects of drugs, etc.;

- b. Economic contributions by individuals to another country to obtain an additional citizenship, passport, or long-term visa, if these contributions are specifically earmarked for capital investment projects,
- c. Exceptionally large insurance settlements in the wake of a disaster. For more details on when this is the appropriate form of recording see chapter  $\frac{1724}{2}$ ;
- d. Transfers from government units to publicly or privately owned enterprises to cover large operating deficits accumulated over two or more years;
- e. Transfers from central government to units at lower levels of government to cover some, or all, of the costs of gross fixed capital formation or large expenditure deficits accumulated over two or more years;
- f. Legacies or large gifts inter vivos, including legacies to NPIs;
- g. Exceptionally large donations by households or enterprises to NPIs to finance gross fixed capital formation: for example, gifts to universities to cover the costs of building new residential colleges, libraries, laboratories, etc.;
- h. Unrequited or partially requited Ttransfers of responsibility for pension entitlements, for example when general government assumes responsibility for pensions provision from an employer;
- h.i. Negotiated changes in the terms and conditions of defined benefit pension entitlements;
- i+j.\_Community built assets where responsibility for maintenance is then assumed by government or by an NPISH.

# Chapter 12: Financial account (OLD Chapter 11: The financial account)

# A. Introduction

- 12.1 The financial account is the final account in the full sequence of <u>economic</u> accounts that records transactions between institutional units. Net saving is the balancing item of the use of income accounts, and net saving plus net capital transfers receivable or payable can be used to accumulate non-financial assets. If they are not exhausted in this way, the resulting surplus is called net lending. Alternatively, if net saving and capital transfers are not sufficient to cover the net accumulation of non-financial assets, the resulting deficit is called net borrowing. This surplus or deficit, net lending or net borrowing, is the balancing item that is carried forward from the capital account into the financial account. The financial account does not have a balancing item that is carried forward to another account, as has been the case with all the accounts discussed in previous chapters. It simply explains how net lending or net borrowing is effected by means of changes in holdings of financial assets and liabilities. The sum of these changes is conceptually equal in magnitude, but on the opposite side of the account, to the balancing item of the capital account.
- 12.2 The financial account records transactions that involve financial assets and liabilities and that take place between resident institutional units and between resident institutional units and the rest of the world. The left-hand side of the account (table 1112.1) records acquisitions less disposals of financial assets less disposals, while the right-hand side records incurrence less repayments of liabilities less their repayment.

# 1. Financial assets and liabilities

- 12.3 As described in chapter 34, an asset is defined as follows. An asset is a store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another.
- 12.4 Benefits are exchanged by means of payments. From this a financial claim, and hence a liability, can be defined. There are no non-financial liabilities recognized in the SNA, thus the term liability necessarily refers to a liability that is financial in nature.
- 12.5 A liability is established when one unit (the debtor) is obliged, under specific circumstances, to provide a payment or series of payments to another unit (the creditor). <u>This includes shares and other equity in corporations</u>. The most common circumstance in which a liability is established is a legally binding contract that specifies the terms and conditions of the payment(s) to be made and payment according to the contract is unconditional.
- 12.6 In addition, a liability may be established not by contract but by long and well-recognized custom that is not easily refuted. Some payments by government to individuals fall under this category. In these cases, the creditor hasmay have a valid expectation of payment, despite the lack of a legally binding contract. Such liabilities, are called usually referred to as constructive liabilities, are not recognised in the sequence of economic accounts.
- 12.7 Whenever<u>a</u> either of these types of liability exists, there is a corresponding financial claim that the creditor has against the debtor. *A financial claim is the payment or series of payments due to the creditor by the debtor under the terms of a liability*. Like the liabilities, the claims are unconditional. In addition, a financial claim may exist that entitles the creditor to demand payment from the debtor but whereas the payment by the debtor is unconditional if demanded, the demand itself is discretionary on the part of the creditor.
- 12.8 Financial assets consist of financial claims and gold bullion held by monetary authorities as a reserve asset. Financial claims represent all financial instruments that give rise to an economic asset that has a counterpart liability, including shares and other equity in corporations.all financial claims, shares or other equity in corporations plus gold bullion held by monetary authorities as a reserve asset. Gold bullion held by monetary authorities as a reserve asset is thus treated as a financial asset even though the holders do not have a claim on other designated units. Shares are treated as financial assets even though the financial claim

their holders have on the corporation is not a fixed or predetermined monetary amount.

# 2. Quadruple-entry accounting

- 12.9 The accounting rules of the SNA, explained in chapter 34, describe how the quadruple principle of accounting is implemented. When a good, service, asset or liability is sold by one institutional unit to another, two pairs of entries are recorded. The first pair records the supply of the item by one unit and the acquisition by the other. The second pair of entries records the second party supplying the means of payment for the item, and the first party receiving this. Similar quadruple entries are required in respect of transactions involving property income and transfers. The second pair of entries usually appears in the financial account though in a few cases of transfers in kind, the second pair of entries may appear as negative and positive final consumption expenditure or disposal and acquisition of a non-financial asset. The latter also holds for cases where the counterpart entry consists of crypto assets without a corresponding liability designed to act as a general medium of exchange, and those designed to act as a medium of exchange within a platform only, which are treated as non-produced non-financial assets. In all cases of transactions involving financial instruments, except those relating to an exchange of financial instruments, the acquisition of a financial asset or settlement of a liability-the first pair of entries appears in one or more of the non-financial accounts. In the case of the exchange of a financial instrument, all four entries appear in the financial account.
- 12.10 There are thus two reasons for entries in the financial account. The first reason is as counterpart to entries in other accounts; the second is to record transactions involving the exchange of financial assets and liabilities only, so both the original and the counterpart entries are recorded in the financial account.

# 3. Counterparts of non-financial transactions

- 12.11 Transactions involving the transfer of ownership of a good or non-financial asset, or the provision of a service or labour almost always entail a counterpart entry in the financial account for means of payment or claims on future means of payment. Even many transactions in kind, such as barter sales and remuneration in kind, conceptually lead to entries in the financial account. If unit A provides a product of value x to unit B, expecting another product of the same value in return, A has a financial claim of x on B. This financial claim is settled and thus no longer needs to be recorded when B fulfils delivery of the product promised. Entries in the financial account are needed when all elements of the in-kind transaction are not completed simultaneously.
- 12.12 The sale of a good, service, or asset may have as its counterpart a change in currency or transferable deposit. Alternatively, the counterpart may be reflected in the financial account in a trade credit or other category of accounts receivable or payable.

# 4. Exchanges of financial assets and liabilities

- 12.13 Whenever one financial asset is exchanged for another or when a liability is repaid with a financial asset, transactions are recorded only in the financial account. These transactions change the distribution of the portfolio of financial assets and liabilities and may change the totals of both financial assets and liabilities, but they do not change the difference between total financial assets and liabilities. For example, trade credits are extinguished by payments. The claim represented by the trade credit no longer exists when the debtor provides means of payment to the creditor. The resulting four entries in the financial account are:
  - a. the creditor reduces its holdings of trade credits and increases its means of payment (currency or transferable deposits); and
  - b. the debtor reduces its liabilities (in the form of trade credits) and reduces its financial assets (in the form of means of payment).
- 12.14 When existing financial assets are exchanged for other financial assets, all entries take place in the financial

account and only affect assets. For example, if a debt security such as an existing bond is sold by one institutional unit to another on the secondary market, the seller reduces his holdings of securities and increases his holdings of means of payment by an equal amount. The purchaser increases his holdings of securities and decreases his holdings of means of payment.

12.15 When a new financial asset is created through the incurrence of a liability by an institutional unit, all related entries are also made in the financial account. For example, a corporation may issue short-term securities in exchange for means of payment. The financial account of the corporate sector accordingly shows an increase in liabilities in the form of securities and an increase in financial assets in the form of means of payment; the financial account of the purchasing sector shows a reduction in assets in the form of means of payment and an increase in assets in the form of securities.

# 5. Net lending

12.16 Some sectors or subsectors are net lenders while others are net borrowers. When institutional units engage in financial transactions with each other, the surplus resources of one sector can be made available by the units concerned for use by other sectors. The financial account indicates how deficit, or net borrowing, sectors obtain the necessary financial resources by incurring liabilities or reducing assets and how the net lending sectors allocate their surpluses by acquiring financial assets or reducing liabilities. The account also shows the relative contributions of various categories of financial assets to these transactions.

#### Table 121.1: The financial account - concise form - changes in assets

Table 124.1 (cont): The financial account - concise form - changes in liabilities and net worth

- 12.18 Although much borrowing and lending is routed through financial intermediaries, some borrowers can transact directly with non-financial lenders. For example, governments can issue securities in the market; these securities can be purchased by households, non-financial corporations and the rest of the world as well as by financial institutions. In many other cases, financial intermediaries have as their special function the creation of a financial market that links lenders and borrowers indirectly. The financial institution incurs liabilities to net lenders through taking deposits or issuing securities and providing the financial resources thus mobilized to borrowers, for example in the form of loans, holding of debt securities and holdings of equity securities. Thus, their transactions in financial assets and liabilities will be comparatively large relative to other sectors and to the size of their own net lending or borrowing. In table <u>1+12</u>.1, the financial corporations sector has a net borrowing of <u>151</u>, which is financed by net incurrence of liabilities of <u>182173</u> and net acquisition of financial assets of <u>167172</u>.
- 12.19 An examination of the financial transactions of the subsectors of the financial corporations sector, in addition to those of the consolidated financial sector, is often useful.
- 12.20 It is important to note that, for each institutional sector, the financial account indicates the types of financial instruments utilized by that sector to incur liabilities and acquire financial assets. The financial account does not, however, indicate to which sectors the liabilities are incurred and on which sectors the assets indicate financial claims. A more detailed and complex analysis of financial flows between sectors is discussed in chapter 2737. The analysis there illustrates debtor or creditor relationships by type of financial asset.
- 12.21 In the hypothetical case of a closed economy in which resident institutional units do not engage in transactions with non-residents, the total net lending and total net borrowing of the various sectors would have to be equal since the net borrowing requirements of deficit sectors would be met by net lending of surplus sectors. For the economy as a whole, net lending or borrowing would have to be zero. This equality reflects the symmetric

nature of financial assets and liabilities. When residents engage in transactions with non-residents, the sum of the net lending and net borrowing of each of the sectors making up the total economy must equal the economy's net lending to, or borrowing from, the rest of the world. In table <u>112</u>.1 the total economy has acquired financial assets of 436 and incurred liabilities of 426. Net lending for the total economy to the rest of the world is therefore 10.

# 6. Contingen<u>t asset and liabilitiescies</u>

- 12.22 Many types of contractual financial arrangements between institutional units do not give rise to unconditional requirements either to make payments or to provide other objects of value; often the arrangements themselves do not have transferable economic value. These arrangements, which are often referred to as contingent assets and liabilities<del>cies</del>, are not actual current financial assets and are not recorded in the SNA. The principal characteristic of contingent assets and liabilitiescies is that one or more conditions must be fulfilled before a financial transaction takes place. One-off guarantees of payment by third parties, whether implicit or explicit, are contingen<u>t assets and liabilities</u>eies since payment is only required if the principal debtor defaults. Until the default is evident, the value of the one-off guarantee should may be shown as a memorandumsupplementary item. Loan commitments provide a guarantee that funds will be made available but no financial asset exists until funds are actually advanced. Letters of credit constitute promises to make a payment conditional upon the presentation of certain documents specified by contract. Underwritten note issuance facilities (NIFs) provide a guarantee that a potential debtor will be able to sell short-term securities (notes) that he issues and that the bank or banks issuing the facility will take up any notes not sold in the market or will provide equivalent advances. The facility itself is contingent, and the creation of the facility does not give rise to anno entry in the financial account. Only if the underwriting institution is requested to make funds available will it acquire an actual asset, which is recorded in the financial account.
- 12.23 Certain financial derivatives are not treated as contingent financial assets but as actual assets. These are described in section C below. Standardized guarantees are also-treated as giving rise to actual and not contingent liabilities. A standardized guarantee is one where many guarantees of similar characteristics are issued. Even though the probability of any one guarantee being called is uncertain, the fact that there are many similar guarantees means that a reliable estimate of the number of calls under the guarantee can be made. Liabilities of this sort where the size of the liability may be determined probabilistically are often described as provisions. The term liability is used when the fact that payment will be required and the amount of the payment or the way in which the amount will be calculated are agreed. The term provision is used when the fact that a payment will be required is regarded as certain but there is no agreement on how the amount payable will be determined. A contingent liability is one where the size of payment may or may not be known with certainty but there is uncertainty about whether there will be a payment required or not.
- 12.24 For the purposes of the SNA, the treatment of contingent assets and liabilitieseies is simple. Any payments of fees related to the establishment of contingent arrangements are treated as payments for services. Transactions are recorded in the financial account only when an actual financial asset is created or changes ownership. However, by conferring certain rights or obligations that may affect future decisions, contingent arrangements obviously produce an economic impact on the parties involved. Collectively, such contingent assets and liabilitieseies may be important for financial programming, policy, and analysis. Therefore, where contingent positions are important for policy and analysis, it is recommended encouraged that information be collected and presented as supplementary data. Even though no payments may eventually be due for contingent liabilities, the existence of a high level of them may indicate an undesirable level of risk on the part of those units offering them. An example is an overdraft facility on a bank account, which is contingent until exercised.
- 12.25 Country practices <u>may</u> vary in determining which instruments are considered contingent and which are considered actual assets to be recorded in the balance sheet. Flexibility in the application of this recommendation is required to take national practices and variations in the nature of these instruments into account. An example, which is quantitatively important in trade financing, is the bankers' acceptance. A banker's acceptance involves the acceptance by financial institutions of drafts or bills of exchange and the unconditional promise to pay a specific amount at a specified date. The banker's acceptance represents an unconditional claim on the part of the holder and an unconditional liability on the part of the accepting bank; the bank's counterpart asset is a claim on its customer. For this reason, the banker's acceptance is treated as

an actual financial asset in the SNA even though no funds may have been exchanged.

12.26 There are other circumstances where future payments are not treated as assets, even though both the size of the payment and the fact that it will be paid are known with a high degree of certainty. One example is that although a bank loan may be granted to an individual using the fact that he is in permanent employment with a regular wage as security, the promise of future earnings is not recognized as a financial asset; nor are future receipts from sales for an enterprise nor a stream of future tax revenue for government.

# B. Transactions in financial assets and liabilities

# 1. The classification of financial assets and liabilities

- 12.27 Because of the symmetry of financial claims and liabilities, the same classification can be used to portray both assets and liabilities. Further, the same classification is used in all accumulation accounts for financial transactions. Within the SNA, the term "instrument" may be used to relate to the asset or liability aspect of an item on the financial balance sheet. In monetary statistics, some off-balance sheet items may also be described as instruments. The use of the same term in the SNA is for convenience only and does not imply an extension of the coverage of assets and liabilities to include these off-balance-sheet items.
- 12.28 <u>One</u>Two classes of financial assets that cannot properly be equated with identified claims over other designated institutional units are included in the classification of financial instruments. The first class is gold bullion owned by monetary authorities and others subject to the monetary authorities' effective control and held as a financial asset—and as a component of foreign reserves. There is no matching liability for gold bullion. The second class is shares, other corporate equity securities and financial participations. These do not have fixed redemption values, as is the case for many other financial assets, but represent claims by the shareholders on the net worth of the corporation.
- 12.29 Table 1412.2 shows an elaboration of table 1412.1 incorporating the classification of financial instruments. The exact coverage and the definition of each of the items are described in section C along with an explanation of the types of transactions appearing in the financial account that apply to each instrument. (For a discussion of financial instruments in the context of Islamic finance, reference is made to chapter 26.) The remainder of this section deals with general matters of classification and the application of the accounting rules of the SNA as they apply to transactions in financial instruments.
- 12.30 The detail in which the classification is employed depends on the institutional sector to be analysed. The types of financial assets in which households transact are more limited than those for other sectors, and sources of information are generally more limited than those for other sectors. Financial corporations, on the other hand, transact in the full range of instruments, and information on their operations is often the most detailed and timely of any institutional units. Consequently, a detailed breakdown may be developed for financial corporations. Blanks, rather than zeros in table <u>112</u>.2 show where entries are conceptually impossible; zeros show that entries are possible but expected to be small.
- 12.31 The standard items in the classification of financial assets and liabilities provide a useful basis for international comparison of national data. Presentation of data for individual countries, however, must be tailored to meet their analytical needs and to reflect national practices. Thus the particular form of presentation chosen may reflect differing institutional arrangements, the extent and nature of national financial markets, the complexity of financial assets available, and the degree of regulation and other financial control exercised. For this reason, a number of supplementary items are suggested for use in addition to the standard components of the SNA. These are described together with the standard items in section C.
- 12.32 The classification of financial transactions has become more difficult because of financial innovation that has led to the development and increased use of new and often complex financial assets and other financial instruments to meet the needs of investors with respect to maturity, yield, avoidance of risk, and other factors. The identification issue is further complicated by variations in characteristics of financial instruments across countries and variations in national practices on accounting and classification of instruments. These factors tend to limit the scope for firm recommendations with respect to the treatment of certain transactions within the SNA. Thus, a substantial amount of flexibility, particularly with regard to further breakdowns, is required to match the classification scheme to national capabilities, resources and needs. In particular, further

breakdowns of the standard items are desirable for many countries to distinguish important types of assets within categories (such as short-term securities included in measures of money).

# 2. Negotiability

12.33 Financial claims can be distinguished as to whether they are negotiable or not. A claim is negotiable if its legal ownership is readily capable of being transferred from one unit to another unit by delivery or endorsement. While any financial instrument can potentially be traded, negotiable instruments are designed to be traded on organized and other markets. Negotiability is a matter of the legal form of the instrument, and evidence of actual trading is not required. Those financial claims that are negotiable are referred to as securities. Some securities may be legally negotiable, but there is not, in fact, a liquid market where they can be readily bought or sold. Securities include shares and debt securities. However, the SNA treats financial derivatives as a distinct type of financial asset that is neither a debt or equity security.

# **3.** Valuation of transactions

- 12.34 The payments required under a contract relating to financial assets and liabilities almost always represent more than one transaction in the sense used in the SNA. Payments of interest on loans and deposits, as specified by financial institutions, involve both interest as recorded in the SNA and a service fee, which is the service payment to the financial institution for <u>intermediating depositors and loan borrowersmaking the loan available or safe guarding the deposit</u>. The buying and selling prices for foreign currency, <u>debt securities</u> and shares are usually different; the difference between the buying price and mid-price represents a service provided to and charged to the buyer and the difference between the mid-price and selling price a service provided to and charged to the seller. The mid-price is the mid-point of the buying and selling price at the time a transaction takes place; if the purchase and sale of a share, for instance, do not take place simultaneously, the mid-point for the sale and purchase price at the time of sale and of purchase will not necessarily be equal. For some financial instruments, for example bonds, the increase in value over time is taken to-represents interest, not simply a price increase in the value of the asset. In some cases more than one adjustment may be needed to the apparent transaction value to identify and re-route both the service charge and interest associated with the asset.
- 12.35 It is essential that the value of the transactions in financial instruments recorded in the financial account carefully excludes these service charges and interest payments. Part 4 of eChapter 1725 describes the adjustments necessary to make these exclusions on an instrument-by-instrument basis.
- 12.36 Financial transactions with respect to proprietors' net additions to the accumulation of equity in quasicorporations and changes in households' claims on insurance companies and pension funds raise complex issues of valuation that are referred to in the relevant item under classification of these categories below and more extensively in chapters <u>1724 and 25</u>.

# 4. Time of recording

- 12.37 In principle, the two parties to a financial transaction should record the transaction at the same point in time. When the counterpart to an entry in the financial account is in another account, the time of recording of financial claims is to be aligned with the time of recording in the other accounts of the transactions that gave rise to the financial claim. For example, when sales of goods or services give rise to a trade credit, the entries in the financial accounts should take place when ownership of the goods is transferred or when the service is provided. Similarly, when accounts receivable or payable arise from transactions related to taxes, compensationremuneration of employees and other distributive transactions, the entries in the financial account should take place when the entries are made in the relevant non-financial account.
- 12.38 When all entries relating to a transaction pertain only to the financial account, they should be recorded when the ownership of the asset is transferred. This point in time is usually clear when the transaction involves the sale of existing financial assets. When the transaction involves the incurrence or redemption of a liability,

both parties should record the transaction when the liability is incurred or redeemed. In most cases, this will occur when cash or some other financial asset is paid by the creditor to the debtor or repaid by the debtor to the creditor.

12.39 In practice, the two parties to a financial transaction may perceive the transaction as being completed at different points in time. This is especially true when trade credits or other accounts payable or receivable are extinguished by final payments and there is a lag between the point in time when payments are made and received, creating a "float". There are several stages at which creditors and debtors could record a transaction. The debtor could record the liability as being extinguished when the <del>cheque or other</del> means of payment is issued to the creditor. A substantial certain period of time may elapse before the creditor receives the means of payment and records the payment in his accounts. There may then be further time lags between presentation of a cheque to a bank, cheque clearance, and final settlement of the transaction. Asymmetries in time of recording of this transaction are, therefore, likely to emerge unless the debtor records his transaction on a "cheques cleared" basis, a fairly uncommon accounting procedure. A financial claim exists up to the point that the payment is cleared and the creditor has control of the funds; this would be the optimal point in time for recording the transaction. In some cases, Tthe float, in practice, may be significant very large and may affect, in particular, transferable deposits, trade credits, and other accounts receivable. This effect is especially pronounced in countries where the postal system and bank clearing procedures are weak. When the float is significant and accounts for large discrepancies in reporting, it is necessary to develop estimates of the size of the float in order to adjust the accounts.

# 5. Netting and consolidation

## Netting

- 12.40 As described in chapter 34, netting is a process whereby entries on alternate sides of the account for the same transaction item and same institutional unit are offset against one another. In general the preference of the SNA is to avoid netting where possible but this may not always be possible and for some particular analyses, not always desirable.
- 12.41 The degree of netting at which transactions in financial assets and liabilities should be recorded depends to a great extent on the analysis for which the data are to be used. In practice, the degree of netting will depend on how data can be reported, and reporting may vary substantially for different classes of institutional units. If detailed information on financial transactions is maintained and reported, gross presentations are possible; if transactions must be inferred from balance sheet data, a certain level of netting is inevitable. A number of degrees of netting can be identified:
  - a. no netting or fully gross reporting in which purchases and sales of assets are separately recorded, as are the incurrence and repayment of liabilities;
  - b. netting within a given specific asset, such as subtracting sales of bonds from acquisition of bonds and redemption of bonds from new incurrences of liabilities in the form of bonds;
  - c. netting within a given category of assets, such as subtracting all disposals of debt securities from all acquisitions of such assets;
  - d. netting transactions in liabilities against transactions in assets in the same asset category; and
  - e. netting transactions in groups of liability categories against transactions in assets in the same groups.
- 12.42 Transactions recorded in the financial account represent net acquisition of assets and net incurrence of liabilities. However, it is clear that, when data are collected on as gross a basis as possible, they can be netted to whatever degree is necessary for a particular use; when data are collected net, they cannot be grossed up. In general, netting beyond the level described in (c) above is discouraged as it hinders the usefulness of the financial accounts for tracing how the economy mobilizes resources from institutional units with positive net lending and transmits them to net borrowers. For detailed flow of funds-analysis of flows from creditors to debtors, gross reporting or netting at level (b) above is desirable, particularly for analysis of securities, but netting at level (c) above still provides useful information on financial flows.

# Consolidation

12.43 Consolidation in the financial account refers to the process of offsetting transactions in assets for a given group of institutional units against the counterpart transactions in liabilities for the same group of institutional units. Consolidation can be performed at the level of the total economy, institutional sectors, and subsectors. Different levels of consolidation are appropriate for different types of analysis. For example, consolidation of the financial accounts for the total economy emphasizes the economy's financial position with the rest of the world since all domestic financial positions are netted on consolidation for sectors permits the tracing of overall financial movements between sectors with positive net lending and those with net borrowing and the identification of financial intermediation. Consolidation only at the subsector level for financial corporations can provide much more detail on intermediations. Another area where consolidation can be instructive is within the general government sector when transactions between the various levels of government are consolidated. Chapter 2230 makes a specific recommendation in this regard. Within the main-sequence of economic accounts, however, the SNA discourages consolidation.

# C. Recording of individual financial instruments

# 1. Monetary gold and SDRs

12.44 Monetary gold and Special Drawing Rights (SDRs) issued by the International Monetary Fund (IMF) are assets that are normally held only by monetary authorities.

# Monetary gold

- 12.45 Monetary gold is gold to which the monetary authorities (or others who are subject to the effective control of the monetary authorities) have title and is held as a reserve asset. It comprises gold bullion (including gold held in allocated gold accounts) and unallocated gold accounts with non-residents that give title to claim the delivery of gold. All monetary gold is included in reserve assets or is held by international financial organizations. Only gold that is held as a financial asset and as a component of foreign reserves is classified as monetary gold. Therefore, except in limited institutional circumstances, gold bullion can be a financial asset only for the central bank or central government. Transactions in monetary gold consist of sales and purchases of gold among monetary authorities. Purchases (sales) of monetary gold are recorded in the financial account of the domestic monetary authority as increases (decreases) in assets, and the counterparts are recorded as decreases (increases) in assets of the rest of the world. Transactions in non-monetary gold (including non-reserve gold held by the monetary authorities and all gold held by financial institutions other than the monetary authorities) are treated as acquisitions less disposals of valuables, (if the sole purpose is to provide a store of wealth,) and otherwise as final or intermediate consumption, change in inventories, exports or imports. Deposits, loans, and securities denominated in gold are treated as financial assets (not as gold) and are classified along with similar assets denominated in foreign currencies in the appropriate category. A discussion on the treatment of allocated and unallocated gold accounts appears under currency and deposits.
- 12.46 Monetary gold under reverse transactions, such as gold swaps, is collateralized and generally not readily available for balance of payments financing needs, because restrictions to a cash borrower's control of its gold collateral are imposed during the tenure of the swap agreement. Such collateralized amounts of monetary gold should be excluded from reserve assets and either demonetized (in the case of gold bullion) or reclassified as other investment, currency and deposits (in the case of unallocated gold accounts). (See paragraphs 6.xxx to 6.xxx of BPM7 for additional details.)

12.47

12.4812.47 Gold bullion in monetary gold takes the form of coins, ingots, or bars with a purity of at least 995 parts per thousand; it is usually traded on organized markets or through bilateral arrangements between central banks. Therefore, valuation of transactions is generally not a problem. Gold bullion held as a reserve

asset is the only financial asset with no corresponding liability.

# **SDRs**

- <u>12.48</u> Special Drawing Rights (SDRs) are international reserve assets created by the International Monetary Fund (IMF) and allocated to its members to supplement existing reserve assets. <u>SDRs are held only by the monetary authorities of IMF members and a limited number of international financial institutions that are authorized holders. The Special Drawing Rights Department of the IMF manages reserve assets by allocating SDRs among member countries of the IMF and certain international agencies (collectively known as the participants).</u>
- 12.49 Holdings of SDRs by an IMF member are recorded as a financial asset, while the allocation of SDRs is recorded as the incurrence of a liability of the member receiving them (because of a requirement to repay the allocation in certain circumstances, and also because interest accrues). The holdings and allocations should be shown gross, rather than net.
- 12.49
   12.50
   Domestic arrangements for holding SDRs and the accounting treatment may differ across IMF

   members according to differences in legal and institutional frameworks. The majority of members record the SDR positions on the central bank's balance sheet while some members record them on the balance sheet of a government agency. Regardless of where SDRs are recorded, the country's reserve assets increase with the allocation.

The mechanism by which SDRs are created (referred to as allocations of SDRs) and extinguished (cancellations of SDRs) gives rise to transactions. These transactions are recorded at the gross amount of the allocation and are recorded in the financial accounts of the monetary authority of the individual participant on the one part and the rest of the world representing the participants collectively on the other.

SDRs are held exclusively by official holders, which are central banks and certain other international agencies, and are transferable among participants and other official holders. SDR holdings represent each holder's assured and unconditional right to obtain other reserve assets, especially foreign exchange, from other IMF members. SDRs are assets with matching liabilities but the assets represent claims on the participants collectively and not on the IMF. A participant may sell some or all of its SDR holdings to another participant and receive other reserve assets, particularly foreign exchange, in return.

# 2. Currency and deposits.

- 12.51 Financial transactions in currency and deposits consist of additions to, or disposals of, currency and establishing or incrementing a deposit or making a withdrawal from it. In the case of a deposit, an apparent increase in the value may be due to the payment of interest on an existing stock level. Payments of bank interest are always separated into SNA interest and a charge for <u>implicit</u> financial intermediation services on loans and deposits indirectly measured (FISIM). SNA interest is first recorded in the distribution of primarycarned income account and then may be recorded in the financial account as a new deposit. An increase in deposits may correspond to a rundown of currency or vice versa.
- 12.5012.52 Off-market central bank currency swap arrangements should be recorded as an exchange of deposits with maintenance of value. However, if the central banks conduct the transaction as a standard (market priced) currency swap, then it is recommended that the swap be recorded as an exchange of deposits with the simultaneous creation of a financial derivative, namely a forward contract (see paragraphs 6.102-104, BPM7 for additional details on central bank swap arrangements, and chapter 25 for the treatment of off-market swap more generally).
- 12.5112.53 The aggregate of currency, transferable deposits (including inter-bank deposits) and other deposits should always be calculated. A distinction should alwayspreferably be made between currency and deposits in domestic currency and in foreign currency. If it is considered useful to have data for individual foreign

currencies, a distinction should be made between currency and deposits in each currency.

# Currency

- 12.54 Currency consists of notes and coins (including digital versions) that are of fixed nominal values and are issued or authorized by the central bank or government. Currency thus also includes digital currencies issued by the central bank or government. (Commemorative coins that are not actually in circulation should be excluded as should unissued or demonetized currency.) A distinction should be drawn between domestic currency (that is, currency that is the liability of resident units, such as the central bank, other banks and central government) and foreign currencies that are liabilities of non-resident units (such as foreign central banks, other banks and governments). All sectors may hold currency as assets, but normally only central banks and government may issue currency. In some countries, commercial banks are able to issue currency under the authorization of the central bank or government.
- 12.5212.55 Notes and coins are treated as liabilities at full face value. The cost of producing the physical notes and coins is recorded as government expenditures of the issuing authority and not netted against the receipts from issuing the currency.

# <u>Crypto-assets with a corresponding liability designed to act as a general medium of</u> exchange

 12.53
 This category includes crypto assets with a corresponding liability designed to act as a general medium of exchange that are not issued or authorized by the central bank or government. They consist of, for example, stablecoins with a claim on the issuer. Similar assets designed as a medium of exchange within a platform are classified as debt or equity securities. Crypto assets without a corresponding liability designed to act as a medium of exchange are recorded as non-produced non-financial assets; see chapter 11.

## **Transferable deposits**

<u>12.54</u><u>12.57</u> Transferable deposits comprise all deposits that:

- a. are exchangeable for bank notes and coins <u>(including digital versions)</u> on demand at par and without penalty or restriction; and
- b. are directly usable for making payments by cheque, draft, giro order, direct debit/credit, or other direct payment facility.

Some types of deposit accounts embody only limited features of transferability; these are excluded from the category of transferable deposits and treated as other deposits. For example, some deposits have restrictions such as on the number of third-party payments that can be made per period or on the minimum size of the individual third-party payments. A transferable deposit cannot have a negative value. A bank current or checking account, for example, is normally treated as a transferable deposit but if it is overdrawn, the withdrawal of funds to zero is treated as the withdrawal of a deposit and the amount of the overdraft is treated as the granting of a loan.

- 12.58 Transferable deposits also include electronic money or e-money. E-money is monetary value stored electronically, which represents a liability of the issuer and is denominated in a currency backed by an authority. E-money must represent general purchasing power, in the sense that it may be used for purchasing goods and services from a variety of other entities. For more details, reference is made to the Monetary and Financial Statistics Manual and Compilation Guide (MFSMCG) 2014.
- <u>12.55</u>12.59 Transferable deposits should <u>preferably</u> be cross-classified according to:
  - a. whether they are denominated in domestic currency or in foreign currencies; and

b. whether they are liabilities of resident institutions or the rest of the world.

#### Inter-bank positions

- 12.60 Though not strictly accurate, the term bank is frequently used as a synonym for the central bank and other deposit-taking corporations. Banks take deposits from and make loans to all other sectors. There may also be substantial borrowing and lending within the banking subsector, but this is of different economic significance from their intermediation activities involving other sectors. Chapter 2737 describes how a full analysis of the debtor and creditor sector for each instrument can be portrayed. Such an analysis is known as a detailed flow of fundsfrom-whom-to-whom table. However, not all countries are able to provide these tables on a timely basis.
- 12.5612.61 Inter-bank positions can usually be identified and arecould usefully be recorded as a separate instrument category. This is one reason to consider separating inter-bank loans and deposits from other loans and deposits. A second reason concerns the calculation of the charge for implicit financial intermediation services on loans and deposits indirectly measured (FISIM). This calculation depends on knowing the level of loans and deposits extended by banks to non-bank customers and calculating the difference between the interest the banks receive or pay and the interest when a reference rate is applied to the same levels of loans and deposits. However, there is normally little if any implicit financial services on loans and depositsFISIM payable between banks as banks usually borrow from and lend to each other at a risk-free rate. For both these reasons, it should be possible to separate inter-bank loans and deposits from other loans and deposits

### Table 124.2: The financial account - full detail - changes in assets

#### Table 124.2 (cont): The financial account - full detail - changes in liabilities and net worth

12.5712.62 There may be cases where the instrument classification of inter-bank positions is unclear, for example because the parties are uncertain, or one party considers it as a loan and the other a deposit. Therefore, aAs a convention to assure symmetry, allsuch inter-bank positions other than securities and accounts receivable or payable, and including the changes in these positions, are classified under deposits. Chapter 2737 describes the detailed flow of fundsfrom-whom-to-whom tables which removes the need for identifying inter-bank deposits as a separate category.

#### Other transferable deposits

#### 12.58

12.1 Other transferable deposits are those where one party or both parties to the transaction, or either the creditor or debtor or both of the positions, is not a bank.

12.59

# Other deposits

12.63 Other deposits comprise all claims, other than transferable deposits, that are represented by evidence of deposit. Typical forms of deposits that should be included under this classification are savings deposits (which are always non-transferable), fixed-term deposits and non-negotiable certificates of deposit. The category also covers shares or similar evidence of deposit issued by savings and loan associations, building societies, credit unions and the like. Deposits of limited transferability that are excluded from the category of transferable deposits are included here. Claims on the IMF that are components of international reserves and are not evidenced by loans should be recorded in other deposits. (Claims on the IMF evidenced by loans should be included in loans; see paragraphs 5.43 and 5.51 of BPM7 for further details on claims on the IMF included in other deposits and loans.)

12.60 12.64 Repayable margin payments in cash in financial contracts, such as those related to financial

derivative contracts (described below), are classified as deposits (if the debtor's liabilities are included in broad money), other accounts receivable/payable, or loans. -are included in other deposits, as are overnight and very short term repurchase agreements if they are considered part of the national definition of broad money. Other repurchase agreements should be classified under loans.

- 12.6112.65 It is possible to hold accounts for both "allocated gold" and "unallocated gold". The distinction is precise, practical and recognized in the balance sheets of units holding these accounts. An allocated gold account gives full outright ownership of the gold and is equivalent to a custody record of title. The unallocated gold account does not give the holder the title to physical gold but provides a claim against the account provider denominated in gold. In effect, therefore, it is a deposit denominated in gold. They are thus treated as deposits in foreign currency. Accounts that are held for allocated gold, on the other hand, are treated as holdings of valuables. Both allocated and unallocated gold accounts are classified in reserve assets if-unless they are held by monetary authorities, or other units authorized by them, and meet other criteria fores reserve assets. The relevant unallocated gold account liabilities are classified as deposits. (See paragraphs 5.76 and 5.77 of BPM7 for further details on allocated and unallocated gold accounts.)
- 12.62 Similar accounts, distinguishing between unallocated and allocated accounts for different precious metals, are also possible and should be treated in a similar way; those for unallocated metals are deposits in foreign currency, those for allocated accounts are holdings of valuables. If the practice of using commodities in this way extends beyond metals, it will be for consideration whether to extend this practice.
- 12.6312.67 Transferable and other deposits may be held as assets by all sectors. Deposits are most often accepted as liabilities by financial corporations but institutional arrangements in some countries permit non-financial corporations, general government and households to accept deposits as liabilities.

<u>12.6412.68</u> Other deposits should <u>preferably</u> be cross-classified according to:

- a. whether the deposits are denominated in domestic currency or in foreign currencies, and
- b. whether they are liabilities of resident institutions or the rest of the world.

# **3.** Debt securities

- 12.65<br/>
  12.69 Debt securities are negotiable instruments serving as evidence of a debt. They include bills, bonds,<br/>
  negotiable certificates of deposit, commercial paper, debentures, asset-backed securities, money-market<br/>
  instruments, and similar instruments normally traded in the financial markets. Bills are defined as securities<br/>
  that give the holders the unconditional rights to receive stated fixed sums on a specified date. Bills are<br/>
  issued and usually traded in organized markets at discounts to face value that depend on the rate of interest<br/>
  and the time to maturity. Examples of short-term securities are Treasury bills, negotiable certificates of<br/>
  deposit, bankers' acceptances and commercial paper. Bonds and debentures are securities that give the<br/>
  holders the unconditional right to fixed payments or contractually determined variable payments, that is,<br/>
  the earning of interest is not dependent on earnings of the debtors. Bonds and debentures also give holders<br/>
  the unconditional rights to fixed sums as payments to the creditor on a specified date or dates.
- 12.70 Utility tokens that provide the holders future access to goods or services, should be classified as debt securities. The same holds for crypto assets with a corresponding liability designed to act as a medium of exchange within a platform. Because these latter payment tokens are quite different from traditional debt securities, it is recommended to record them in a separate subcategory (see below).
- 12.6612.71 Loans that have become negotiable from one holder to another are to be reclassified from loans to debt securities under certain circumstances. For such reclassification, there needs to be evidence of secondary market trading, including the existence of market makers, and frequent quotations of the instrument, such as provided by bid-offer spreads.
- 12.6712.72 Non-participating preferred stocks or shares are those that pay a fixed income but do not provide for participation in the distribution of the residual value of an incorporated enterprise on dissolution. They are repaid after standard debt and before equity in the order of repayment in case of bankruptcy. These shares are classified as debt securities. Bonds that are convertible into equity should also be classified in this category prior to the time that they are converted.

- 12.6812.73 Asset-backed securities and collateralized debt obligations are arrangements under which payments of interest and principal are backed by payments on specified assets or income streams. Securitization may also be used as a term to describe this process. Asset-backed securities may be issued by a specific holding unit or vehicle, which issues securities that are sold to raise funds to pay the originator for the underlying assets. Asset-backed securities are classified as debt securities because the security issuers have a requirement to make payments, while the holders do not have a residual claim on the underlying assets; if they did, the instrument would be equity or investment funds shares. Asset-backed securities are backed by various types of financial assets, for example, mortgages and credit card loans, non-financial assets, or by future income streams (such as the earnings of a musician or a government's future revenue) that are not recognized in themselves as an economic asset in macro-economic statistics.
- 12.6912.74 A banker's acceptance involves the acceptance by a financial corporation, in return for a fee, of a draft or bill of exchange and the unconditional promise to pay a specific amount at a specified date. In contrast to acceptances more generally, a banker's acceptance must be tradable. Much international trade is financed this way. Bankers' acceptances are classified under the category of debt securities. The banker's acceptance represents an unconditional claim on the part of the holder and an unconditional liability on the part of the accepting financial corporation; the financial corporation's counterpart asset is a claim on its customer. Bankers' acceptances are treated as financial assets from the time of acceptance, even though funds may not be exchanged until a later stage.
- 12.7012.75 Stripped securities are securities that have been transformed from a principal amount with coupon payments into a series of zero-coupon bonds, with a range of maturities matching the coupon payment date(s) and the redemption date of the principal amount(s). The function of stripping is that investor preferences for particular cash flows can be met in ways different from the mix of cash flows of the original security. Stripped securities may have an issuer different from the original issuer; in which instance, new liabilities are created. There are two cases of stripped securities:
  - a. When a third party acquires the original securities and uses them to back the issue of the stripped securities. Then new funds have been raised and there is a new financial instrument.
  - b. When no new funds are raised and the payments on the original securities are stripped and marketed separately by the issuer or through agents (such as strip dealers) acting with the issuer's consent.

12.7112.76 Index-linked securities are instruments for which either the coupon payments (interest) or the principal or both are linked to an index such as a price index, an interest rate or the price of a commodity. The objective is to conserve purchasing power or wealth during a period of inflation in addition to earning interest income. When the coupon payments are index-linked they are treated entirely as interest, as is the case with any variable interest rate financial asset. When the value of the principal is indexed to an indicator that moves in line with a broad-based measure of inflation, the issue price of the security is recorded as the principal and the index payment paid periodically and at maturity is treated as interest. The payment owing to indexation should be recorded as interest (property income) over the life of the security and the counterpart should be recorded under debt securities in the financial account. When a security is indexed to a commodity and thus may be subject to large price fluctuations, a variation on this procedure is recommended. It is explained in detail in part 4 of chapter 1725.

## Supplementary classifications of debt securities

12.7212.77 It is recommended to compile the following breakdownA supplementary subclassification of debt securities: by maturity into short term and long term should be based on the following criteria.

- a. Short-term debt securities include those securities that have an original maturity of one year or less. Securities with a maturity of one year or less should be classified as short-term even if they are issued under long-term facilities such as note issuing facilities.
- b. Long-term debt securities include those securities that have an original maturity of more than one year. Claims with optional maturity dates, the latest of which is more than one year away, and claims with indefinite maturity dates should be classified as long-term.

### b.c. Crypto assets that qualify as debt securities.

In addition, it may sometimes be useful to distinguish listed debt securities from unlisted ones and to record them according to whether they are short- or long-term. It may also be useful to distinguish securities with an original maturity of more than one year, whose remaining maturity is less than one year.

## 4. Loans

**12.73**12.78 Loans are financial assets that:

- a. are created when a creditor lends funds directly to a debtor, and
- b. are evidenced by documents that are not negotiable.
- 12.7412.79 The category of loans includes overdrafts, instalment loans, hire-purchase credit and loans to finance trade credit, including factoring claims. Peer-to-peer lending through digital platforms, which facilitate lending of money from individuals and other lenders, often unsecured, to unrelated individuals or small businesses, thereby circumventing traditional financial intermediaries, are also considered as loans. Claims on or liabilities to the IMF that are in the form of loans are also included. An overdraft arising from the overdraft facility of a transferable deposit account is classified as a loan. However, undrawn lines of credit are not recognized as a liability as they are contingent. Securities, repurchase agreements, gold swaps and financing by means of a financial lease may also be classified as loans. However, accounts receivable/payable, which are treated as a separate category of financial assets, and loans that have become debt securities are also excluded from loans.
- 12.80 A securities repurchase agreement (repo) is an arrangement involving the provision of securities in exchange for cash with a commitment to repurchase the same or similar securities at a fixed price either on a specified future date (often one or a few days hence, but also further in the future) or with an "open" maturity. Securities lending with cash collateral and sale/buy-backs are economically the same as a repurchase agreement; all involve the provision of securities as collateral for a loan or deposit. A repo is a securities repurchase agreement where securities are provided for cash with a commitment to repurchase the same or similar securities for cash at a fixed price on a specified future date. (It is called a repo from the perspective of the security provider and a reverse repo from the perspective of the security taker.)
- 12.7512.81 The supply and receipt of funds under a securities repurchase agreement may be treated as a loan or deposit. It is generally a loan, but is classified as a deposit if it involves liabilities of a deposit-taking corporation and is included in national measures of broad money. However, margin calls in cash under a repo are classified as loans. If a securities repurchase agreement does not involve the supply of cash (that is, there is an exchange of one security for another, or one party supplies a security without collateral), there is no loan or deposit. However, margin calls in cash under a repo are classified as loans.
- 12.82 The securities provided as collateral under securities lending, including a securities repurchase agreement, are treated as not having changed economic ownership. This treatment is adopted because the cash receiver is still subject to the risks or benefits of any change in the price of the security.
- 12.76
   12.83
   The party that acquires securities under a repurchase agreement or security lending (borrowing) can on-sell the securities due to the change in legal ownership of the securities). This on-selling of the securities is recorded as a negative asset, to avoid the double-counting of the security by both the economic (original) owner and the final owner.
- 12.84 A gold swap involves an exchange of gold for foreign exchange deposits with an agreement that the transaction be reversed at an agreed future date at an agreed gold price. The gold should not be recorded on the balance sheet of the gold taker (cash provider) will not usually record the gold on its balance sheet, while the gold should also not be removed from the balance sheet of the gold provider (cash taker) will not usually remove the gold from its balance sheet. In this manner, the transaction is analogous to a repurchase agreement and should be recorded as a collateralized loan or deposit. Gold swaps are similar to securities repurchase agreements except that the collateral is gold.

# 12.7712.85 Reverse transactions that involve commodities (or potentially other non-financial assets) are recorded in the same way as the above reverse transactions for securities and gold.

- 12.86 When goods are acquired under a financial lease, a change of economic ownership of the goods from the lessor to the lessee is deemed to take place. The change of economic ownership may be distinguished by the fact that all the risks and rewards of ownership are transferred from the legal owner of the good, the lessor, to the user of the good, the lessee. The lessee contracts to make payments that enable the lessor, over the period of the contract, to recover all, or virtually all, of his costs including interest. This de facto change in ownership is recorded by assuming a loan is made by the lessor to the lessee, the lessee uses this loan to acquire the asset and the payments by the lessee to the lessor represent not rentals on the asset but payments of interest, possibly a service charge and repayments of principal on the imputed loan. Interest is recorded as property income payable or receivable and debt repayment is recorded in the financial account as reducing the value of the asset (loan) of the lessor and the liability of the lessee. There is more extensive discussion of financial leases in part 5 of chapter 1727.
- 12.7812.87 Factoring is a transaction in which a factor, which can be a bank, a specialized factoring company, or other financial organization, buys trade accounts receivable from a supplier at a discount. Factoring is commonly viewed as a purchase or sale of invoices transferring the legal right of the claim on the debtor to the factor. In factoring, the indirect financing by the factor to the debtor is treated as a loan. The accounts receivable concerned are trade-related receivables arising from the provision of goods, services, or work in progress. There are two basic types of factoring: non-recourse and recourse factoring. In a nonrecourse agreement, the factor assumes the full risk of non-payment by the debtors at maturity and therefore may charge the supplier a higher fee. In a recourse agreement, all or part of the risk is kept by the supplier. The factor may also keep a reserve that should be paid back to the supplier once the debtor pays its liability in full. The instrument reclassification from trade credit to a loan should be recorded as a transaction in the financial account. The recourse is seen as a guarantee treated as a contingent liability for the supplier, which should therefore not be recorded unless and until being activated by the factor. The factoring income is treated as a fee paid by the supplier; see paragraph 7.xxx. The reserve held by a factor is classified as a deposit, a loan, or other accounts receivable/payable, following the recording of other cash collaterals (e.g., repayable margins for financial derivatives).

# Supplementary classifications of loans

12.7912.88 Loans may be divided, on a supplementary basis, between short- and long-term loans.

- a. Short-term loans comprise loans that have an original maturity of one year or less. Loans repayable on the demand of the creditor should be classified as short-term even when these loans are expected to be outstanding for more than one year.
- b. Long-term loans comprise loans that have an original maturity of more than one year.
- 12.8012.89 It may also be useful to distinguish loans that, though taken out for a period longer than a year, have less than one year to maturity in the accounting period considered, as well as loans secured by mortgages.

# 5. Equity and investment fund shares

- 12.8112.90 Equity and investment fund shares have the distinguishing feature that the holders own a residual claim on the assets of the institutional unit that issued the instrument. Equity represents the owner's funds in the institutional unit. In contrast to debt, equity does not generally provide the owner with a right to a predetermined amount or an amount determined according to a fixed formula.
- 12.8212.91 Investment fund shares have a specialized role in financial intermediation as a kind of collective investment in other assets, so they are identified separately.
# Equity

- 12.8312.92 Equity comprises all instruments and records acknowledging claims on the residual value of a corporation or quasi-corporation after the claims of all creditors have been met. Equity is treated as a liability of the issuing institutional unit.
- 12.93 Ownership of equity in legal entities is usually evidenced by shares, stocks, depository receipts, participations, or similar documents. They may also take the form of equity crypto assets, which are similar to standard equity albeit with a novel technology for being created, allocated, transferred and managed. Shares and stocks have the same meaning, while depository receipts are securities that facilitate ownership of securities listed in other economies; a depository issues receipts listed on one exchange that represent ownership of securities listed on another exchange. Participating preferred shares are those that provide for participation in the residual value on the dissolution of an incorporated enterprise. Such shares are also equity securities, whether or not the income is fixed or determined according to a formula. (Non-participating preferred shares are treated as debt securities as explained above.)
- 12.84Subscription rights are the rights of corporate shareholders to participate in the acquisition of shares<br/>newly issued by the corporation. Subscription rights are designed to offset any potential dilution effect in the<br/>value of the stake of current shareholders resulting from the terms of issuance: by exercising the rights, the<br/>investor maintains their percentage of ownership in the corporation buying a proportionate number of shares<br/>of the issuance. Despite their expiry date, subscription rights are classified as equity, as they represent part<br/>of the own funds of the corporation.
- 12.8512.95 Equities are subdivided into:
  - a. listed shares;
  - b. unlisted shares; and
  - c. other equity and equity in international organisations.

Both listed and unlisted shares are negotiable and are therefore equity securities.

- 12.8612.96 Listed shares are equity securities listed on an exchange. They are also referred to as quoted shares. The existence of quoted prices of shares listed on an exchange means that current market prices are usually readily available.
- 12.8712.97 Unlisted shares are equity securities not listed on an exchange. Unlisted shares can also be called private equity; venture capital usually takes this form. Unlisted shares tend to be issued by subsidiaries and smaller scale enterprises and typically have different regulatory requirements but neither qualification is necessarily the case.
- 12.8812.98 Other equity and equity in international organisations consists of all forms of equity other than listed and unlisted sharesis equity that is not in the form of securities. It can include equity in quasicorporations (such as branches, trusts, limited liability and other partnerships), unincorporated funds and notional units for ownership of real estate and other natural resources. The equity ownership of many international organizations (e.g., ownership of currency union central banks) is usually not in the form of tradable shares and so is classified in this item. Although equity in some international organizations, such as the Bank for International Settlements (BIS), is in the form of unlisted shares, the equity is not tradable by member countries; therefore, it should also be classified in this item. The ownership of some international organizations is not in the form of shares and so is classified as other equity (although equity in the Bank for International Settlements (BIS) is in the form of unlisted shares).
- 12.8912.99 Transactions in equity in the financial account cover three different types of transactions. The first is the recording of the value of shares bought and sold<u>on an exchange</u>. From time to time corporations restructure their shares and may offer shareholders a new number of shares for each share previously held. These bonus shares, which are different from subscription rights (see above), are not however treated as transactions but as a form of redenomination since the value of the new number of shares times the new price represents the same proportion of the value of the corporation as the old number of shares times the old price.

- The second type of transaction concerning equity is capital injections by the owners or, on occasion, <del>12.90</del>12.100 withdrawals of equity by the owners. Dividends are recorded in the distribution of primaryallocation of earned income account as if they were always paid out of operating surplus earned in the current period. An enterprise, though, usually aims to have a smooth track record of dividend payments and will therefore sometimes pay out more than the current operating surplus net earnings from current production, property income (excluding distributed income in the form of dividends) and transfer income transactions and sometimes rather less, the balance carrying through to the accumulation accounts by way of saving (which might be negative). However, if the dividends paid out are significantly in excess of recent average earningsoperational profits excluding holding gains and losses, then the excess should no longer all be recorded in the allocation of primary earned income account but should be regarded recorded as a financial transaction (withdrawal of equity) by the owners akin to the partial liquidation of the enterpriseand be reflected under this item. Such payments are sometimes referred to as "super dividends" (see paragraph 8.xxx). Withdrawals may take the form of proceeds from sales of fixed or other assets, transfers of fixed and other assets from the quasi-corporation to the owner and funds taken from accumulated retained earnings and reserves for the consumption of fixed capital depreciation. In the case of foreign direct investment relationships, the treatment of these exceptional payments as withdrawals of equity is restricted to those related to non-operating activities (sales of assets, liquidations of branches). For domestic direct investment relationships, such as government controlled public corporations, super dividends may also concern payments out of reserves accumulated in past periods. (The particular case of payments between government and public enterprises corporations is discussed in chapter 2230.) Equally, liquidating dividends paid to shareholders when an enterprise becomes bankrupt should be recorded as withdrawal of equity.
- 12.9112.101 Conversely, owners may inject extra finance into an enterprise. If the enterprise is publicly controlled and runs a regular deficit each year as a matter of government economic or social policy that is covered by a receipt from government to match this deficit, the payment is regarded as a subsidy. If the payment from government is irregular but clearly designed to cover accumulated losses, it is treated as a capital transfer. If government makes an investment grant to a public corporation this also is recorded as a capital transfer. However, there may be cases where the owners (public or private) agree to make new finance available to permit expansion, say, and represent not just a reduction of debt but a positive addition to the enterprise's own funds. The finance consists of funds for use by the enterprise in purchasing fixed assets, accumulating inventories, acquiring financial assets or redeeming liabilities. Transfers by owners of fixed and other assets to the quasi-corporation are also included as addition to equity. Such payments are to be included in this item as an acquisition of equity, even if no new shares are issued in response to the financial contribution.
- 12.9212.102 The third type of transaction concerning equity is the special case of equity addition and withdrawal that happens in respect of the reinvestment of earnings of foreign direct investment enterprises. In the distribution of primaryearned income account, the share of operating surplusretained earnings (i.e., net earnings from current production, property and transfer income transactions that have not been distributed) proportionate to the foreign direct investor's share of equity is shown as being withdrawn and distributed to him as reinvested earnings. Because it is not actually withdrawn, it adds to the value of the equity of the enterprise by a recording as reinvestment of earnings in the financial account.
- 12.9312.103 Notional resident units are treated in the same manner as quasi-corporations. For example, an extension to a holiday home of a non-resident is recorded as an increase in the value of an asset owned by a resident notional unit with a matching increase in the equity of the non-resident owner. However, the entire income from a holiday home is treated as a withdrawal by the owner of the notional resident unit so there are no earnings left to be reinvested. This ensures that the entire net worth of the notional resident unit is the value of the property in question.

# Investment fund shares or units

- 12.9412.104 Investment funds are collective investment undertakings through which investors pool funds for investment in financial or non-financial assets or both. Those units acquiring shares in the funds thus spread their risk across all the instruments in the fund.
- 12:9512.105 In a detailed flow of fundsfrom-whom-to-whom table, the acquisition of instruments by the

investment funds is shown separately from the acquisition of shares in the funds and a full analysis of the from-whom-to-whom transactions captures the holdings of instruments via investment funds without needing to have a separate category for it. However, as noted in connection with the category of inter-bank positions, timely flow-of-fundsfrom-whom-to-whom tables are not always available. Therefore, in order to distinguish when non-financial units acquire instruments such as securities and equities directly and when they are acquired via investment funds, the latter are shown separately.

- 12.9612.106 Investment funds include mutual funds and unit trusts. Investment funds issue shares when a corporate structure is used and units when a trust structure is used. Investment fund shares refer to the shares issued by mutual funds, rather than the shares the mutual fund may hold.
- 12.97<u>12.107</u> Investment funds are divided into money market funds (MMF) and non-MMF investment funds. The fundamental difference between them is that MMFs typically invest in money market instruments with an original-residual maturity of less than one year, are often transferable and are often regarded as close substitutes for deposits. Non-MMF investment funds typically invest in longer-term financial assets or certain non-financial assets and possibly real estate. They are not transferable and are typically not regarded as substitutes for deposits.
- 12.9812.108 The increase in value of investment fund shares or units other than from holding gains and losses and after any reinvested earnings are deducted is shown in the SNA as distributed to the share or unit holders and reinvested by them in the financial account, after deduction of all implicit and explicit charges for management and operating costs.

#### Money market fund shares or units

12.9912.109 Money market funds are investment funds that invest only or primarily in short-term money market securities such as Treasury bills, certificates of deposit and commercial paper. Money market funds sometimes are functionally close to transferable deposits, for example, accounts with unrestricted chequewriting privileges. If these fund shares are included in broad money in the reporting economy, they should be recorded as a separate item to allow reconciliation with monetary statistics. Money market fund shares or units represent a claim on a proportion of the value of an established money market fund.

#### **OtherNon-MMF** investment fund shares or units

12.10012.110 OtherNon-MMF investment fund shares or units represent a claim on a proportion of the value of an established investment fund other than a money market fund.

# Supplementary classifications of investment fund shares

- <u>12.10112.111</u> It may be useful to distinguish listed from unlisted investment fund shares.
- 12.10212.112 Investment funds invest in a range of assets including debt securities, equity, commodity-linked investments, real estate, shares in other investment funds and structured assets. Data on the composition of their assets could be useful in economies where investment funds are significant. See chapter 29 for more details.

#### 6. Insurance, pension and standardized guarantee schemes

12.10312.113 Insurance, pension and standardized guarantee schemes all function as a form of redistribution of income or wealth mediated by financial institutions. The redistribution may be between individual institutional units in the same period or for the same institutional unit over different periods or a combination of the two. Units participating in the schemes contribute to them and may receive benefits (or have claims settled) in the same or later periods. While they hold the funds, insurance corporations invest them on behalf of the participants. The part of the investment income that is distributed to the participants as property income is returned as extra contributions. In all cases, net contributions or premiums less service charges are defined

as actual contributions or premiums plus distributed property income less the service charge retained by the financial institution concerned. Entries in the financial account, therefore, reflect the difference between net contributions or net premiums less service charges paid to the schemes less benefits and claims paid out. Significant other additions to the reserves of the schemes come via other changes in the volume of assets and especially holding gains. There is more extensive discussion on the recording of all these schemes in parts 1, 2 and 3 of chapters 1724 and 25.

12.10412.114 There are fivesix sorts of reserves applicable to insurance, pension and standardized guarantee schemes. These are non-life insurance technical reserves, life insurance and annuities entitlements, pension entitlements, claims of pension funds on the pension manager<u>entitlements to non-pension benefits</u> and provisions for calls under standardized guarantees.

#### Non-life insurance technical reserves

12.10512.115 Non-life insurance technical reserves consist of prepayments of net-non-life insurance premiums less service charges and reserves to meet outstanding non-life insurance claims. They consist of actual premiums paid but not yet earned (called unearned actual premiums) and claims due but not yet settled, including cases where the amount is in dispute or the event leading to the claim has occurred but has not yet been reported (called claims outstanding). The only transactions for non-life insurance technical reserves recorded in the financial account are accrual adjustments. In this respect, refunded premiums at surrender of an insurance policy should be recorded as a financial transaction (i.e., a decrease of insurance technical reserves).

#### Life insurance and annuities entitlements

12.10612.116 Life insurance and annuities entitlements show the extent of financial claims policyholders have against an enterprise offering life insurance or providing annuities. The only transaction for life insurance and annuity entitlements recorded in the financial account is the difference between net premiums less service charges receivable and claims payable.

#### **Pension entitlements**

12.10712.117 Pension entitlements show the extent of typically concern financial claims both existing and future pensioners hold against either their employer or a fund designated by the employer to pay pensions earned as part of a compensation agreement between the employer and employee. However, they may also relate to collective arrangements established for selected groups of self-employed persons, if certain conditions are met (see chapter 24 for more details). The only transaction for pension entitlements recorded in the financial account is the difference between net-contributions less service changes receivable and benefits payable. The increase in pension entitlements shown in the financial account is equal to the entry in the use of income accounts for the change in pension entitlements plus any transfer of entitlements from a previous pension manager.

# Claims of pension funds on pension manager

**12.108** An employer may contract with a third party to administer the pension funds for his employees. If the employer continues to determine the terms of the pension schemes and retains the responsibility for any deficit in funding as well as the right to retain any excess funding, the employer is described as the pension manager. <u>or pension sponsor</u>, and the unit working under the direction of the pension manager is described as the pension administrator. If the agreement between the employer and the third party is such that the employer passes the risks and responsibilities for any deficit in funding to the third party in return for the right of the third party to retain any excess, the third party becomes the pension manger as well as the administrator.

12.10912.119 When the pension manager, or sponsor, is a unit different from the administrator, with the

consequences that responsibility for any deficit, or claims on any excess, rest with the pension manager, the claim of the pension fund on the pension manager is shown under this heading. (The entry is negative if the pension fund makes more investment income from the pension entitlements it holds than is necessary to cover the increase in entitlements and the difference is payable to the pension manager of the scheme.)

#### **Entitlements to non-pension benefits**

12.11012.120 Funded schemes for social insurance benefits other than pensions are not very common. They may, however, exist in two circumstances. The first is when an employer has a fund for such benefits and accumulates any underspend in one year to pay for possible overspends in future years. Alternatively, an employer may realise that the commitments to make payments in future are such that it is prudent to build reserves to be able to make such payments. An example of such a scheme might be one that provides health cover, invalidity or other (non-longevity) risks to present and past employees. Unlike in the case of pensions, estimates of possible future claims on social insurance benefits other than pensions are generally not included in the SNA. Liabilities are recorded only when and to the extent that they exist in the employer's accounts.

#### Provisions for calls under standardized guarantees

12.11112.121 Provisions for calls under standardized guarantees consist of prepayments of net-fees less service charges and provisions to meet outstanding calls under standardized guarantees. The transactions for provisions for calls under standardized guarantee schemes recorded in the financial account are similar to the reserves for non-life insurance; they include unearned fees and calls not yet settled.

### 7. Financial derivatives and employee stock options

#### **Financial derivatives**

- 12.112 Financial derivatives, including derivative crypto assets (i.e., derivative contracts that rely on cryptography and that can be exchanged peer-to-peer even if the underlying asset is not a crypto asset), are financial instruments that are linked to a specific financial instrument or indicator or commodity, through which specific financial risks can be traded in financial markets in their own right. The value of a financial derivative derives from the price of the underlying item: the reference price. The reference price may relate to a commodity, a financial asset, an interest rate, an exchange rate, another derivative or a spread between two prices. The derivative contract may also refer to an index or a basket of prices.
- 12.11312.123 An observable market price or an index for the underlying item is essential for calculating the value of any financial derivative. If a financial derivative cannot be valued because a prevailing market price or index for the underlying item is not available, it cannot be regarded as a financial asset. Unlike debt instruments, no principal amount is advanced to be repaid and no investment income accrues. Financial derivatives are used for a number of purposes including risk management, hedging, arbitrage between markets and speculation. Financial derivatives enable parties to trade specific financial risks (interest rate risk, currency, equity and commodity price risk and credit risk, etc.) to other entities who are more willing, or better suited, to take or manage these risks, typically, but not always, without trading in a primary asset or commodity. The risk embodied in a derivatives contract can be "traded" either by trading the contract itself, such as is possible with options, or by creating a new contract that embodies risk characteristics that match, in a countervailing manner, those of the existing contract owned. The latter is termed offsetability and is particularly common in forward markets or where there are no formal exchanges through which to trade derivatives.
- 12.11412.124 Financial derivative instruments that can be valued separately from the underlying item to which they are linked should be treated as financial assets, regardless of whether "trading" occurs on- or off-exchange. Transactions in financial derivatives should be treated as separate transactions, rather than as integral parts of the value of underlying transactions to which they may be linked. The two parties to the derivatives may have different motives for entering into the transaction. One may be hedging, while the other may be dealing in derivative instruments or acquiring the derivative as an investment. Even if both parties

are hedging, they may be hedging transactions or risks that involve different financial assets or even transactions in different accounts. Therefore, if derivative transactions were treated as integral parts of other transactions, such treatment would lead to asymmetries of measurement in different parts of the accounts or to asymmetries of measurement between institutional sectors.

- 12.11512.125 Any commissions paid to or received from brokers or other intermediaries for arranging options, futures, swaps and other derivatives contracts are treated as payments for services in the appropriate accounts. Financial derivatives transactions may take place between two parties directly, or through an intermediary. In the latter case, implicit or explicit service charges may be involved. However, it is usually not possible to distinguish the implicit service element. Net settlement payments under derivative contracts are therefore recorded as financial transactions. However, where possible, the service charge component should be separately recorded. Financial derivatives contracts are usually settled by net payments of cash. This often occurs before maturity for exchange-traded contracts such as commodity futures. Cash settlement is a logical consequence of the use of financial derivative contracts, particularly involving foreign currency, are associated with transactions in the underlying item. A transaction in an asset underlying a financial derivative contract that goes to delivery should be recorded at the prevailing market price for the asset with the difference between the prevailing price and the price actually paid (times the quantity of the asset) recorded as a transaction in financial derivatives.
- <u>12.11612.126</u> There are two broad classes of financial derivatives: option<u>-type</u> contracts (options) and forwardtype contracts (forwards). Within each class, a further distinction could be made by market risk categories; foreign exchange, single currency interest rate, equity, commodity, credit and other. Option-type contracts entail two payment streams, a "premium leg", comprising of fixed payments from the buyer to the seller, and a "contingent leg", comprising payments from the seller to the buyer depending on the underlying asset's pricing, whereas forward-type contacts entail contingent payments between the parties involved depending on the underlying asset's pricing. The contingent leg in an option-type contract usually entails a single payment at maturity; the premium leg in standard put and call options consists in a single payment at inception.

12.127 Option-type contracts can be contrasted with forward-type contracts in that:

- a. <u>at inception, there is usually no up-front payment for a forward-type contract and the derivative</u> <u>contract begins with zero value, whereas there is usually a premium paid for an option-type contract</u> <u>representing a non-zero value for the contract;</u>
- b. during the life of the contract, for a forward-type contract, either party can be creditor or debtor, and it may change, whereas for an option-type contract, the buyer is always the creditor and the writer is always the debtor except for contracts with multiple payments in the premium leg like credit default swaps; and
- d.c. at maturity, redemption is unconditional for forward-type contracts, whereas for standard call and put option contracts it is determined by the buyer of the contract.
- 12.2 A major difference between forward and option contracts is that, whereas either party to a forward contract is a potential debtor, the buyer of an option contract acquires an asset and the option writer incurs a liability. However, option contracts frequently expire without worth; options are exercised only if settling a contract is advantageous for the option holder.

#### 12.117

#### Option-type contracts (options)

12.11812.128 Options are contracts that give the purchaser of the option the right, but not the obligation, to buy (a "call" option) or to sell (a "put" option) a particular financial instrument or commodity at a predetermined price (the "strike" price) within a given time span (American option) or on a given date (European option). Many options contracts, if exercised, are settled by a cash payment rather than by delivery of the underlying assets or commodities to which the contract relates. Options are sold or "written" on many types of underlying bases such as equities, interest rates, foreign currencies, commodities and specified indices. The buyer of the option pays a premium (the option price) to the seller for the latter's commitment to sell or purchase the specified amount of the underlying instrument or commodity on demand of the buyer. While the premium paid to the seller of the option can conceptually be considered to include a service charge, in practice, it is usually not possible to distinguish the service element. The full price should be recorded as acquisition of a financial asset by the buyer and as incurrence of a liability by the seller. However, where possible, the service charge component should be separately recorded.

- 12.11912.129 The timing of premium payments on options varies. Depending on the type of contract, premiums are paid when the contracts begin, when the options are exercised, or when the options expire. The value of an option at inception should be recorded at the full price of the premium. If the premiums are paid after the purchase of an option, the value of the premium payable is recorded as an asset at the time the derivative is purchased, financed by an account receivable from the writer. Sometimes a premium is paid after the inception of the contract. In that case, the value of the premium is recorded at the inception of the contract in the same manner as if it had been paid then, but is shown as being financed by accounts receivable/payable between the writer and the purchaser. Subsequent purchases and sales of options are also to be recorded in the financial account. If an option based on a financial asset is exercised or if a commodity based option proceeds to delivery, the acquisition or sale of the underlying asset should be recorded at the prevailing market price in the appropriate accounts with the difference between this amount and the amount actually paid recorded as transactions in financial derivatives.
- 12.12012.130 Warrants are a form of options that are treated in the financial account in the same way as other options. Warrants are tradable instruments giving the holder the right to buy, under specified terms for a specified period of time, from the issuer of the warrant (usually a corporation) a certain number of shares or bonds. There are also currency warrants based on the amount of one currency required to buy another and cross-currency warrants tied to third currencies. They can be traded apart from the underlying securities to which they are linked and therefore have a market value. The issuer of the warrant incurs a liability, which is the counterpart of the asset held by the purchaser.

#### Forward-type contracts (forwards)

- 12.12112.131 Under a forward contract, the Forwards are unconditional contracts by which two counterparties agree to buy or sellexchange a specified quantity of an underlying item (a particular product or financial or non-financialasset) at an agreed-upon contract price (the "strike" price) on a specified date. Futures contracts are forward contracts traded on organized exchanges. A forward contract is an unconditional financial contract that represents an obligation for settlement on a specified date. Futures and other forward contracts are typically, but not always, settled by the payment of cash or the provision of some other financial instrument rather than the actual delivery of the underlying item and therefore are valued and traded separately from the underlying item. At the inception of the contract, risk exposures of equal market value are exchanged and hence the contract has zero value. Some time must elapse for the market value of each party's risk to differ so that an asset (creditor) position is created for one party and a liability (debtor) position for the other. The debtor/creditor relationship may change both in magnitude and direction during the life of the forward contract.
- <u>12.12212.132</u> Common forward-type contracts include interest rate swaps, forward rate agreements (FRA), foreign exchange swaps, forward foreign exchange contracts and cross-currency interest rate swaps.
  - a. An interest rate swap contract involves an exchange of cash flows related to interest payments, or receipts, on a notional amount of principal, which is never exchanged, in one currency over a period of time. Settlements are often made through net cash payments by one counterparty to the other.
  - b. A forward rate agreement (FRA) is an arrangement in which two parties, in order to protect themselves against interest rate changes, agree on an interest rate to be paid, at a specified settlement date, on a notional amount of principal that is never exchanged. FRAs are settled by net cash payments. The only payment that takes place is related to the difference between the agreed

forward rate agreement rate and the prevailing market rate at the time of settlement. The buyer of the forward rate agreement receives payment from the seller if the prevailing rate exceeds the agreed rate; the seller receives payment if the prevailing rate is lower than the agreed rate.

- c. A foreign exchange swap is a spot sale/purchase of currencies and a simultaneous forward purchase/sale of the same currencies.
- d. A forward foreign exchange contract involves two counterparties who agree to transact in foreign currencies at an agreed exchange rate in a specified amount at some agreed future date.
- e. A cross-currency interest rate swap, sometimes known as a currency swap, involves an exchange of cash flows related to interest payments and an exchange of principal amounts at an agreed exchange rate at the end of the contract.
- 12.133 When a contract requires ongoing servicing (such as payments in an interest rate swap) and a cash payment is received, there is a decrease (increase) in a financial derivative asset (liability) if, at the time of the payment, the contract is in an asset (liability) position. If compilers are unable to implement this approach because of market practice, all cash receipts should be recorded as reductions in financial assets, and all cash payments should be recorded as decreases in liabilities. There might also be an exchange of principal at the beginning of the contract and, in these circumstances, there may be subsequent repayments, which include both interest and principal, over time according to the predetermined rules. Streams of net settlement payments resulting from swap arrangements are to be recorded as transactions in financial derivatives and repayments of principal are to be recorded under the relevant instrument item in the financial account.
- 12.134 For financial derivative contracts involving foreign currency, such as currency swaps, it is necessary to distinguish between a transaction in a financial derivative contract and transactions in the underlying currencies. At inception, the parties' exchange of the underlying financial instruments is usually classified under deposits. At the time of settlement, the difference in the values, as measured in the unit of account at the prevailing exchange rate, of the currencies swapped are allocated to a transaction in a financial derivative, with the values swapped recorded in the relevant other item (usually other investment).

#### Credit derivatives

12.12312.135 The financial derivatives described in the previous paragraphs are related to market risk, which pertains to changes in the market prices of securities, commodities, interest and exchange rates. Credit derivatives are financial derivatives whose primary purpose is to trade credit risk. They are designed for trading in loan and security default risk. Under a credit default swap, premiums are paid in return for a cash payment in the event of a default by the debtor of the underlying instrument. Credit derivatives take the form of both forward-type and option-type contracts and like other financial derivatives, they are frequently drawn up under standard master legal agreements and involve collateral and margining procedures, which allow for a means to make a market valuation.

# Margins

12.136 Margins are payments of cash or deposits of collateral that cover actual or potential obligations incurred. The required provision of margin reflects market concern over counterparty risk and is standard in financial derivative markets, especially futures and exchange-traded options. Ownership of the margin remains with the unit that deposited it. Margin payments in cash are classified as deposits (if the debtor's liabilities are included in broad money), loans, or other accounts receivable/payable. When a repayable margin deposit is made in a non-cash asset (such as securities), no transaction is recorded because no change in economic ownership has occurred. In organised exchanges and clearing houses, margins are increased or decreased as a result of settling profits/losses of the derivative contracts by marking them to market value often on a daily or intraday basis; they are recorded as an increase or decrease in deposits, loans, or other accounts receivable/payable with a corresponding entry in a decrease in financial derivative assets or liabilities. If the margin falls short of a required level (often called a maintenance margin), an additional margin must be posted to meet the requirement; this payment is not to settle a financial derivative contract and should not be recorded in financial derivatives. Margins are payments of eash or collateral that cover actual or potential obligations under financial derivatives, especially futures or exchange traded options. Repayable margins consist of deposits or other collateral deposited to protect a counterparty against default risk, but that remain under the ownership of the unit that placed the margins. Although its use may be restricted, a deposit is classified as repayable if the depositor retains the risks and rewards of ownership. Repayable margin payments in cash are transactions in deposits, not transactions in a financial derivative. The depositor has a claim on the exchange or other institution holding the deposit. Some compilers may prefer to classify these margins within other accounts receivable or payable in order to reserve the term deposits for monetary aggregates. When repayable margin payments are made in non-cash assets, such as securities, no entries are required because the entity on whom the depositor has a claim (the issuer of the security) is unchanged. Nonrepayable margins reduce a financial liability created under a financial derivative contract. The entity that pays a non-repayable margin no longer retains ownership of the margin nor has the right to the risks and rewards of ownership, such as the receipt of income or exposure to holding gains and losses. A payment of a non-repayable margin is normally recorded as a decline in currency and deposits with a counter entry in the reduction in financial derivative liabilities and the receipt of a non-repayable margin is recorded as an increase of holdings of currency and deposits with the counter entry in the reduction in financial derivative assets.

#### 12.137 Financial derivatives should be broken down by type of market risk, as follows:

- foreign exchange derivatives;
- single currency interest rate derivatives;
- equity derivatives;
- credit derivatives; and
- <u>other derivatives.</u>

#### 12.138 In addition, the following breakdowns are encouraged as supplementary items:

• By instrument, as follows:

- <u>o forwards;</u>
- <u>o options;</u>
- o credit derivatives; and
- o other and hybrid derivatives

• By trading venue, as follows:

- o exchange-traded derivatives;
- o Over-the-counter derivatives;
- o cleared derivatives; and
- o non-cleared (over-the-counter) derivatives.

<u>12.12412.139</u> It may also be considered useful to compile data on the currency composition of the notional values of the derivatives linked to foreign currencies.

# **Employee stock options (ESOs)**

- 12.140 An employee stock option is an agreement made on a given date (the "grant" date) under which an employee may purchase a given number of shares of the employer's stock at a stated price (the "strike" price) either at a stated time (the "vesting" date) or within a period of time (the "exercise" period) immediately following the vesting date. The exercise date is the time at which the option is exercised. It cannot be earlier than the vesting date or later than the end of the exercise period. Transactions in employee stock options are recorded in the financial account as the counterpart to the element of compensationremuneration of employees represented by the value of the stock option. The means of valuing and time of recording ESOs is discussed in part 6 of chapter 17.
- <u>12.12512.141</u> Chapter 25 contains a more detailed discussion on the classifications and (time of) recording of financial derivatives and employee stock options, including related financial instruments.

# 8. Other accounts receivable or payable

#### Trade credit and advances

12.142 This category comprises trade credit for goods and services extended to corporations, government, NPISHs, households and the rest of the world, and advances for work that is in progress (if classified as such under inventories) or is to be undertaken. Trade credits and advances do not include loans to finance trade credit, which are classified as loans. It may be valuable to separate short-term trade credits and advances from long-term trade credit and advances by employing the same criteria used to distinguish between other short- and long-term financial assets.

12.12612.143 For the recording of factoring, see paragraph 12.xxx.

# Emission permits

12.144 An emissions permit (cap-and-trade) system is a flexible market mechanism that establishes a maximum level of pollution - a cap. Enterprises must have a permit to cover each unit of pollution they produce. Each permit stipulates the amount of greenhouse gas emissions that can be emitted (quota). Payments for such emission permits are recorded as prepaid taxes on production, with taxes recorded at the time of surrender, at issuance prices. As such, they qualify as a category of other accounts receivable and payable.

#### Other

12.145 This category includes accounts receivable and payable, other than those described previously, that is the amounts are not related to the provision of goods and services. It covers amounts related to taxes, dividends, purchases and sales of securities, rent, wages and salaries, and social contributions. Interest that accrues but is not paid is included in this item only if the accrued interest is not added to the value of the asset on which the interest is payable (as is usually the case).

<u>12.127</u><u>12.146</u> This category does not include statistical discrepancies.

# 9. <u>SupplementaryMemorandum</u> items

#### Foreign direct investment

12.12812.147 Transactions in financial assets and liabilities arising from the provision of, or receipt of, foreign direct investment are to be recorded under the appropriate categories: debt securities, loans, equity, trade credit or other. However, it is encouraged to also record the amounts of foreign direct investment included within each of those categories should also be recorded separately as memorandum supplementary items. Foreign direct investment is discussed further in chapter 33s 17 and 24.

#### Non-performing loans

<u>12.148</u> It is useful to identify transactions relating to non-performing loans as <u>memorandumsupplementary</u> items. There is a discussion of the definition of and recording for non-performing loans in chapter <u>1314</u>. In addition, when they are important it may be useful to group all arrears of interest and repayment under a <u>memorandumsupplementary</u> item. The recording of provisions, among which those related to non-performing loans, including arrears of interest and repayment, is also discussed in chapter <u>14</u>.

# Sustainable finance

- 12.149Two primary types of sustainable finance are defined: ESG (Environmental, Social, Governance) finance and<br/>green finance with green finance being a sub-set of ESG finance. ESG finance is finance for activities or<br/>projects that sustain or improve the condition of the environment or society or governance practices. Green<br/>finance is finance for activities or projects that sustain or improve the condition of the environment.
- 12.129
   12.150
   Countries are encouraged to compile measures of ESG finance and green finance as of which items for the following financial instruments: debt securities, loans, equity, and investment fund shares/units. For more information, see chapter 35.

# Chapter 14: Balance sheet

# (OLD Chapter 13: The balance sheet)

Please note that the order of this chapter in the 2008 SNA has been slightly changed, mainly because of the revised classification of non-financial assets, from distinguishing between produced and non-produced non-financial assets to having a breakdown into (i) produced non-financial assets (excluding natural capital); (ii) non-produced non-financial assets (excluding natural capital); and (iii) natural capital. This affects the order in Section C, where these re-allocations have not been shown in the form of track changes.

# A. Introduction

14.1 This chapter is concerned with measuring the stocks of assets, both non-financial and financial, and liabilities. Assets and liabilities can be aggregated across all types so as to show the total value of assets less liabilities, or net worth, of an institutional unit<u>or a sector</u>. Alternatively, the total value of a given type of asset across all units in the economy can be derived. Tables depicting the first sort of aggregation are called balance sheets; those depicting the second sort are called asset accounts. For both balance sheets and asset accounts, it is also important to show how the transactions and other flows recorded during the course of an accounting period explain the changes in value of the stock in question between the start and end of the period. The value of the stock at the start of the period is referred to as the opening stock and the value at the end of the period is referred to as the closing stock. Sometimes a stock level is referred to as a position, especially in the <u>case of financial assets and liabilities</u> balance of payments context.

# 1. Balance sheets

- 14.2 A balance sheet is a statement, drawn up in respect of a particular point in time, of the values of assets owned and of the liabilities owed by an institutional unit or group of unitssector and of liabilities incurred by this institutional unit or sector. A balance sheet may be drawn up for institutional units, institutional sectors and the total economy. A similar account is drawn up showing the stock levels of assets and liabilities originating in the total economy held by non-residents and of <u>foreignexternal</u> assets and liabilities held by residents. In BPM<u>76</u> this account is called the international investment position (IIP) but is drawn up from the point of view of residents whereas in the SNA it is drawn up from the point of view of the rest of the world with the rest of the world being treated in the same way as domestic sectors.
- 14.3 Assets appear in the balance sheet of the unit that is the economic owner of the asset. In many cases this unit will also be the legal owner but in the case of a financial lease, the leased asset appears on the balance sheet of the lessee, while the lessor has a financial asset of similar amount and a corresponding claim against the lessee. On the other handFurthermore, when a natural resource is the subject of a resource lease, the asset is recorded in the accounts of the legal owner, often government, and the extractor, in line with the estimated appropriation of future resource rents; as such the economic ownership of the natural resource is split between the original owner and the extractor continues to appear in the balance sheet of the lessee. A fuller description of the treatment of leases is given in part 5 of chapter 1727 and of the distinction between legal and economic owner is given in chapter 34.
- 14.4 The financial and non-financial resources at the disposal of an institutional unit or sector shown in the balance sheet provide an indicator of economic status. These resources are summarized in the balancing item, net worth. Net worth is defined as the value of all the assets owned by an institutional unit or sector less the value of all its outstanding liabilities (including shares and other equity). For the economy as a whole, the balance sheet shows the sum of non-financial assets and net <u>financial</u> claims on the rest of the world. This sum is often referred to as national wealth <u>or national net worth</u>.
- 14.5 The balance sheet completes the sequence of <u>economic</u> accounts, showing the ultimate result of the entries in the production, distribution and use of income, and accumulation accounts.
- 14.6 The existence of a set of balance sheets integrated with the flow accounts encourages analysts to look more

broadly when monitoring and assessing economic and financial conditions and behaviour. Balance sheets provide information necessary for analysing a number of topics. For example, in studies of the factors determining household behaviour, consumption and saving functions often include wealth variables to capture the effects of such factors as price fluctuations in corporate securities or the deterioration and obsolescence of stocks of durable consumer goods on households' purchasing patterns. Further, balance sheets for groups of households are needed in order to assess the distribution of wealth and liquidity.

14.7 Balance sheets allow economists to assess the financial status of a sector and permit risk analyses by a central bank, for example. For corporations, balance sheets permit the computation of widely used ratios that involve data on the level of the different items on the balance sheet. Banks and other financial institutions, for example, are required to maintain specific reserve ratios that can be monitored via a balance sheet. Non-financial corporations check certain ratios such as current assets in relation to current liabilities and the market value of corporate shares in relation to the adjusted book value. Data on the stocks of fixed assets owned by corporations, as well as by other institutional units, are useful in studies of their investment behaviour and needs for financing. Balance sheet information on financial assets held by, and liabilities owed to, non-residents are of considerable interest as indicators of the economic resources of an economy nation and for assessing the external debtor or creditor position of a country. For more details on analysing financial risks and vulnerabilities, see chapter 37.

# 2. Asset accounts

14.8 As well as drawing up a balance sheet showing the values of all assets (and liabilities) held by an institutional unit, it is possible to draw up a similar account for the value of a single type of asset (or liability) held by all institutional units in the economy. This is called an asset account. A basic accounting identity links the opening balance sheet and the closing balance sheet for a given asset or liability):

The value of the stock of a specific type of asset in the opening balance sheet;

*plus* the total value of the same type of asset acquired, less the total value of the same type of asset disposed of, in transactions that take place within the accounting period: transactions in non-financial assets are recorded in the capital account (including <u>consumption of fixed</u> <u>capital\_depreciation and depletion</u>) and transactions in financial assets are recorded in the financial account;

*plus* the value of other positive or negative changes in the volume of these assets held, for example, as a result of the <u>discoverycoming into existence</u> of a subsoil asset or the destruction of an asset (as a result of war or a natural disaster): these changes are recorded in the other changes in the volume of assets account;

*plus* the value of the positive or negative nominal holding gains accruing during the period resulting from a change in the price of the asset: these changes are shown in the revaluation account;

equals the value of the stock of the asset in the closing balance sheet.

14.9 Although balance sheets are more familiar to those used to working with commercial accounts, asset accounts are particularly useful for some types of analyses. One example is in connection with environmental accounting where the asset account provides a particularly revealing picture of whether an asset is being used sustainably or not. Another example is in connection with the development of capital stock series for fixed assets. Many financial statistics describe the evolution of an individual financial asset, for example showing how the level of lending has changed over the period.

# **3.** Structure of the balance sheet

14.10 The balance sheet records assets on the left-hand side and liabilities and net worth on the right-hand side, as do the accumulation accounts for changes in these items. In table 143.1, only a limited number of classes of assets are shown, though in principle the table can include all the detailed non-financial assets described and

defined in chapter <u>1011</u> and the full set of financial assets and liabilities described and defined in chapter <u>1112</u>. A balance sheet relates to the values of assets and liabilities at a particular point in time. The SNA provides for balance sheets to be compiled at the beginning of the accounting period (with the same values as at the end of the preceding period) and at its end. The SNA then provides for a complete recording of the changes in the values of the various items in the balance sheet between the beginning and end of the accounting period to which the flow accounts of the SNA relate. The balancing item in the balance sheet is net worth, which, as noted earlier, is defined as the value of all the assets owned by an institutional unit or sector less the value of all its outstanding liabilities. Changes in net worth can thus be explained fully only by examining the changes in all the other items that make up the balance sheet.

#### Table 143.1: Opening and closing balance sheets with changes in assets

Table 143.1 (cont): Opening and closing balance sheets with changes in liabilities and net worth

- 14.11 Table 143.1 consists of three sections. The first shows the opening balance sheet and net worth for each institutional sector and the total economy. For the rest of the world, the only relevant entries are for contracts, leases and licences, financial assets and liabilities, and net worth. In addition, changes in the ownership between residents and non-residents of non-produced non-financial assets are recorded in the capital accounts, albeit that changes in ownership of natural resources typically do not give rise to an international transaction, because notional resident units are generally identified as the owners of these immovable assets.
- 14.12 The second part of table 143.1 consists of a summary of the entries in the capital, financial, other changes in volume of assets and revaluation accounts grouped by type of asset. The entries for fixed assets, for example, show the totals of the entries for fixed assets in each of the capital account, the other changes in volume of assets account and the revaluation account. Under these entries there is a breakdown showing how much of the change in net worth is due to saving and capital transfers, other changes in the volume of assets and holding gains. There is no entry carried forward from the financial account because the changes in net worth due to saving and capital transfers are completely exhausted by changes in transactions in financial and non-financial assets.
- 14.13 The third section of table 143.1 shows the closing balance sheet which is numerically equal, cell by cell, to the sum of the corresponding cells in the first two parts of the table. In practice, though, these figures will be determined independently and a reconciliation exercise needed to ensure the identities inherent in the table are satisfied.

### 4. Structure of asset accounts

14.14 An example of a set of asset accounts is given in table 143.2. The same data for the stock levels in the opening and closing balance sheets are given for the same range of assets, but instead of the breakdown by sectors, the columns show the entries for each type of asset coming from the capital and financial account, the other changes in the volume of assets account and the revaluation account.

#### Table 134.2: Asset accounts for the total economy

14.15 Unlike table 143.1, table 143.2 does not include any entries for assets held by or due to the rest of the world because it focuses on the holding by resident units of particular assets and liabilities. However, by comparing the figures for financial assets and liabilities of the same instrument, it is possible to derive the balance with the rest of the world. For example, in the opening balance sheet figures, the value of financial assets for currency and deposits is 1 482 and of liabilities is 1 471. This implies that the rest of the world has a net liability with the national economy of 11. Table 143.1 shows that the asset position of the rest of the world is 105 and the liability position 116.

# **B.** General principles of valuation

- 14.16 For the balance sheets to be consistent with the accumulation accounts of the SNA, every item in the balance sheet should be valued as if it were being acquired on the date to which the balance sheet relates. This implies that when they are exchanged on a market, assets and liabilities are to be valued using a set of prices that are current on the date to which the balance sheet relates and that refer to specific assets. In the case of non-financial assets, other than land, the value includes any associated costs of ownership transfer. Financial claims that are not traded on organized financial markets are valued at the amount the debtor must pay to the creditor to extinguish the claim. This section contains a concise overview of the main principles and methodologies for valuing assets and liabilities; more details are provided in the annex to chapter 4.
- 14.17 The prices at which assets may be bought or sold on markets are the basis of decisions by investors, producers, consumers and other economic agents. For example, investors in financial assets (such as securities) and natural resources (such as land) make decisions in respect of acquisitions and disposals of these assets in the light of their values in the market. Producers make decisions about how much of a particular commodity to produce and about where to sell their output by reference to prices on markets. For a given asset, there is a clear relationship between the price paid by the purchaser and the price received by the seller. For non-financial assets other than land, the price paid by the purchaser exceeds that received by the seller by the costs of ownership transfer. In the case of financial assets, the value is the same for creditor and debtor because the costs of transferring financial assets and liabilities are treated as consumption rather than accumulation.
- 14.18 Ideally, observable market prices should be used to value all assets and liabilities in a balance sheet. However, in estimating the current market price for balance sheet valuation, a price averaged over all transactions in a market can be used if the market is one on which the items in question are regularly, actively and freely traded. When there are no observable prices because the items in question have not been purchased or sold on the market in the recent past, an attempt has to be made to estimate what the prices would be were the assets to be acquired on the market on the date to which the balance sheet relates.

#### 14.19

14.20 In addition to values observed in markets or estimated from observed prices, values may be approximated for balance sheet valuation in two other ways. In some cases, values may be approximated by accumulating and revaluing acquisitions less disposals of the type of asset in question over its lifetime and adjusted for changes such as depreciation; this generally is the most practical and also the preferred method for fixed assets, but it can be applied to other assets as well. In other cases, values may be approximated by the present, or discounted, value of future economic benefits expected from a given asset; this is the case for a number of financial assets, natural resources and even for fixed assets. With good information and efficient markets, the values of the assets obtained by accumulating and revaluing transactions should equal, or at least approximate, both the present, or discounted, value of the remaining future benefits to be derived from them and their market values when active second hand markets exist. These three price bases are discussed below in general terms.

#### 14.21

14.18 Ideally, observable market prices should be used to value all assets and liabilities in a balance sheet. It is important though to make a distinction between the initial recognition of assets, and the subsequent valuation of assets. Regarding the initial recognition, i.e., the time at which the asset (or liability) enters the balance sheet, the relevant transaction value, in the case of financial assets adjusted for commissions and fees, should generally be used. For subsequent valuation, if there are no observable market or near-market prices because the items in question have not been purchased or sold on the market in the recent past, alternative valuation methods need to be applied to estimate what the prices would be were the assets to be acquired on the market on the date to which the balance sheet relates. This is likely to be the case for most non-financial assets, particularly when considering the second-hand nature and the partial depreciation of these assets, and also for certain financial instruments.

- 14.19 For valuing non-financial assets, two basic approaches can be distinguished, the first one based on the market prices for similar (second-hand) assets, and the second one based on the contribution of capital services, including depreciation, to the production process in the remaining service life of the asset. The latter approach is usually approximated by accumulating and revaluing acquisitions less disposals over its lifetime and adjusted for changes such as depreciation. Similar valuation issues may exist in the case of, for example, natural resources, the stocks of which are generally not traded in the market, so any values derived from occasionally traded stocks cannot be used for the valuation of similar assets, also because of the heterogeneity of the resources in question. In these cases, the value on the balance sheet can be approximated by the net present value of future benefits derived from these resources, which represent an alternative way of estimating the capital services to the production process.
- 14.20 Many financial assets are traded in markets on a regular basis and therefore can be valued by directly using the price quotations from these markets. Valuation according to market-value equivalent is needed for valuing financial assets and liabilities that are not traded in financial markets or are traded only infrequently. For these assets and liabilities, it will be necessary to estimate fair values that, in effect, approximate market prices. The present value of future cash flows can also be used as an approximation to market prices, provided an appropriate discount rate is used.
- 14.21Non-tradable financial assets, particularly those with a face value applicable at some point in the future (e.g.,<br/>loans, deposits, and other accounts receivable and payable) are valued at valued at nominal value (i.e., the<br/>amount the debtor must pay to the creditor to extinguish the claim, including any accrued interest). For a<br/>restricted group of financial instruments, however, the above valuation methods cannot be applied. Examples<br/>relate to unlisted equity and defined benefit pension entitlements. While for the latter the present value of<br/>future pension benefits is the generally accepted method for valuation, various approaches can be considered<br/>in the case of unlisted equity (see paragraphs 14.81 to 14.86).
- 14.22 Below, three basic methods for valuing stocks of assets and liabilities are described. These are (i) values observed in markets, (ii) values obtained by accumulating and revaluing transactions, and (iii) values obtained by applying the net present value of future benefits. More detailed information on the valuation of assets and liabilities, including methods such as the valuation at nominal value, can be found in the annex to chapter 4.

# 1. Value observed in markets

- 14.2214.23 The ideal source of price observations for valuing balance sheet items is a market, like the stock exchange, in which each asset traded is completely homogeneous, is often traded in considerable volume and has its market price listed at regular intervals. Such markets yield data on prices that can be multiplied by indicators of quantity in order to compute the total market value of different classes of assets held by sectors and of different classes of their liabilities. These prices are available for nearly allnegotiable financial assetselaims, regularly traded in active market with price quotations, existing transportation equipment, crops, and livestock as well as for newly produced fixed assets and inventories.
- 14.23 For securities quoted on a stock exchange, for example, it is feasible to gather the prices of individual assets and of broad classes of assets and, in addition, to determine the global valuation of all the existing securities of a given type. In some countries, another example of a market in which assets may be traded in sufficient numbers to provide useful price information is the market for existing dwellings.
- 14.25 In addition to providing direct observations on the prices of assets actually traded there, information from such markets may also be used to price similar assets that are not traded. For example, information from the stock exchange also may be used to price unlisted shares by analogy with similar, listed shares, making some allowance for the inferior marketability of the unlisted shares. Similarly, <u>expert estimates such as</u> appraisals of assets for insurance or other purposes generally are based on observed prices for items that are close substitutes, although not identical, and this approach can be used for balance sheet valuation. For a discussion of the special valuation problems associated with direct investment enterprises, see chapters 24.30 and 2633.

# 2. Values obtained by accumulating and revaluing transactions

- 14.26 Most non-financial assets change in value year by year reflecting changes in market prices. At the same time, initial acquisition costs are reduced by <u>consumption of fixed capitaldepreciation</u> (in the case of fixed assets) or other forms of <u>depreciation\_deterioration</u> over the asset's expected life. The value of such an asset at a given point in its life is given by the current acquisition price of an equivalent new asset less the accumulated depreciation. This valuation is sometimes referred to as the "written-down replacement cost". When reliable, directly observed prices for used assets are not available, this procedure gives a reasonable approximation of what the market price would be were the asset to be offered for sale.
- 14.24 14.27 For the purpose of valuing assets using this method, the perpetual inventory method is usually applied. The method can be considered superior to market(-equivalent) prices, if the market prices for second-hand assets cannot be considered as representative for the future capital services, which can be derived from the continued use of the asset in production. A problem in the application of this method relates to the information needed for the application of this estimation method. Most importantly, apart from long time series on past expenditures on the purchases, including price developments, of the assets in question, information is needed on the service life; the age-price or the age-efficiency profile; and discard patterns. More detailed guidance is provided in the OECD Manual on Measuring Capital (2009, 2<sup>nd</sup> edition).

# 3. Present value of future <u>benefitsreturns</u>

- 14.28 In the case of assets for which the returns either are delayed (as with forests) or are spread over a lengthy period (as with subsoil assets), although market prices are used to value the ultimate output, a rate of discount must, in addition, be used to compute the present value of the expected future returns. For some assets, mainly relating but not necessarily confined to natural resources, the most suitable method for valuation is the net present value of future benefits associated with the use of the relevant asset. This method can only be used if there is a direct link between the future benefits and the asset in question, in the sense that one can assume that there are no other assets which may have generated the benefits. Furthermore, it is also important to acknowledge that, because it may be difficult to determine the future earnings with the appropriate degree of certainty, and given that assumptions are also needed about the asset's life length and the discount factor to be applied, other possible sources of valuation should be exhausted before resorting to this method.
- 14.25 14.29 When estimating the future benefits related to natural resources, the residual value method, i.e., the output generated with the exploitation of the resources minus all costs associated with the exploitation, is typically used. Exploitation rights are often provided by government for a series of rent payments. The (present value of) actual rent payments may not account for the full value of benefits, or resource rents, that can be derived from these assets, and the asset in question may clearly generate a future stream of resource rents, going well beyond the payments of rent to the legal owner. The unit having the rights to exploit the resources thus appropriates part of the resource rents, reflecting the future capital services derived from these assets by the unit having the exploitation rights. In these cases, the value of the resources in question is split between the legal owner and the unit exploiting the resources.

# 4. Assets denominated in foreign currencies

14.2614.30 Assets and liabilities denominated in foreign currencies should be converted into the domestic currency at the market exchange rate prevailing on the date to which the balance sheet relates. This rate should be the mid-point between the buying and selling spot rates for currency transactions.

# C. The entries in the balance sheet

14.2714.31 Definitions of the assets in the balance sheet at the most detailed level of the classification of assets are given in chapter 1011 for non-financial assets and in chapter 112 for financial assets. Definitions are repeated in this section only to the extent needed to provide the context for information on valuation specific to particular assets and other specialized topics. More details on the principles and methodologies for valuing assets are provided in the annex of chapter 4.

# 1. Produced <u>non-financial assets (excluding natural capital)</u>

#### **Fixed assets**

- 14.2814.32 In principle, fixed assets should be valued at the prices prevailing in the market for assets in the same condition as regards technical specifications and age. In practice, this sort of information is not available in the detail required and recourse must be had to valuation by another method, most commonly the value derived by adding the revaluation element that applied to the asset during the period covered by the balance sheet to the opening balance sheet value (or the time since acquisition for newly acquired assets) and deducting the consumption of fixed capitaldepreciation estimated for the period as well as any other volume changes and the value of disposals. In the case of anticipated terminal costs, the value of these costs should be added to the value of the relevant assets, with a corresponding entry under provisions; see also the section on supplementary items below. In calculating the value of eonsumption of fixed capitaldepreciation, assumptions have to be made about the decline in price of the asset and even where full market information is not available, partial information should be used to check that the assumptions made are consistent with this.
- 14.2914.33 Estimates of consumption of fixed capitaldepreciation must include the decline in value of the purchasers' costs of ownership transfer on acquisition and disposal associated with these assets. These are to be written off over the period the purchaser expects to own the asset. In many cases, this period may coincide with the expected life length of the asset but for some types of asset, particularly vehicles, the purchaser may intend to sell them after a certain period, for example, in order to acquire a newer model with a higher level of specification and lower maintenance costs. Installation costs should be treated in a similar manner. Where possible, the estimates of consumption of fixed capitaldepreciation should also allow for anticipated terminal costs such as decommissioning or rehabilitation. Further explanation of these adjustments can be found in chapters 1011 and 1917. More detail on the application of a perpetual inventory method (PIM) of estimating the value of capital stock of fixed assets can be found in the OECD Manual on Measuring Capital (2009, 2nd edition).
- **14.30**<u>14.34</u> For dwellings, there may be adequate information available from the sale of both new and existing buildings to assist in making balance sheet estimates of the total value of dwellings. However house prices depend to a considerable extent on location and the geographical pattern of sales in the period may not cover all areas adequately, in which case a technique such as a PIM will have to be used. This technique will probably also apply to many other buildings and structures since their characteristics are often specific to the structure concerned.
- 14.31<u>14.35</u> The value of land improvements is shown as the written down value of the improvements as originally carried out, suitably revalued. This will always be equal to the difference in value between the land concerned in an unimproved or natural state, and its value after the improvements have been effected, though both the land and the land improvements will be subject to price changes over time.
- 14.36 Markets for existing automobiles, aircraft, and other transportation equipment may be sufficiently representative to yield useful price observations for valuation of these stocks or at least to use in conjunction with a set of PIM assumptions. In the case of existing industrial plant and equipment, however, observed prices on markets may not be suitable for determining values for use in the balance sheets, either because many of the transactions involve assets that for some reason are not typical, or because they embody specialized characteristics, or because they are obsolete or because they are being disposed of under financial duress.
- 14.32Military weapons systems comprising vehicles and other equipment such as warships, submarines,<br/>military aircraft, tanks, missile carriers and launchers, etc. can be valued by accumulating and revaluing<br/>transactions. Depreciation is typically based on its use in providing deterrence in periods of peacetime.<br/>Destruction in war times and other decreases beyond expectation, which should be recorded as other changes<br/>in the volume of assets, may significantly affect the value of weapons systems.
- 14.3314.38 Research and development expenditure carried out on contract is valued at the contract price. If carried out on own account, it is valued as cumulated costs. If it is carried out by a market producer, the costs, which should include a return to capital. Both The valuation estimates need to be increased for changes in prices and reduced because of consumption of fixed capital depreciation over the life of the asset.

- 14.34<u>14.39</u> Even though costs of ownership transfer on non-produced assets (other than land) are shown separately in the capital account, and treated as gross fixed capital formation, in the balance sheets these costs are incorporated in the value of the asset to which they relate even though the asset is non-produced. Thus there are no costs of ownership transfer shown separately in the balance sheets. The costs of ownership transfer on financial assets are treated as intermediate consumption when the assets are acquired by corporations or government, final consumption when the assets are acquired by households and exports of services when the assets are acquired by non-residents.
- 14.3514.40 Mineral exploration and evaluation should be valued either on the basis of the amounts paid under contracts awarded to other institutional units for the purpose or on the basis of the costs incurred for exploration undertaken on own account. These costs should include a return to the fixed capital used in the exploration activity. That part of exploration undertaken in the past that has not yet been fully written off should be revalued at the prices and costs of the current period.
- 14.3614.41 Originals of intellectual property products, such as computer software (including artificial intelligence), data and databases, and entertainment, literary or artistic originals should be entered at the written down value of their initial cost, revalued to the prices of the current period. Since these products will have often been produced on own account, the initial cost may be estimated by the sum of costs incurred including a return to capital on the fixed assets used in production. If value cannot be established in this way, it may be appropriate to estimate the present value of future returnsbenefits arising from the use of the original in production.
- 14.3714.42 Subsequent copies may appear as assets (i) if the original owner has subcontracted the duties of reproducing and providing support to users of the copies, or (ii) if a copy is being used under a contract that is effectively a financial lease. In these cases, market prices should be available to use for valuation.

#### Inventories

- 14.3814.43 Inventories should be valued at the prices prevailing on the date to which the balance sheet relates, and not at the prices at which the products were valued when they entered inventory. In the balance sheets, figures for inventories frequently have to be estimated by adjusting figures of book values of inventories in business accounts, as described in chapter 67.
- 14.3914.44 As is the case elsewhere in the SNA, inventories of materials and supplies are valued at purchasers' prices, and inventories of finished goods and work-in-progress are valued at basic prices. Inventories of goods intended for resale without further processing by wholesalers and retailers are valued at prices paid for them, excluding any transportation costs that have been separately invoiced to the wholesalers or retailers and included in their intermediate consumption.
- **14.40**<u>14.45</u> For inventories of work-in-progress, the value for the closing balance sheet should be consistent with the value of the opening balance sheet, plus any work put in place during the current period, less any work completed and reclassified as finished goods. In addition, an allowance for any necessary revaluation for changes in prices in the period must be included. As explained in chapter <u>67</u> and chapter <u>1917</u>, the time series of the value of work-in-progress put in place over a period of time should reflect the increase in value of work put in place earlier as the delivery date approaches.

# Valuables

- 14.4114.46 Given their primary role as stores of value, it is especially important to value works of art, antiques, jewellery, precious stones and metals at current prices. To the extent that well-organized markets exist for these items, they should be valued at the actual or estimated prices that would be paid for them to the owner were they sold on the market, excluding any agents' fees or commissions payable by the seller, on the date to which the balance sheet relates. On acquisition they are valued at the price paid by the purchaser including any agents' fees or commissions.
- 14.4214.47 An approach in the absence of organized markets is to value these items using data on the values at which they are insured against fire, theft, etc., to the extent information is available.

# 2. Non-produced non-financial assets (excluding natural capital)

#### **Contracts, leases and licences**

14.48 Contracts, leases and licences may be marketable operating leases, licences to use <u>certain</u> natural resources, permits to undertake specific activities and entitlement to future goods and services on an exclusive basis. Non-fungible tokens that grant limited commercial rights are also included. As explained in part 5 of chapter 1727, these sorts of contracts are regarded as assets only if the existence of the legal agreement confers benefits on the holder in excess of the price paid to the lessor, <u>owner of the natural resource</u> or permit issuer and the holder can realize these benefits legally and practically. It is recommended that such assets be recorded only when the value of the asset is significant and is realized, in which case a suitable market price necessarily exists. The asset does not exist beyond the length of the contract agreement and its value must be reduced accordingly as the remaining contract period shortens.

# <u>Crypto assets without a corresponding liability designed to act as a medium of</u> exchange

14.4314.49 Crypto assets without a corresponding liability designed to act as a medium of exchange are completely homogeneous assets which are often traded in considerable volume and have their market prices listed at regular intervals. Such markets yield data on prices that can be multiplied by indicators of quantity in order to compute the total market value of different classes of assets held.

# Purchased Ggoodwill and marketing assets

14.44<u>14.50</u> The balance sheet entry for <u>purchased</u> goodwill and marketing assets is the written-down value of the entry that appears in the financial account when an enterprise is taken over or when a marketing asset is sold. These entries are not revalued.

# 2.3. <u>Non-produced assetsNatural resources</u>

# Land

- 14.4514.51 In principle, the value of land to be shown under natural resources in the balance sheet is the value of land excluding the value of improvements, which is shown separately under fixed assets, and excluding the value of buildings on the land which is also to be shown separately under fixed assets, and also excluding the value of any other natural resources above or below it. Land is valued at its current price paid by a new owner, excluding the costs of ownership transfer which are treated, by convention, as gross fixed capital formation and part of land improvements and are subject to consumption of fixed capital/depreciation.
- 14.4614.52 Because the current market value of land can vary considerably according to its location and the uses for which it is suitable or sanctioned, it is essential to identify the location and use of a specific piece or tract of land and to price it accordingly.
- 14.47<u>14.53</u> For land underlying buildings, the market will, in some instances, furnish data directly on the value of the land. More typically, however, such data are not available and a more usual method is to calculate ratios of the value of the site to the value of the structure from valuation appraisals and to deduce the value of land from the replacement cost of the buildings or from the value on the market of the combined land and buildings. When the value of land cannot be separated from the building, structure, or <u>natural resourceplantation</u>, vineyard, etc., above <u>or below</u> it, the composite asset should be classified in the category representing the greater part of its value. Similarly, if the value of the land improvements (which include site clearance, preparation for the erection of buildings or planting of crops and costs of ownership transfer) cannot be separated from the value of land in its natural state, the value of the land may be allocated to one category or the other depending on which is assumed to represent the greater part of the value.

- 14.4814.54 It is usually much easier to make a division between land and buildings for the total economy than for individual sectors or subsectors. Separate figures are needed for studies of national wealth and environmental problems. Fortunately, combined figures are often suitable for purposes of analysing the behaviour of institutional units and sectors.
- 14.4914.55 Land appears on the balance sheet of the legal owner except when it is subject to a financial lease as may most often occur in connection with a financial lease over a building or plantation on the land. By convention, an exception is made for cases where the legal owner of a building is not the legal owner of the land on which the building stands but the purchase price of the building includes an upfront payment of rent on the land beneath without any prospect of further payments being due in future. In such a case, land is recorded on the balance sheet of the owner of the building on the land.

#### Mineral and energy resources

- 14.50As the ownership of non-renewable mineral and energy resources does not change frequently on<br/>markets, it may be difficult to obtain appropriate prices that can be used for valuation purposes. Therefore,<br/>the value of subsoil-non-renewable mineral and energy resources is usually determined by the present value<br/>of the expected net returnsbenefits, or the residual value, resulting from the commercial exploitation of those<br/>resources, although such valuations are subject to uncertainty and revision. As the ownership of mineral and<br/>energy resources does not change frequently on markets, it may be difficult to obtain appropriate prices that<br/>ean be used for valuation purposes. In practice, it may be necessary to use the valuations that the owners of<br/>the assets place on them in their own accounts.
- 14.57 It is frequently the case that the enterprise extracting a resource is different from the legal owner of the resource. In many countries, for example, oil resources are the property of governmentthe state. However, it is the extractor who determines how fast the resource will be depleted and since the resource is not renewable on a human time-scale, it appears as if there has been a change of economic ownership to the extractor even if this is not the legal position. Nor is it necessarily the case that the extractor maywill have the right to extract until the resource is exhausted. Whatever the case, as the lessor often does not appropriate the full resource rent which can be derived from the exploitation of mineral and energy resources, the asset should be allocated to the lessor and the extractor in line with the estimated appropriation of future resource rents. As such, the economic ownership is split between the original (legal) owner and the extractor. More details on the recording of this split-asset approach are provided in chapter 27.Because there is no wholly satisfactory way in which to show the value of the asset split between the legal owner and the extractor, the whole of the resource is shown on the balance sheet of the legal owner and the payments by the extractor to the owner shown as rent. (This is therefore an extension of the concept of a resource rent applied in this case to a depletable asset.)
- 14.5114.58 For renewable energy resources, the recording and valuation is similar to that recommended for non-renewable mineral and energy resources. However, there are two additional issues to take into consideration. Firstly, where the residual value method is inappropriate due to subsidisation or other market distortions, an alternative approach, known as the "least-cost alternative" method could be applied. This latter approach attempts to identify resource rents by comparing the cost of electricity generation with and without renewable resources. Secondly, the possibility of double-counting needs to be acknowledged. Especially in the case of privately owned land, the market value of land may already capture the additional value related to a permission to exploit for example wind energy. On the other hand, the double-counting problem does not exist in cases where the relevant land is not valued, or no land is involved (e.g., wind turbines on open seas).

#### Non-cultivated bBiological resources, water resources and other natural resources

14.5214.59 For biological resources, a distinction can be made between resources yielding repeat products and resources yielding once-only products. Regarding the first category, For balance sheet purposes, livestock that continue to be used in production year after year should be valued on the basis of the current purchasers' prices for animals of the same age. For valuing work-in-progress, for example relating to animals yielding repeat products that are not yet mature, market prices may also be available. Such information is less likely

to be available for trees (including shrubs) cultivated for products they yield year after year; in this case they should then be recorded at the current written-down value of the cumulated capital formation. Such capital formation, including work-in-progress, may have to be valued using the sum-of-costs method when produced on own account. However, the net present value of future benefits from exploiting these resources may be an alternative and more appropriate method for approximating the value of these resources.

- 14.60 Regarding biological resources yielding once-only products, a distinction can be made between cultivated resources, mainly consisting of livestock raised for slaughter, agricultural crops and resources such as trees for timber production, and non-cultivated resources, mainly consisting of resources such as fish in open seas.
- 14.61Regarding livestock raised for slaughter and agricultural crops, the asset only consists of work-in-progress,<br/>and can usually be valued by reference to the prices of such products on markets.
- 14.5314.62 In the case of trees for timber production and similar cultivated resources, Standing single-use crops (including timber) cultivated by human activity and livestock being raised for slaughter are also counted as inventories in work in progress. The conventional way of valuing these resourcesstanding timber is to discount the future proceeds of selling the timber at current prices after deducting the expenses of bringing the timber to maturity, felling, etc. For the most part, other crops and livestock can be valued by reference to the prices of such products on markets. However, this value will typically include two types of assets, which need to be recorded separately under the relevant asset categories: (i) the work-in-progress representing the growth of trees to maturity; and (ii) the resource rent captured by the underlying asset, i.e., the forest land which is typically not separately valued, and thus not included in the value of land.
- 14.5414.63 Non-cultivated biological resources, water and other natural resources are included in the balance sheet to the extent that they have been recognized as having economic value that is not included in the value of the associated land. An example relates to fish in open seas, which are subject to some form of quota regime. As observed prices are not likely to be available, they are usually valued by the present value of the future benefitsreturns expected from them.

# 3.4. Financial assets and liabilities

14.5514.64 In line with the general valuation principles described above, whenever financial assets and liabilities are regularly traded on organized financial markets, they should be valued at current prices. Financial claims that are not traded on organized financial markets should be valued by the amount that a debtor must pay to the creditor to extinguish the claim. Financial claims should be assigned the same value in the balance sheets whether they appear as assets or liabilities. The prices should exclude service charges, fees, commissions and similar payments for services provided in carrying out the transactions. There is more detailed discussion on the definition of financial assets and their recording in chapters 12 and 2511 and part 4 of chapter 17.

#### **Monetary gold and SDRs**

- <u>14.56</u><u>14.65</u> Monetary gold is to be valued at the price established in organized markets or in bilateral arrangements between central banks.
- 14.5714.66 The value of the SDR is determined daily by the IMF on the basis of a basket of currencies. Rates against domestic currencies are obtainable from the prices in foreign exchange markets; both the basket and the weights are revised from time to time.

#### **Currency and deposits**

14.5814.67 For currency, the valuation is the nominal or face value of the currency. For deposits, the values to be recorded in the balance sheets of both creditors and debtors are the amounts of principal that the debtors are contractually obliged to repay the creditors under the terms of the deposits when the deposits are liquidated. The amount of principal outstanding includes any interest and service charge implicit financial services on loans and deposits due but not paid. Currency and deposits in foreign currency are converted to

domestic currency at the mid-point of the bid and offer spot exchange rates prevailing on the date of the balance sheet. Repayable margin payments in cash related to financial derivatives contracts are included in other deposits.

#### **Debt securities**

- 14.5914.68 Short-term securities, and the corresponding liabilities, are to be valued at their current market values. Such a valuation is particularly important under conditions of high inflation or high nominal interest rates.
- 14.6014.69 Long-term securities should always be valued at their current prices on markets, whether they are bonds on which regular payments of interest are paid or deep-discounted or zero-coupon bonds on which little or no interest is paid. The price should always be that including accrued interest (the so-called "dirty" price, which is considered suitable for valuation of items in the balance sheet). In contrast, the market price of a debt security excluding the accrued interest not yet payable is called the "clean price" and requires accrued interest not yet paid to be added for use in the balance sheet. Although the nominal liability of the issuer of a long-term security may be fixed in money terms, the market prices at which fixed interest securities are traded may vary considerably in response to variations in general market rates of interest. As the issuer of a long-term security usually has the opportunity to refinance the debt by repurchasing the security on the market, valuation at market prices is generally appropriate for both issuers and holders of long-term securities, especially financial transactors who actively manage their assets or liabilities.
- 14.61<u>14.70</u> An index-linked debt security is also valued at its market price in the balance sheet whatever the nature of the index to which the security is linked.
- 14.6214.71 If both the principal and coupons of a debt instrument are indexed to a foreign currency, the security should be treated as if it is denominated in that foreign currency with conversion to domestic currency at the mid-point of the rates prevailing on the date of the balance sheet.
- 14.6314.72 For analytical purposes, it is encouraged to compile, as supplementary items, statistics on the nominal value of liability positions in debt securities.

#### Loans

- 14.64<u>14.73</u> The values of loans to be recorded in the balance sheets of both creditors and debtors are the amounts of principal outstanding, i.e., the nominal value. This amount should include any <u>accrued</u> interest that has been earned but not been paid. It should also include any amount of <u>indirectly measured service</u> chargeimplicit financial services on loans and deposits (the difference between bank interest and SNA interest) due on the loan that has accrued and not been paid. In some instances, accrued interest may be shown under accounts receivable or payable but inclusion in loans is to be preferred if possible. In addition to specific transactions, such as debt forgiveness or restructuring, the value of loans may be affected by value resets recognized by the creditor, such as in cases of bankruptcy, liquidation, or other factors. The other factors should be restricted to re-assessments in view of a formal, publicly known process.
- <u>14.65</u><u>14.74</u> The value of a loan does not reflect the consequences of any interest payments due after the date of the balance sheet, even if these were specified in the original loan agreement.
- 14.6614.75 If there is evidence of a secondary market for a loan, and frequent market quotations are available, the loan is reclassified as a security. A loan that is traded once only and for which there is no evidence of a continuing market is not reclassified but continues to be treated as a loan. The valuation rules for debt securities and loans then apply.
- 14.67<u>14.76</u> Loans where the principal is index-linked, or both principal and interest are indexed to a foreign currency, should be treated in the manner described above for debt securities with these characteristics.

#### Non-performing loans

- 14.6814.77 Despite the fact that loans are to be recorded in the balance sheets at nominal values, certain loans that have not been serviced for some time should be identified and <u>memorandumsupplementary</u> items concerning them should be included in the balance sheet of the creditor. These loans are termed non-performing loans. A common definition of such a loan is as follows. A loan is non-performing when payments of interest or principal are past due by 90 days or more, or interest payments equal to 90 days or more have been capitalized, refinanced, or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons (such as a debtor filing for bankruptcy) to doubt that payments will be made in full. This definition of a non-performing loan is to be interpreted flexibly, taking into account national conventions on when a loan is deemed to be non performing. Once a loan is classified as non-performing, it (or any replacement loans) should remain classified as such until payments are received or the principal is written off on this or subsequent loans that replace the original.
- 14.6914.78 Two memorandum supplementary items are recommended relating to non-performing loans. The first is the nominal value of the loans so designated, including any accrued interest and service charge. The second is the market equivalent value of these loans. The closest approximation to market equivalent value is fair value, which is "the value that approximates the value that would arise from a market transaction between two parties". Fair value can be established using transactions in comparable instruments, or using the discounted present value of cash flows, or may sometimes be available from the balance sheets of the creditor. In the absence of fair value data, the memorandum supplementary item will have to use a second best approach and show nominal value less expected loan losses.
- 14.79 These memorandum supplementary items should be standard for both the government sector and the financial corporations sector. If they are significant for other sectors, or for loans with the rest of the world, they should be shown as supplementary items.

# Equity and investment funds shares/units

Equity

- 14.71<u>14.80</u> Listed shares are regularly traded on stock exchanges or other organized financial markets. They should be valued in the balance sheets at their current prices.
- 14.7214.81 For unlisted shares, there may be no observable market prices for positions in equity not listed on a stock exchange. This situation often arises for direct investment enterprises, private equity, equity in unlisted and delisted companies, listed but illiquid companies, joint ventures, and unincorporated enterprises.
- 14.7314.82 When actual market values are not available, an estimate is required for measuring the equity of unlisted corporations at market-equivalent prices. The following methods for approximating market values are preferred, as also illustrated in figure 14.1: Alternative methods of approximating market value of shareholders' equity in a direct investment enterprise follow. These are not ranked according to preference, and each would need to be assessed according to the circumstances and the plausibility of results.
  - a. *Own funds at book value.* This method for valuing equity uses the value of the enterprise recorded in the books of the direct investment enterprise, as the sum of (i) paid-up capital (excluding any shares on issue that the enterprise holds in itself and including share premium accounts); (ii) all types of reserves identified as equity in the enterprise's balance sheet (including investment grants when accounting guidelines consider them company reserves); (iii) cumulated reinvested earnings; and (iv) holding gains or losses included in own funds in the accounts, whether as revaluation reserves or profits or losses. The more frequent the revaluation of assets and liabilities (at least, on an annual basis), the closer the approximation to market values. Data that are not revalued for several years may be a poor reflection of market values.
  - b. *Recent transaction price.* Unlisted instruments may trade from time to time, and recent prices, within the past year, at which they were traded may be used. Recent prices are a good indicator of current market values to the extent that conditions are unchanged. This method can be used as long as there has been no material change in the corporation's position since the transaction date. Recent transaction prices become increasingly misleading as time passes and conditions change.

c. <u>Market capitalisation or Price to book Value (P/B) method.</u> Book values reported by enterprises with macrolevel adjustments by the statistical compiler. For untraded equity, information on "own funds at book value" can be collected from enterprises, then adjusted with ratios based on suitable price indicators, such as prices of listed shares to book value in the same economy with similar operations. Alternately, assets that enterprises carry at cost (such as land, plant, equipment, and inventories) can be revalued to current period prices using suitable asset price indices.

# 14.7414.83 In the case the above methods cannot be applied, for example due to the unavailability of relevant source data, the following methods could be used as an alternative:

- a. Net asset value. Appraisals of untraded equity may be conducted by knowledgeable management or directors of the enterprise, or provided by independent auditors to obtain total assets at current value less total liabilities (excluding equity) at market value. Valuations should be recent (within the past year).
- b. *Present value/price to earnings ratios.* The present value of unlisted equity can be estimated by discounting the forecast future profits. At its simplest, this method can be approximated by applying a market or industry price-to-earnings ratio to the (smoothed) recent past earnings of the unlisted enterprise to calculate a price. This method is most appropriate where there is a paucity of balance sheet information but earnings data are more readily available.
- c. Apportioning global value. The current market value of a global enterprise group can be based on the market price of its shares on the exchange on which its equity is traded, if it is a listed company. Where an appropriate indicator may be identified (for example, sales, net income, assets, or employment), the global value may be apportioned to each economy in which it has direct investment enterprises, on the basis of that indicator, by making the assumption that the ratio of net market value to sales, net income, assets, or employment is a constant throughout the transnational enterprise group. (Each indicator could yield significantly different results from the others.)

Figure 14.1: Decision tree for valuing unlisted equity



- 14.7514.84 In cases where none of the above methods is feasible, less suitable data may need to be used. For example, cumulated flows or a previous balance sheet adjusted by subsequent flows may be the only sources available. Since these sources use the prices of previous periods, they should be adjusted for subsequent price developments, for example by using aggregate share price or asset price indices, and taking into account exchange rate movements, where relevant. The use of unadjusted summing of past transactions is not a recommended practice. Equity represents owners' funds. The means through which equity can be generated may take various forms, such as share issues, equity injections without any commensurate issue of shares (sometimes called "contributed surplus" or "capital contributions"), share premiums, accumulated reinvested earnings, or revaluation. While these should be taken into account when cumulated flows need to be used as a starting point to measure the value of equity, the different categories are all components of equity and need not be identified separately in other cases.
- 14.76 If the current market price is not directly observable, the decision about the method to adopt should take into account the availability of information as well as judgments as to which available method best approximates market values. Different methods may be suitable for different circumstances and a standard ranking of the alternative methods is not proposed for valuing instruments when current market prices are not directly observable. Compilers should be transparent and should state clearly the method(s) used. Methods for valuation of direct investment equity positions are discussed in more detail in the OECD Benchmark Definition of Foreign Direct Investment, fourth edition (Organisation for Economic Co operation and Development, 2008) referred to as the BD.

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<u>14.85</u> Other equity covers equity in any corporation or quasi-corporation that does not issue shares or units. Such corporations include public enterprises, the central bank, some special government units, partnerships, unlimited liability companies and quasi-corporations whenever they are institutional units without shares. Other equity should be valued as equal to the value of the unit's assets less the value of its liabilities.

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Alternatively, equity in quasi-corporations may be valued using one of the three preferred methods for valuing unlisted equity mentioned above.

- 14.86 The valuation methods for unlisted equity recommended in the above can lead to negative values. This is in particular true for those methods which are based on the balance sheet items of the corporation in question. In the case of unlimited liability entities, it is recommended to always record the resulting negative equity positions. In the case of limited liability entities, however, it is recommended to record negative equity positions as the default option and only zeroing out negative positions in specific cases where the shareholder's and its affiliates' liability is strictly limited.
- 14.87 In respect of the latter, strictly limited liability is referring to a situation where the shareholder would not suffer any other direct economic losses than the existing equity investment in case of bankruptcy and would not be likely to take on any financial obligations in the absence of implicit guarantees or significant reputational risks. Examples of other direct economic losses would include loan losses and the realization of guarantees, while the willingness to assume new financial obligations could be related to reputational, societal, or other reasons.
- 14.78Generally, it can be assumed that implicit guarantees or significant reputational risks exist when a<br/>shareholder's ownership share is at least 10%. This implies that negative direct investment equity positions<br/>should not be zeroed out unless the direct investor has no legally binding economic obligations, except for<br/>the existing equity investment, and a history of not assuming any new financial obligations in the event of<br/>bankruptcy or termination of its direct investment enterprises. Following this recommendation, negative<br/>equity positions in public corporations including central banks should never be zeroed out.
- 14.7914.89 Countries are encouraged to show negative equity positions as supplementary "of which" items under the relevant equity assets and liabilities.

#### Investment fund shares or units

14.8014.90 Shares (or units) in money market funds or in other investment funds should be valued in a manner similar to the proposals under equity. Listed shares should be valued using the market price of the share. Unlisted shares should be valued according to one of the methods described above for unlisted equity.

#### Insurance, annuities, pension and standardized guarantee schemes

#### Non-life insurance technical reserves

14.8114.91 The amount of the reserves for non-life insurance to be recorded in the balance sheet covers actual premiums paid but not earned at the date for which the balance sheet is drawn up plus the amount set aside to meet outstanding claims. This latter amount represents the present value of the amounts expected to be paid out in settlement of claims, including disputed claims, as well as allowances for claims for incidents which have taken place but have not yet been reported.

#### Life insurance and annuityies entitlements

14.8214.92 The amount to be recorded under the stock values for life insurance and annuit<u>yies</u> entitlements is similar to that for non-life insurance technical reserves in that it represents reserves sufficient to meet all future claims. However, in the case of life insurance, the level of the reserves is considerable and represents the present value of all expected future claims. In the commercial accounts of insurance corporations, some of these will be described as provisions for bonuses and rebates. These are the result of the insurance industry's practice of smoothing benefits over time and possibly retaining some benefits until the policy matures.

#### Pension entitlements

14.8314.93 The entitlements due under pension schemes comprise two elements; one when the formula determining the amount of the pension is agreed in advance (as under a defined benefit scheme) and one where the amount of the pension depends on the performance of financial-assets acquired with the future pensioner's contributions (a defined contribution scheme). For the former, an actuarial estimation of the liabilities of the pension provider is used; for the latter the value is the market-value of the financial-assets held by the pension fund on behalf of the future beneficiaries. The basis on which pension entitlement is calculated and the alternative means of representing these in the accounts of the SNA are described in detail in chapter 1724.

# Claims of pension funds on pension managers

14.94 When a pension manager is responsible for meeting the liabilities of a defined benefit pension fund, the pension fund has a claim on the pension manager equal to the shortfall of the assets accumulated in the pension fund as compared to the pension entitlements. In the case of a surplus, a claim with a negative value is recorded. In this way, the net worth of the pension fund remains equal to zero at all times.

#### Provisions for calls under standardized guarantees

14.95 The value to be entered in the balance sheet for provisions for calls under standardized guarantees is the expected level of claims under current guarantees less any expected recoveries. Strictly speaking, these amounts will represent a degree of double counting in the assets of the units benefiting from the guarantees. For example, if financial institutions make 1 000 loans of 20 each that are covered by guarantees and 10 are expected to default, the value of the loans made is still shown as 20 000 and in addition the lenders have an asset of 200 in respect of the expected calls under the guarantee. However, the unit offering the guarantee has a liability of 200 with no matching asset so the net worth for the whole economy is not overstated.

# **Financial derivatives**

14.8414.96 The treatment of derivatives is discussed in chapter 1125. Financial derivatives should be included in the balance sheets at market value. If market value data are unavailable, other fair value methods to value derivatives, such as options models or present values, may be used.

### **Options**

14.8514.97 Options should be valued in the balance sheets as either the current value of the option, if this is available, or the amount of the premium payable. A liability should be entered in the sector of the writer of the option to represent either the current cost of buying out the rights of the option holder or the accrual of a holding gain. Depending on how margin systems operate, it may be appropriate to enter zero for the value of an option, as any profits (losses) will have been received (paid) daily by the holder. The counterpart of these asset entries should be entered as liabilities.

#### Forwards

14.8614.98 A forward is recorded at market value. When payments are effected, the value of the asset and associated liability is amortized and subsequently reflected in the balance sheet value on the appropriate accounting date. The market value of a forward contract can switch between an asset position and a liability position between accounting dates depending on price movements in the underlying item(s). All price changes, including those that result in such switches, are treated as revaluations.

#### Employee stock options

14.8714.99 Employee stock options (ESOs) should be valued by reference to the fair value of the equity instruments granted. The fair value of equity instruments should be measured at grant date using a market value of equivalent traded options (if available) or using an option pricing model (binomial or Black-Scholes) with suitable allowance for particular features of the options. The IASB gives detailed recommendations on how ESOs may be valued and their recommendations are likely to be followed by corporations using ESOs as a form of compensationremuneration for their employees. The value of the ESO alters between grant date and vesting date and then between the vesting date and exercise date as the value of the shares covered changes. Part 6 of eChapter 1725 covers ESOs in more detail.

#### Other accounts receivable or payable

- 14.8814.100 Trade credit and advances and other items due to be received or paid (such as taxes, dividends, rent, wages and salaries, and social contributions) should be valued for both creditors and debtors at the <u>outstanding</u> amount of <u>principal</u> the debtors are contractually obliged to pay the creditors when the obligation is extinguished. Interest due <u>but not paid</u> on other accounts receivable or payable may be included here but, in general, interest due <u>but not paid</u> on deposits, debt securities <u>and loans</u> is recorded as increasing the value of the asset concerned. Interest accruing on deposits and loans may have to follow national practices and be classified here if it is not incorporated into the <u>principal-outstanding amount</u> of the relevant loan or deposit.
- 14.8914.101 Emission permits are treated as prepaid taxes on production. As such, they are also recorded as part of other accounts receivable and payable. They should be valued at their nominal value, despite the fact that they may be tradable and have a market price which is different from the prepaid taxes on production at issuance prices.

#### 4.<u>5.</u> Net worth

- 14.9014.102 Net worth is the difference between the value of all financial and non-financial assets and all liabilities (including shares and other equity) at a particular point in time. For this calculation, each asset and each liability is to be identified and valued separately. As the balancing item, net worth is calculated for institutional units and sectors and for the total economy.
- 14.9114.103 For government, households and NPISHs, the value of net worth is clearly the worth of the unit to its owners. In the case of quasi-corporations, net worth is zero, because the value of the owners' equity is assumed to be equal to its assets less its liabilities. For other corporations, the situation is less clear-cut.
- 14.9214.104 In the SNA, net worth of corporations is calculated in exactly the same way as for other sectors, as the sum of all assets less the sum of all liabilities. In doing so, the value of shares and other equity, which are liabilities of corporations, are included in the value of liabilities. Shares are included at their market price on the balance sheet date. Thus, even though a corporation is wholly owned by its shareholders collectively, it is seen to have a net worth (which could be positive or negative) in addition to the value of the shareholders' equity.
- 14.9314.105 An alternative calculation is similar to the treatment of quasi-corporations. This calculates the value of the shareholders' equity in such a way that net worth is zero. This calculation of shareholders' equity is called own funds and is calculated as the sum of its assets less the sum of its liabilities other than shares.
- 14.94<u>14.106</u> A non-zero value of own funds comes about through a number of factors. One reason is the existence of "assets" that are not recognized as such in the SNA such as <u>purchased</u> goodwill and marketing assets. Another is that the view in the SNA that the value of some financial assets, such as bonds and non-performing loans, may not coincide with a fair value approach. Some or all of these items may be available from the balance sheet of the corporation and it may be useful to compare the sum of these with the amount derived as the difference between net worth and the value of owner's equity. (For unlisted shares, indeed, this may be one way to value these shares.) Further, the market value of shares reflects market sentiment about future income streams which may fluctuate with much more volatility than the underlying value of the corporation.

- 14.9514.107 Own funds include accumulation over time of retained and reinvested earnings. Once current transfers receivable are added to entrepreneurial income and current transfers payable (and the pension entitlement adjustment) are deducted, what remains is available for distribution in the form of dividends. Retained earnings are the amount of a corporation's income available for distribution as dividends that is not so distributed. This amount may be negative on occasion, representing a withdrawal from own funds. In the case of a direct investment enterprise a proportion of retained earnings is treated as reinvested earnings, the proportion depending on the extent of the direct investor's ownership of the corporation. These earnings are recorded in the financial account as being reinvested in the corporation and form part of own funds at that time.
- 14.9614.108 From time to time, some of own funds may be assigned to (or withdrawn from) either general or special reserves. They may be augmented by an injection of capital by the owners or by the receipt of investment grants.

# **5.6.** <u>MemorandumSupplementary</u> items

14.97<u>14.109</u> In addition to the <u>memorandum supplementary</u> items on non-performing loans, the SNA allows for twoencourage the compilation of <u>memorandum supplementary</u> items to the balance sheets in order to show items not separately identified as assets in the <u>central frameworksequence of economic accounts</u> that are of more specialized analytic interest for particular institutional sectors. These <u>twoerelate to</u> are consumer durables, <u>concessional lending</u>, <u>and</u> foreign direct investment, <u>and provisions</u>.

#### **Consumer durables**

- 14.9814.110 Households acquire durable goods such as cars and electrical goods. However, these are not treated as being used in a production process giving rise to household services. They therefore do not constitute fixed assets and are not shown as such in the balance sheet. Nevertheless, it is useful to have data on these goods and so consumer durables are included in the balance sheets as a <u>memorandumsupplementary</u> item. The stocks of consumer durables held by households are to be valued at current prices, both gross and net of accumulated depreciation equivalent to <u>consumptiondepreciation</u> of fixed <u>assetseapital</u>. The figures shown as <u>memorandumsupplementary</u> items in the balance sheet should be net of these accumulated charges.
- 14.9914.111 Durable goods held by owners of unincorporated enterprises may be used partly by the enterprise for production and partly by members of the household for final consumption. The same holds for durable goods such as vehicles which are partly used by self-employed to offer taxi services to third parties. The values shown in the balance sheet for the enterprise, or self-employed, should reflect the proportion of the use that is attributable to the enterprise, but this may not always be known in practice.

# **Concessional lending**

- 14.112 Institutional units may lend to other units under conditions in which the contractual interest rate is intentionally set below the market interest rate that would otherwise apply. The degree of "concessionality" can be enhanced with grace periods, frequencies of payments and a maturity period favourable to the debtor. Since the terms of a concessional loan are more favourable to the debtor than market conditions would otherwise permit, concessional loans effectively include a transfer from the creditor to the debtor. In the sequence of economic accounts, adjustments are only made for concessional loans provided by employers to employees, whereby the difference between the market interest rate and the concessional rate is recorded as remuneration of employees.
- 14.113 In view of its importance for various analytical purposes, it is encouraged to compile, as supplementary items, statistics on concessional loans provided by governments and international organisations. The supplementary items consist of the nominal value of such loans in the sequence of economic accounts, as well as the adjusted nominal value of these loans. The latter value is to be calculated by adjusting the original nominal value with the net present value of the future concessional elements. Alternatively, the adjusted nominal value could be estimated by the net present value of future payments discounted with the market interest rate. The difference

between the two nominal values is considered to be a capital transfer at inception. The latter is recommended, because the decision to provide a lower interest rate for a certain period of time at the start of the loan, or the decision to change the conditions of a loan, is an explicit policy decision at the time of inception or at the time of changing the conditions.

# **Foreign direct investment**

<u>14.114</u> Just as flows of foreign direct investment are shown in the financial account, so it is interesting to have similar items in the balance sheets showing the stock of assets and liabilities invested in the country by non-residents and invested abroad by residents. All sectors may have <u>foreign direct</u> investment abroad; only financial and non-financial corporations (excluding non-profit institutions within them) may receive <u>foreign direct</u> investment from abroad.

#### Accounting for provisions

- 14.115 To arrive at a better understanding of (potential) financial vulnerabilities, it is encouraged to compile supplementary items for (changes in) three types of provisions, as follows:
  - a. *Financial assets related provisions.* This category concerns provisions which have a clear relationship with financial assets. They include provisions for losses on loans and other financial assets. Provisions for calls under standardized guarantees are not included, as these provisions are recognised as liabilities in the sequence of economic accounts.
  - b. Non-financial assets related provisions. This category concerns provisions which have a clear relationship with non-financial assets such as mineral and energy resources. They include but are not necessarily confined to anticipated terminal costs (e.g., future obligations to remove offshore oilrigs and to restore sea beds), and potential compensation payments for damages caused by process of extracting natural resources (e.g., damages caused by oil spills or damages to neighbouring dwellings and other structures resulting from mining activities).
  - **a.c.** *Provisions unrelated to asset ownership.* This category includes, for example, provisions made in respect of warranties, customer refunds, and the like. Provisions for major compensation payments related to, for example, health damages caused by produced goods and services, are also included.

# Chapter 17: Capital services (chapter 20 in the 2008 SNA, moved upwards, revised title and revised content)

(OLD Chapter 20: Capital services and the national accounts)

#### A. Introduction

- 17.1 This chapter differs in content and style from those describing the accounts of the SNA. Its aim is to show how a link can be made between the value of assets used in production and the gross operating surplus generated. This link has been elaborated over a period of about fifty years in a body of knowledge described as the theory of capital services. In recent years, statistical offices have incorporated the ideas from the theory into the measurement of stocks of those assets used in production. Because there is evidence that this approach leads to improved measures of capital stock, it is recommended that a table supplementary to the standard accounts is prepared to display the implicit services provided by non-financial assets. The contribution of labour input to production is recognized in remuneration of employees. By also associating estimates of capital services with the standard breakdown of value added, the contributions of both labour and capital to production of the SNA. The methods for measuring the contributions of labour and capital to the analysis of productivity are summarized in section F of chapter 18.
- 17.2 The rest of the introduction gives a very general overview of the ideas involved in linking capital services with national accounts. Section B shows how the measurement of capital stock can be aligned with the notion of the efficiency of an asset as well as its price. This is followed by section C showing how to identify flows of capital services within existing entries in the accounts. Section D shows how consideration of the basic link between asset value and contribution to operating surplus can be exploited to determine the appropriate way to account for costs associated with acquiring and disposing of assets and to place a value on assets where limited market price information is available. Finally, section E summarizes the fundamental methods of capital measurement and discusses a table on capital services.

#### 1. The basic ideas of capital services

- 17.3 Non-financial assets give rise to benefits either from being used in production or simply from being held over a period of time. This chapter concerns those non-financial assets that contribute to production and how this contribution is recorded in the accounts. The assets concerned are <u>any produced fixed assets (excluding natural capital)</u>, non-produced fixed assets (excluding natural capital), or natural capital assets which are used in <u>an on-going basis on</u> production. Valuables give rise to benefits derived from holding them as stores of value rather than using them and so are not covered by this chapter.
- 17.4 Assets appear on the balance sheet of their economic owner and the changes in value between one balance sheet and the next have to be identified and included in the appropriate account. Changes in the value of assets due to changes in absolute or relative prices appear in the revaluation account. Changes due to unexpected events not reflected in transactions appear in the other changes in the volume of assets and liabilities account. Every other change in value is treated as a transaction and must be recorded elsewhere in the SNA. If the user of the asset is not the legal owner, two sets of transactions are recorded, those giving rise to payments between the user and the owner and those that show the user receiving the benefits of using the asset. These latter are recorded as internal to the user. If the legal owner of the asset is also the user of the asset, only the internal transactions are recorded.
- 17.5 Assets used in production have to be paid for but the payment is not deducted from the value of production in the period the asset is acquired but is spread over the whole of the period the asset is in use in production. For fixed assets, this gradual payment for an asset is recorded as <u>depreciation</u>, which is the decline in the value of the asset due to its use in production. However, assets are not just a charge on production, they also contribute to the profitability of an enterprise by being the source of operating surplus. It has long been commonplace to recognize that operating surplus is the return to capital used in production. <u>This chapter</u>

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presents an articulation of how this surplus is generated and how it relates to the value of an asset and the way in which this value changes during a period. As noted, this articulation is known as the theory of capital services. This terminology sits a bit uncomfortably with national accountants since the services referred to are not the outputs of production in the way that transportation or education services, for example, are. Nevertheless, the terminology is well established and should not in itself give rise to problems as long as it is remembered that capital services are not produced services. Alternatively, capital services can be thought of as simply the term for the way in which the changes in the value of assets used in production are captured in the production account and the balance sheet.

- 17.6 Much of the impetus for identifying the entries associated with capital services in the national accounts has come from those interested in the analytical uses that can be made of the information, especially for productivity studies. Because much of this work has been undertaken by researchers, it is perhaps inevitable that the rationale and reasoning behind the proposals should have been expressed in a rather academic manner, in particular making extensive use of sometimes rather complex algebra. This chapter takes a different approach. It aims to show that, rather than introducing a new concept into the SNA, capital services can, in theory, be identified within the existing accounts. Further, recognizing this can lead to improvements in the estimates of <u>depreciation</u>, which are currently required in the production accounts, and of the values of capital stock, which are required in the balance sheets. The derivation of information analytically useful for productivity studies can thus be seen as a by-product of improved national accounts compilation practices and not an additional exercise. The explanation is done in terms of highly simplified numerical examples but still aims to demonstrate the connection between the concepts referred to in studies referring to capital services and the national accounts approach to the valuation of capital and the derivation of stock levels.
- 17.7 The explanation given here is to some extent superficial since it is intended to give an overview of the concepts and indicate in general terms why the theory of capital services is relevant to national accountants. For a deeper understanding of the subject, reference should be made to the two OECD manuals on the subject, <u>Measuring Capital (2009)</u> and <u>Measuring Productivity</u> (2001), and some of the practical and theoretical work referenced in those manuals.

#### B. Valuing capital stock

- 17.8 Estimating the value of capital stock is not a straightforward process. Whereas it is possible to measure all new capital formation undertaken in a year directly and simply aggregate it, estimating the total value of a stock of assets, even of the same basic type, but with differing characteristics and of different ages, is not simple. In theory, if there were perfect second-hand markets for assets of every specification, these observed prices could be used to revalue each asset at the prices prevailing in a given year, but in practice, this sort of information is very seldom available. Even if information from a second-hand market is available, there are a number of potential problems with using it to revalue other assets: the market may be extremely thin, so that the assets offered for sale on second-hand markets may be unrepresentative of the assets that are not offered for re-sale; and the prices for second-hand assets may be close to their scrap value, thus not providing a good representation of the capital services that can be derived from them in the remainder of the service life. See the discussion of prices from second-hand markets in paragraphs 4.164 to 4.166 and 4.307. Thus measures of capital stock must be derived indirectly and this is conventionally done by making assumptions about how the price of an asset declines over time and incorporating this in a model based on the perpetual inventory model (PIM). Basically the PIM writes down the value of all assets existing at the beginning of the year in question by the reduction in their value during the year, eliminates those assets that reach the end of their useful lives in the year and adds the written-down value of assets acquired during the year. This routine is so well established that it is possible to overlook the assumptions it rests on but it is an investigation of these assumptions that reveals the dual benefits of deriving capital service values.
- 17.9 In the absence of observable prices, the value of an asset may be determined by the present value of its future earnings. Economic theory states that in a well functioning market (suitably defined) even when prices are observable, this identity will hold also. There are thus two sorts of questions that may be posed about the value of an asset; (i) how much would it fetch if sold, and (ii) how much will it contribute to production over its useful life. The first of these is the traditional question asked by national accountants; the second is basic to studies of productivity. However, these two questions are not independent.

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#### 1. Knowing the contribution to production

17.10 Suppose an asset will add values of 100, 80, 60, 40 and 20 to production over the next five years. For simplicity assume all products have the same prices and there is no inflation. Assume, further, that the real rate of interest is five per cent per annum for all five years.

- 17.11 The value of the asset in all five years can be derived using present value techniques as shown in table <u>17.1</u>. (For simplicity, in this and all the following examples, the values shown are values at the start of the year so that, when discounting, the factor for the whole year is used. This simplification is made only to facilitate exposition; in practice mid-year figures should be used. It should also be noted that the figures in the tables are rounded and therefore may appear not to add exactly. However, a reader who follows the examples in a spreadsheet will achieve exactly the figures shown.)
  - 17.12 The addition to the value of the asset in year 1 from the expected earnings of 80 in year 2 is 76, that is 80 divided by 1.05. (Alternatively, the addition to the value of the asset in year 1 can be viewed as 80 times a discount factor of 0.9524, the reciprocal of 1.05.) The addition to the value of the asset in year 2 from earnings in year 3 is 57 (60 divided by 1.05) and in year 1 is 54 (57 divided by 1.05) and so on. When the value of 100 for the earnings in the first year is added to 76, the value of the second year's earnings in the first year, and to 54, the value of the third year's earnings in the first year, a value of the asset in year 4 and 5 in the first year, a value of the asset in year 1 of 282 is derived. When the table is complete, the value of the asset in each of the five years is seen to be 282, 191, 116, 59 and 20.
  - 17.13 The decline in value of the asset from year to year can be calculated by deducting each succeeding year's value from the value of the present year. Thus a series of 91, 74, 57, 39 and 20 is derived, a series that sums to 282, the original value of the asset. If the decline in value of the asset (91 in the first year) is deducted from the contribution to production (100 in the first year), the value of income generated in a year results (9 for the first year). To see that this item represents income, consider that the sum of the elements in the first column for years 2 to 5 together (182) represents the value of the same capital stock existing in year 2 but value di in the first year. This value of 182 increases by 9 to 191 between year 1 and year 2. This amount satisfies the criterion for income that it is the amount that the owner of the capital can spend and still be as well off at the end of the period as at the beginning.

# Table <u>17</u>.1: Example of deriving the value of capital stock from knowledge of its contribution to production

307	Discount rate 5%						
	Year 1	Year 2	Year 3	Year 4	Year 5	Sum of 5 years	
Contribution to asset value							
from earnings in :							
Year 1							
Year 2	76 -	- 80					
Year 3	54	← 57 ·	60				
Year 4	35	36	38	40			
Year 5	16	17	18	19	20		
Value in year	+282-	-+191	116	59	20		
Value index (year on year)	1.00	0.68	0.61	0.51	0.34		
Decline in value	L 91'	74	57	39	20	282	
Income	. 9	6	3	1	0	18	

17.14 Over the five-year period, the value of income is equal to the difference between the sum of the diagonal

elements (300) less the amount of the decline in value (282), or to put it another way, there is an identity between the value of income the asset yields and the discounting inherent in establishing its current value.

#### 2. Knowing the value at any time

17.15 Now suppose nothing is known about the contribution of the asset to production but the decline in the value of the asset over the five years, due to ageing, is known. If this is postulated in terms of a value index relative to the preceding year's value, and the initial value is known to be 282, then the entries in table <u>17.2</u> can be calculated. By design, a value series consistent with the figures in table <u>17.1</u> is assumed. Applying the decline in value of 0.68 to the initial value of 282 gives a value of 191 for year 2; applying the value decline of 0.61 to 191 gives 116 for year 3 and so on. (Alternatively a time series of values could be postulated and applied to the initial value.) From this the declines in value of the asset from year to year can be deduced and seen to be identical with those in table <u>17.1</u>.

Table 17.2: Example of deriving the value of capital stock from knowledge of its decline in price

			Discount rate 5%					
	Year 1	Year 2	Year 3	Year 4	Year 5	Sum of 5 years		
Contribution to asset value								
from earnings in :	2000							
Year 1	100							
Year 2	76	80						
Year 3	54	57	60					
Year 4	35	36	38-	40				
Year 5	16	17	18	- 19	20			
Value in year	282	A 191	A 116	59	20			
Value index (year on year)	1.00	0.68	0.61	0.51	0.34			
Decline in value	91	74	4 57	39	20	282		
Income	9	6	3	1	0	18		

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17.16 In general this is as far as the PIM goes. Its twofold purpose is to calculate asset values for the balance sheet and the figures for <u>depreciation</u> and these requirements are satisfied at this point. But it is in fact possible to go further. The contribution of the asset to production in the final year (20) is the same as the final year's value. If this is discounted by five per cent, the addition to the value of the asset at the start of year 4 is 59, there must be a figure of 40 contributed to the production in that year. Extending this, for year 3 the value of 116 must consist of 18 representing the contribution to production in year 5 of 20 discounted twice, 38 representing the value contributed to production in year 4 of 40 discounted once and so by residual the value contributed to production in year 4 of 40 discounted once and so by residual the value contributed to walues of the amounts of income in a year be derived just as in table <u>17</u>.1.

#### 3. Age-efficiency and age-price profiles

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7 Although tables <u>17.1</u> and <u>17.2</u> start from different assumptions, exactly the same complete table results even though they are filled in a different order in the two cases. Table <u>17.1</u> starts from assumptions about the declining contribution to production and derives stock values and the decline in value each year. Table <u>17.2</u> starts from assumptions about the decline in value of the stock and derives the contribution to production and the decline in value each year. Both techniques give values of stocks to include in the balance sheets and the decline in the balance sheets and the balan

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figures of <u>depreciation</u>. The assumptions made in the two cases must be consistent. In fact it can be shown that every pattern of decline in the contribution of an asset to production (usually called the age-efficiency profile) corresponds to one and only one pattern of decline in prices (usually called the age-price profile).

17.18 Given this, it would seem possible to take the information in a set of PIM assumptions and simply derive the contributions to production from these. While it is possible to do this, it is generally held to be preferable to start again by postulating a set of age-efficiency profiles. The reason for this can be illustrated by table <u>17.3</u>.

#### Table 17.3: Table 17.2 with a slightly different pattern of price decline

		Discount rate 5%					
	Year 1	Year 2	Year 3	Year 4	Year 5	Sum of 5 years	
Contribution to asset value from earnings in :							
Year 1	80						
Year 2	96	101					
Year 3	75	79	83				
Year 4	24	26	27	28			
Year 5	6	6	6	T	1		
Value in year	282	211	116	35	7		
Value index (year on year)	1.00	0.75	0.55	0.30	0.20	10000	
Decline in value	< 70	95	81	28	7	> 282	
Income	10	6	2	0	0	18	

- 17.19 Table <u>17.3</u> again starts from a series of relative price changes as in table <u>17.2</u> but these changes are somewhat different. Instead of a series of 1.00, 0.68, 0.61, 0.51 and 0.34, a series of 1.00, 0.75, 0.55, 0.30 and 0.20 is taken. These changes underestimate the rate of decline in value in the second year and assume a faster rate of decline in second year and assume a faster rate of decline in second year and assume a faster rate of asset would be over twenty per cent more efficient in its second year than in its first and still more efficient in the third year than in the first before declining quickly thereafter? Yet this pattern of flows is still consistent with an initial value of 282, as in table <u>17.2</u> and with cumulative declines in value adding to this amount over five years.
  - 17.20 These are the reasons why it is argued that making assumptions about efficiency decline is likely to lead to superior results for the value of stocks, their decline in value and the income they generate than making assumptions about the rate of price decline. As a further example of why this may also be easier, consider the case of an asset that contributes the same to production, let us say 100, for each of five years and then stops dead, like a light bulb. It is easy to postulate a constant age-efficiency profile but the corresponding age-price profile is much less intuitively obvious and varies according to the discount factor applied.
  - 17.21 However, while there are good reasons for using age-efficiency profiles as the starting point, where actual information is available on age-price profiles, even partial information, it should be confirmed that the selected age-efficiency profile is consistent with the observed age-price movements.

#### 4. The special case of geometrically declining profiles

17.22 A number of patterns can be postulated for either the age-price or age-efficiency profile. These include straight line depreciation and various non-linear forms discussed in *Measuring Capital*. One of particular interest is that where the price declines geometrically, that is each year the price (when adjusted for inflation) is a fixed proportion, f, of the
year before. Because such a series converges to, but never actually reaches, zero, it is difficult to portray it in a table such as those shown above but the interesting characteristic can be derived by means of a little very simple algebra. The SNA recommends that the geometric depreciation method be used as a default option; however, other depreciation profiles may be considered more suitable for certain types of assets (see paragraph 7.280).

17.23 It can be seen from the tables above that the value of an asset at the start of any year, Vt, is equal to the capital services to be rendered in that year, a, plus a discount factor, d, times the value of the asset at the start of the next year, Vt+1. Thus

 $V_t = a + d V_{t+1}$ . In the case where  $V_{t+1} = f V_t$ ,  $V_t = a/(1-df)$ .

By analogy, if the value of the capital services rendered by the asset in year t=1 is b,  $V_{t+1} = b/(1-df)$ . But since  $V_{t+1} = fV_t$ , it follows that b must be equal to af. Thus we have the case that the shape of the age-price profile and the shape of the age-efficiency profile are exactly the same.

17.24 As noted above, there is one and only one age-price profile corresponding to one age-efficiency profile, so it follows that the geometrically declining profile is the only profile that is the same for both the decline in price and the decline in efficiency. One consequence is that figures for capital stock adjusted for the decline in value are equal to those for capital stock adjusted for the decline in efficiency. This property adds to the reasons that can be advanced for choosing this profile to determine the value of capital stock.

#### 5. Practical considerations

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- 17.25 As noted at the outset of this section, there are many simplifications built into the examples presented, made in order to facilitate the explanation of the basic theory behind the idea of capital services to those new to the idea. *Measuring Capital* should be consulted for a more rigorous discussion and for considerations such as the rationale for choosing one age-price (or age-efficiency) profile rather than another, how to estimate life lengths and retirement patterns of assets and the role of expectations in the calculations.
- 17.26 The manual also discusses the fact that the return to capital must be sufficient to cover taxes levied on the asset in question, a point that is ignored here also in the name of simplification.
- 17.27 To be precise, a distinction is made between the interest or discount rate, r, usually assumed to be five per cent in this chapter, and the discount factor which is the reciprocal of (1+r). When r is 5 percent, the discount factor is 95.24 per cent. When the discount factor is 95.0 per cent, the discount rate is 5.26 per cent.

# C. Interpreting the flows

17.28 The tables above generate three time series of particular interest. One is the contribution to production of an asset over time, one is the decline in the value of the asset and one is the income generated by the asset. Obviously the middle term corresponds to <u>depreciation</u> as normally understood in the SNA. The contribution of capital to production is what is called gross operating surplus and so the third time series, income, corresponds fittingly to net operating surplus. However, these flows can be described by alternative names also. The diagonal element of the tables, showing the contribution to production, is also known as the value of capital services. The income element is the return to capital. The rate of return on capital is the ratio of income to the value of capital. For tables <u>17</u>,1 and <u>17</u>,2, the income flow as a proportion of the next year's capital stock value (that part not used in the current year) is also five per cent, the same as the discount rate. The alternative terminologies are illustrated in table <u>17</u>.4.

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# 1. Capital services and gross operating surplus

- 17.29 At this point, the national accountant asks how can gross operating surplus be estimated in this way when it is derived as a balancing item in the generation of income account? There are two possible answers to this question. The first answer is that there is not a complete identity with gross operating surplus but the value of capital services is implicitly within it so may be noted as an "of which" item relative to gross operating surplus. Suppose the discount rate chosen is the rate that can be obtained on a bank deposit, say. This determines the amount the user of the asset needs to generate as net operating surplus if the asset is to be cost effective. If the figures for capital services and gross operating surplus are both 100, then the producer has made a reasonable choice of asset; it is earning as much for him as leaving his money in the bank. If the earns a little more than 100, he has done better than leaving the money in the bank. If the national accounts show he has earned 150, say, it may be that the producer has been very lucky indeed, perhaps realizing some monopolistic profits. However, it is also possible that there is some sort of asset he is using that not been identified in calculating capital services, one possibility being some form of intangible asset. Similarly if the value of gross operating surplus is much lower than the value of capital services estimated, there may be good reason to question the range and valuation of assets assumed to be used in production or the quality of the estimates of gross operating surplus. Thus deriving the value of capital services in this manner is also a valuable tool for checking data quality.
- 17.30 The alternative to treating capital services as an element of gross operating surplus is to equate gross operating surplus with capital services exactly and to do this by determining a rate of retum (discount rate) that brings this about. Many traditional analyses of productivity have used this approach and some cross-country comparisons of productivity depend on this assumption. Other studies, used at the industry level, suggest that the variation in apparent rate of return obtained in this way needs to be used, if at all, with very great caution. There is still robust discussion in academic circles about the preferred way of determining the rate of return, exogenously as described in the preceding paragraph or endogenously as described here. One way of interpreting the difference is to say that using an exogenous rate of return simply confronts the cost of capital (capital services) with the benefits (gross operating surplus); the endogenous rate of return.

	Discount rate 5%								
	Year 1	Year 2	Year 3	Year 4	Year 5	Sum of 5 years			
Contribution to asset value	Ka								
from earnings in :	*alue	Of Can							
Year 1	100	-apital s	ervin						
Year 2	76	80	1005 OF	9m					
Year 3	54	57	60		atin				
Year 4	35	36	38	40	Ing sur	lus			
Year 5	16	17	18	19	20	-			
Value in year	282	191	116	59	20				
Value index (year on year)	1.00	0.68	0.61	0.51	0.34	1000			
Decline in value	91	74	57	39	20	282			
	C	onsumpt	ion of fixe	d capital					
Income	9	6	3	1	0	18			
	Return	to capital	or net op	erating su	plus				

# Table 17.4: Capital services and SNA terminology

# 2. Prices and volumes

17.31 An examination of table 17.1, or indeed any of the others, shows that the value of an asset at a point in time,

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such as the start of a year, can be expressed rather neatly as the sum of the capital services rendered in the year plus the discounted value of the asset at the end of the year. This is the starting point of much of the algebraic elaboration of capital services in the literature, but with one important difference. Whereas most national accountants tend to think first in terms of current price aggregates and later (possibly) a breakdown into a volume aggregate plus a corresponding price, most descriptions of capital services run in the other direction. They assume a volume and develop a theory of the corresponding price (the "user cost"). These could be multiplied together to give a current value but much analysis is done using volume or price information.

- 17.32 One reason for working this way is that the assumption underlying table <u>17.1</u>, that the contributions to production over the life of the asset are known, is not often true in practice. What is known, estimated or simply assumed is an index of how the efficiency changes over time. Equally the value of the asset assumed known in table <u>17.2</u> is only known on an asset-by-asset basis when each is new; all other value figures are estimates for reasons explained above. It is possible to use the identity that the start-of-year value of an asset equals capital services rendered in the year plus the discounted end-of-year value, all expressed in index number form and assuming no inflation, into one that expresses the value of the capital services as dependent on the decline in the value of the asset due to ageing (the depreciation element) and the rate of return (the opportunity cost of money). If the impact of general inflation is now taken into account, the price of the capital services (usually called the user cost) can be expressed as depending on the increase in value of a new asset of the same type, the nominal cost of money and the relative year-on-year decline in value of the asset due to ageing.
  - 17.33 It is also possible then to have different prices for different sorts of assets and look at differential movements between asset prices and the movements in the general level of inflation. (Table <u>17.1</u> was based on the very restrictive assumptions of there being neither absolute nor relative price inflation.)
  - 17.34 Another important consideration passed over in the simple numeric tables is the following. For balance sheet data, values at the date the balance sheet is drawn up are needed. For estimates of capital services/gross operating surplus as well as for <u>depreciation</u> and income flows, values at average-year prices are needed. In practice, the mid-year observations are often assumed to be close approximations to the annual averages but this is not always so, especially in times of significant inflation.

# D. Applying the capital service model

- 17.35 Once a theoretical link between the content of gross operating surplus and the capital services embodied in an asset used in production is accepted, there are a number of other beneficial implications for the national accounts. These include the question of the use of land in production, the valuation of non-produced natural resources, the separation of mixed income into the labour and capital components, the measurement of assets with a residual value, the treatment of costs of ownership transfer on acquisition, the treatment of terminal costs, capital maintenance, the valuation of work in progress on long-term projects, an alternative approach to estimating the imputed rentals of owner-occupied dwellings and the separation of the payments under a financial lease into the explained a little further below.
- 17.36 Before discussing land and <u>other non-produced</u> natural resources, it is useful to recall the consequences of an asset being used by a unit not the legal owner of the asset. The important distinction is whether the user does or does not assume the risks associated with its use in production. When the user does not assume the risks, the asset is regarded as being subject to an operational lease. In such a case the payment to use the asset is a rental and forms part of intermediate consumption. The benefits from using the asset in production accrue to the owner in the operating surplus of the production account relating to his leasing activity. (See paragraphs <u>27.6 to 27.8.</u>)
  - 17.37 When the user does assume the risks associated with the use of the asset in production, the benefits from using the asset in production accrue to the user and appear in his operating surplus. This is true of both produced and non-produced assets. The difference between produced and non-produced assets concerns the type of lease existing between the legal owner and the user and the type of property income paid to the legal owner of the asset.

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17.38 In the case of a produced asset, the user of the asset who assumes all risks associated with the asset becomes the economic owner of the asset. The asset appears on the balance sheet of the economic owner. If the legal owner is different, any payment from the economic owner to the legal owner is recorded as property income payable under a financial lease. (See paragraphs 27.9 to 27.15.)

17.39 In the case of a non-produced asset, when the user of the resource and legal owner differ, three different sets of conditions may apply. First, the legal owner may permit the resource to be used to extinction and thus transfers economic ownership of the resource. Second, the legal owner can extend or withhold permission to continued use of the resource from one year to the next and thus retains economic ownership of the resource. In this case the asset remains on the balance sheet of the legal owner but a resource lease between the legal owner and user obliges the latter to pay the former property income in the form of rent. Under the third option the economic ownership of the resource is shared to the extent that both the user and the legal owner are entitled to future economic benefits from the use of the resource. (See paragraphs 27.19 to 27.24.)

17.40 For all non-financial assets used in production, the estimation of the value of the capital services associated with the asset allows this to be contrasted with the property income payable for its use to determine whether the use of the asset is cost-effective.

# 1. Land

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- 17.41 The first and oldest recognized form of non-produced capital is land. Land is special in that, under good management, the value is assumed to remain constant from year to year except for the effects of inflation in land prices. That is to say, there is no depreciation of land and all the contribution to production can be regarded as income. To show how this can be related to the previous examples, Table <u>17.5</u> shows part of a corresponding table for land that contributes 20 to production in perpetuity. A full table would have an infinite number of rows and columns. Here only a few are shown and some very simple algebra (with explanation) is used to explain how the totals are reached.
- 17.42 The value of the first column is the sum of 20, 20 discounted once (the second year's contribution to production discounted once), 20 discounted twice for the third year and so on if not for ever, at least for very many years. With a discount rate of 5 per cent as before, the sum of this column is 420. To see that this is so, consider a simple geometric progression. What is required is the sum of a series that can be written as:

# $S_n = a + ad + ad^2 + ad^3 + ad^4 + ad^5 + \ldots + ad^n$

where a is the return to the asset in every period and d is the discount factor. (As noted earlier. for a discount rate of 5 per cent, the discount factor is 95.24 per cent.) If every term in the equation is multiplied by an extra factor d the result is:

 $\mathrm{dS}_n = \mathrm{ad} + \mathrm{ad}^2 + \mathrm{ad}^3 + \mathrm{ad}^4 + \mathrm{ad}^5 + \ldots + \mathrm{ad}^{n+1}$ 

Subtracting the second expression from the first gives:

 $s_n\left(1\text{-}d\right) = a\left(1\text{-}d^{n+1}\right)$ 

If d is less than unity (as it will be in a discounting framework) and n is very large, that last term becomes insignificant and the sum of the series,  $S_n$ , can be determined as a/(1-d). In table <u>17.</u>5, a is 20 and d is 0.9524, so the sum of the series is 420.

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# Table 17.5: The case of land

				Discoun		
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10
Contribution to asset value						
from earnings in :						
Year 1	20					
Year 2	19	20				
Year 3	18	19	20			
Year 4	17	18	19	20		
Year 10	13	14	14	15	16	20
Year 25	6	7	7	8	8	10
Year 40	3	3	3	3	4	5
Value in year	420	420	420	420	420	420
Value index (year on year)	1.00	1.00	1.00	1.00	1.00	1.00
Decline in value	0	0	0	0	0	0
Income	20	20	20	20	20	

- 17.43 However, since each of the columns of the table, though one term shorter than the previous one, is also an infinite series beginning in exactly the same way, the sum of each column is also 420. Thus the decline in value of the land from year to year is zero and the whole of the 20 is not just the contribution to production but also income. In national accounts parlance, the gross and net operating surplus are both 20 and there is no depreciation. Equally the value of the capital service and the return to capital are both 20.
- 17.44 As noted above, it may seem slightly odd to think of a non-produced asset contributing a "service" since in national accounts services are always produced. This is simply a reflection of the words chosen by economists to describe the contribution of capital to production without connecting the word "service" to the specific interpretation given to it in the SNA. Similarly one may hear remuneration of employees described as the cost of labour services.
- 17.45 Another term used for capital services is resource rent of land is the extent to which the farmer benefits from using the land for agricultural production (20). This rent accrues whether the farmer is farming his own land or is a tenant farmer. The amount that the tenant farmer is due to pay his landlord is what the national accounts show as rent under property income. In the days when a farmer paid his rent as a share of the crop yield, the link was more obvious. What he retained represented enough to cover his costs and the cost of his own (and any hired) labour. In a monetized economy, the rent payable to the landlord is often agreed a very long time in advance. Comparing the rent earned (as operating surplus) with the rent payable to the farming income.

# 2. Valuing <u>non-produced</u> natural resources

- 17.46 There is an increasing interest in placing a capital value on natural resources but, since these assets are seldom sold on the market, there has been doubt about how to do this. Looking at the <u>resource rent</u> to be earned by a mineral deposit, for example, is one way to solve the problem.
- 17.47 Suppose that a mining company knows the size of the deposit being mined, the average rate of extraction and the costs of extraction of one unit. After allowing for all intermediate costs, labour and the <u>capital services of all non-</u>

financial assets used in production including any rents paid on the use of non-produced non-financial assets, what is left must represent the <u>resource rent</u> of the natural resource. By applying this to the expected future extractions, a stream of future income can be estimated and from this, using the techniques already described, a figure for the value of the stock of the resource at any point in time.

17.48 In fact, the application of the capital service technique goes further than this. In the case of <u>renewable non-produced natural resources such as fish in open waters</u>, if the rate of regrowth is at least equal to the rate of <u>extraction</u>, then the value of the <u>fish</u> does not decline and the rate of <u>extraction</u> is sustainable. However, in the case of a mineral deposit with no natural renewable capability, then it is possible as before to separate the contribution to production into an element showing <u>the depletion</u> (the decline in value of the deposit) and a residual element. Because this residual amount is consistent with the idea of maintaining the level of wealth intact, it can be regarded as income;

## 3. Mixed income

- 17.49 When discussing land, above, it was pointed out that the <u>resource rent</u> of the land was the part that was not otherwise accounted for by intermediate consumption, the cost of hired labour and the capital services rendered by <u>non-financial</u> assets and the labour cost of the farmer. Very often, it is difficult to put a value on the labour of a self-employed person and so this may be merged with the <u>resource rent</u> on land and the capital services rendered by <u>non-financial</u> assets used and described as mixed income. In principle, though, if a separate estimate of the capital services rendered by fixed assets can be made from information about the services rendered by similar assets in other parts of the economy, then mixed income can be split into its labour and capital components.
- 17.50 In practice this has often proved difficult since the residual amount for self-employed income may turn out to be very small or even negative. Among the possible causes of this are that the value of output may be volatile due to such things as fluctuations in output prices or the impact of weather. The estimates for the capital services may also be high because larger companies are able to make more efficient use of capital, for example using a high value piece of equipment continuously rather than intermittently, or because they actually have other, intragible, assets, which have not been taken into account. This means the capital services for these unmeasured assets are attributed to those that are recognized but this addition is not appropriate for the self-employed worker. Thus the acceptance of the capital services model is unlikely to provide a quick and accurate breakdown of mixed income but it does show the way to probe the data for both large and small enterprises to ensure that capital is being measured comprehensively and consistently.

### 4. Assets with a residual value

- 17.51 Very many assets are used by a single owner until they are worn out and worth nothing. However, this is not the case for all assets. Some are disposed of after a few years, perhaps because the cost of regular maintenance is deemed by the current owner to be too high relative to the value the asset contributes to production. Some airlines, for example, may wish to use the fact that they keep up-to-date fleets of aircraft as part of their advertising appeal. In other cases, for example with construction equipment, the original owner may simply have no further use for the asset.
- 17.52 Table <u>17.6</u> shows an example of an asset that is used for only four years and then disposed of for a value of 300. Again for simplicity it is assumed that the disposal value after four years is known when the asset is acquired. For example, the market in used assets may be sufficient to ensure that the value at any point is equal to the remaining services to be delivered by the asset. Inflation is still assumed to be zero.
  - 17.53 The top, triangular, part of the table shows the normal calculation of the value of the capital services to be rendered in these four years, a value that at the outset is seen to be 1 107. To this the discounted value of the residual value of 300 must be added. This value is 247, making the total value of the asset 1 354. As in the case where an asset is held to exhaustion, the decline in the value of the asset including the residual value is lower year by year than the decline in the capital services to be rendered in these four years because there is an income element coming from the fact that the remaining value increases as the time for disposal of the asset gets closer. The total of the decline in the value of the asset to be shown as <u>depreciation</u>, is 1 054. This value, together with the residual value of 300, is equal to the original value of 1 354. The total income (net operating surplus) is 121, the sum of the income arising from the use in production (68) plus the income arising from the unwinding of the discount factor on the terminal value (53).

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# Table 17.6: An asset with a residual value

		nt rate 5%				
	Year 1	Year 2	Year 3	Year 4	Residual value	Sum of 4 years
Contribution to asset value						10
from earnings in :						
Year 1	400					
Year 2	286	300				
Year 3	227	238	250			
Year 4	194	204	214	225		
Value in year	1 107	742	464	225	0	
Decline in value	365	278	239	225		1 107
Income	35	22	11	0		68
Residual value	247	259	272	286	300	
Income	12	13	14	14		53
Joint value	1 354	1 001	736	511	300	
Decline in value	352	265	226	211		1 054
Income	48	35	24	14		121

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17.54 Table <u>17.6</u> illustrates that the cumulative value of the <u>depreciation</u> calculated in respect of an asset should be equal to the initial value of the asset, treated as fixed capital formation, less the value to the owner on disposal of the asset. This holds whether the asset passes into use as a fixed asset by another user, is used for another purpose in the same economy or is exported.

# 5. Costs of ownership transfer on acquisition

- 17.55 The costs of ownership transfer incurred on acquisition of an asset are treated as fixed capital formation. This assertion is equivalent to assuming that the services rendered by the asset must be sufficient to cover both the costs of the asset and the costs of ownership transfer. Table <u>17.7</u> shows an example where costs of 30 are incurred on the acquisition of the asset in table <u>17.6</u>. In order for the asset to have exactly the same value as before on disposal, 300, the costs of ownership transfer have to be accounted for during the period in which the owner who incurred the costs uses the asset in production. The figures in the triangular part of table <u>17.7</u> are added to those in the corresponding part of table <u>17.6</u> giving increased value to the asset in each year until the end of year 4, increased <u>depreciation</u> and slightly increased income, because the costs.
- 17.56 If the costs of ownership transfer were to be attributed to the whole life of the asset and not just that part for which the unit that paid the costs owns the asset, there is a mismatch between the calculated value of the asset and the market value demonstrated in the sale at a value of 300. In such a case, the data have to be brought back into reconciliation by means of an entry in the other changes in the volume of assets and liabilities account but this means that not all of the costs incurred by the initial owner are shown as a charge against gross value added and so income is over-stated. This may be inevitable when assets are sold unexpectedly but in the case of many vehicles and large mobile construction equipment, the purchaser may well take account not only of the residual value but also factor the expected life length into the calculations of the amount of <u>depreciation</u> to be attributed to the costs of ownership transfer so there is no residual value of these costs left on disposal.

Table 17.7: Example of costs of ownership transfer on the acquisition of the asset in table 17.6

	Discount rate 5%					
2	Year 1	Year 2	Year 3	Year 4		Sum of 4 years
Contribution to asset value						
from earnings in :						
Year 1	10					
Year 2	9	9				
Year 3	6	7	7			
Year 4	5	5	6	6		
Value in year	30	21	13	6		
Decline in value	9	8	7	6		30
Income	1	1	0	0		2
Residual value	1 384	1 0 2 2	749	517	300	
Decline in value	361	273	232	217	1.22	1 084
Income	49	36	25	14		123

# 6. Terminal costs

17.57 Table <u>17.6</u> considered the case where an asset had a residual value at the time the current owner disposed of it. It is also possible to have assets that have significantly large costs associated with disposal <u>that the owner</u> is obligated to incur. Examples include the decommissioning costs of nuclear power stations or oil rigs or the clean-up costs of landfill sites. The following discussion is not meant to downplay the practical difficulty of estimating terminal costs, simply to demonstrate why in principle the existence of terminal costs should reduce the value of the asset throughout its life.

17.58 Terminal costs are similar to capital formation in that they should be covered by income generated during\_the time the asset is used in production. To avoid a negative value of the asset at the end of its life, the expected terminal costs are added to the value of the asset at the time the asset at the end of its life, the acounterparty entry of provisions at the liability side, both to be recorded in the other changes in the volume of assets and liabilities account. At the end of the life of the asset, the actual investment expenditures on terminal costs, which lead to a positive change in the value of the saset, are counterbalanced with a reversal of the flows in the beginning of the period, i.e., a decline in the value of assets and liabilities.

17.59 Table 17.8 shows an example of how terminal costs should be recorded. The analysis of the data is similar to that for table 17.6 but also includes the recording of provision charges for the terminal cost (see paragraphs 11.223 to 14.225). The value of the capital services to be provided by the asset in use is still 1 107. The value of the capital services to be provided by the asset in use is still 1 107. The value of the capital services to be provided by the asset in use is still 1 107. The value of the asset of the capital certain of the terminal cost of -300 which will be incurred when the asset is disposed of. Subtracting the present value of the asset of 860 is lower than without the present value of the capital services implies that the initial value of the asset of 860 is lower than without the presence of terminal costs. The initial value of 860 is recorded as capital formation in year 1. The terminal cost will be recorded as capital formation at the time of disposal, but it is important that the depreciation associated with the terminal cost (with a positive sign) is added to the value of the asset, allowing the terminal investment to be written off. To maintain the correct contribution of the asset shown on the balance sheet, 1 107 in year 1, is equal to the capital formation for the initial acquisition of the asset plus the discounted value of the capital formation associated with the terminal costs. When discounting is used, the carrying amount of a provision increases in each period to reflect the passage of time. These amounts (shown in the own "unwinding of the discount") also need to be recorded as positive and negative entries in the other changes in volume of assets and liability also need to be recorded as positive and negative entries in the other changes in volume of assets and liability also need to be recorded as capital formation for the initial acquisition of the asset plus the discount of a provision increases in each period to reflect the passage of time. These amount is als

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account each year. The depreciation recorded should equal the change in the value of the asset plus the unwinding of the discount to ensure that the total value of the terminal costs are fully depreciated. If this combined amount is recorded as depreciation, then the cumulated value of depreciation, 1 160, is equal to the capital formation associated with the acquisition of the asset plus the capital formation associated with the asset is decommissioned and the terminal costs are incurred, gross capital formation of 300 is recorded. In addition, the provisions are reversed, showing an entry -300 in other changes in volume of assets and 300 in other changes in volume of liabilities, bringing the cumulative value of the provision charges to zero.

# <u>47.59</u><u>17.60</u> Anticipated costs on ownership transfer on disposal of an asset, including legal fees, commission, transport and disassembly, etc., should in principle be treated in the same way as terminal costs.

	Discount rate 5%							
-	Year 1	Year 2	Year 3	Year 4	<u>Residual</u> value	Sum of 4 years		
- <u>Contribution to asset value from earnings in:</u> <u>Year 1</u> <u>Year 2</u> <u>Year 3</u> <u>Year 4</u> Value excluding terminal cost	400 286 227 194 1,107	<u>300</u> 238 204 <b>742</b>	250 214 <b>464</b>	<u>225</u> 225	0	-		
Terminal cost Joint value	<u>-247</u> <u>860</u>	<u>-259</u> 483	<u>-272</u> 192	<u>-286</u> -61	<u>-300</u>	-		
Initial value of provision Unwinding of the discount Joint value plus provision Decline in value	<u>247</u> <u>12</u> <u>1,107</u> 365	<u>13</u> <u>742</u> 278	<u>14</u> <u>464</u> 239	<u>14</u> <b>225</b> 225		-		
Depreciation = decline in value + unwinding of discount	377	<u>291</u>	253	239		<u>1,160</u>		
Income	<u>23</u>	<u>9</u>	<u>-3</u>	<u>-14</u>		- <u>15</u>		
SNA values: GFCF Provision charge	<u>860</u> 259	<u>13</u>	<u>14</u>	<u>14</u>	<u>300</u> -300	- - <u>1,160</u> <u>0</u>		
(= ouner change in volume) Asset value Depreciation	<u>1,107</u> <u>377</u>	<u>742</u> 291	<u>464</u> 253	<u>225</u> 239	<u>0</u>	- - <u>1,160</u>		
Provision (= contingent liability)	-259	<u>-13</u>	<u>-14</u>	-14	<u>300</u>	<u>0</u>		

# Table 17.8: An asset with a terminal cost

# 7. Major repairs and renovations

17.6017.61 Major repairs and renovations that extend the life of an asset are treated as capital formation and the value of the repairs and renovations is added to the value of the asset before the work was undertaken. The example of costs of ownership transfer on acquisition of an asset can be applied directly in this case, excepting only that the costs are incurred in a year other than the year of acquisition. The value of the capital repairs is supposed to be equal to the discounted value of the increased services that the asset will yield, either by increasing the services in each of the remaining years of the initial life length, or extending the life length, or both.

<u>47.61</u><u>17.62</u> The value of the capital repairs can be analysed by merging the value with that of the asset in question and reworking all the calculations of the services to be rendered, the income generated and the

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<u>depreciation</u> for the asset and the maintenance taken together. However, as table <u>17.7</u> shows, it is also possible to leave the calculations for the asset as they were and simply aggregate them with a separate analysis of the maintenance undertaken as if it related to a wholly new asset.

# 8. Work-in-progress for long term projects

17.6217.63 Table 17.9 relates to an asset with a final value of 200 that is to be constructed over a period of four years. One possibility is that, assuming no inflation, work in progress of 50 should be recorded in each of the four years. However, consistent with the notion of discounting future income, an alternative view is preferable. Suppose still that there is a discount rate of five per cent. In each year, the value of the completed asset in each of years 1 to 3 will be 172.8, 181.4 and 190.5, each of which will cumulate to a value of 200 after, respectively, three, two or one years accumulation in value of 5 per cent. Dividing each of these by four implies that even if equal amounts of work are put in place in each year, the values to be recorded should be 43.2, 45.4, 47.6 and 50.0. In addition, though, there will be income arising from a return to the work already put in place. This would give a time series for the work put in place and other income of 2.2, 4.5 and 7.1 in each of years two to four giving the value of the partially completed structure as 43.2, 90.7, 142.9 and 200.0. These are the values that a purchaser of the partially completed structure would be willing to pay, given that he would forgo the income from the finished structure for up to three years.

# Table 17.9: Valuing work-in-progress spanning several years

8			Discou	int rate 5%
	Year 1	Year 2	Year 3	Year 4
Value of final product in each year	172.8	181.4	190.5	200.0
Value of construction activity (one quarter of final value)	43.2	45.4	47.6	50.0
Income accruing on work put in place				
In year 1		2.2	2.3	2.4
In year 2			2.3	2.4
In year 3				2.4
End year value	43.2	90.7	142.9	200.0

# 9. Owner-occupied dwellings

- 17.6317.64 The SNA specifies that an imputed rental on owner-occupied housing should be included in the production boundary and form part of household consumption. In a situation where there is either no rental market in such properties or only a very limited one, this is difficult to implement. Cross-country comparisons of the results (as in the International Comparison Program) show that the different techniques used produce highly variable results. Here too, the use of the techniques described in this chapter may be helpful.
- 17.6417.65 In the example for land, it is possible to deduce a value of 420 for the land that yielded resource rent of 20 every year in perpetuity. While modern houses do not last forever, if they are assumed to last for, say, fifty years the discount factor applied over this period gives contributions to the value of the asset that are negligible at the end and again it may be supposed that, if the value of the house is 420, then the imputed rental is 20. Given that the market for houses is much better established than for rented housing, this may also provide a source of useful and comparable data for a troublesome area of national accounts. However, this method should be used with caution since houses are often bought in the expectation of making significant real holding gains. It should also be recognized that the rental for a house usually includes land rent.

# 10. A financial lease

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- 17.6517.66 The process of discounting future income streams to determine present value applies to financial assets as well as to non-financial assets. Consider an agreement with a bank to borrow 1 000 over a period of five years at five per cent interest. The total amount to be paid to the bank will be 1 100 at a rate of 220 per year. But, as table 17.10 shows, each year's payment does not consist of repayment of principal of 200 and interest of 20. Interest is payable on the remaining balance, so is highest in the first year and is zero in the last year. (This is a result of the simplifications used in the chapter. In practice, interest would be charged daily and so even in the last year some interest would be payable. However, the way in which the balance between interest and repayment of principal changes over time as the loan is repaid holds.)
- 17.6617.67 The arithmetic behind table 17.10 is indistinguishable from any of the other tables in this chapter demonstrating that the same principles hold for valuing financial assets as for non-financial assets. The same methodology that can be used to show how much of the contribution to production is <u>depreciation</u> and how much contributes to net operating surplus can also be used to show how much of the payment to the bank is a repayment of capital and how much is interest. Both <u>depreciation</u> and a repayment of capital feature in the accumulation accounts as changing the value of the stock of assets. The contributions to net operating surplus and are shown in the current accounts.
- 17.67<u>17.68</u> This duality is especially important when an asset is acquired under a financial lease. In this case, table <u>17.10</u> can be used to show both the change in value of the asset and the change in the loan taken out to pay for it. Cost benefit analyses of the merits of borrowing to acquire assets also depend on this sort of calculation. Unless the asset can contribute at least as much to production as the interest due to the lender, it is not a good investment. Even if a producer has sufficient funds available to purchase an asset without borrowing, it makes sense to undertake such an analysis since the alternative to acquiring the asset is to convert the funds to an asset that will either earn income or appreciate and yield holding gains.

### Table 17.10: The case of a financial lease

				Interes	t rate 5%	
	Year 1	Year 2	Year 3	Year 4	Year 5	Sum of 5 years
Contribution to loan value from payments due in :						
Year 1	220					
Year 2	210	220				
Year 3	200	210	220			
Year 4	190	200	210	220		
Year 5	181	190	200	210	220	
Loan value in year	1000	819	629	430	220	
Repayment of principal	181	190	200	210	220	10 00
Interest	39	30	20	10	0	100

# E. Capital measurement

17.69 Capital services is just one part of capital measurement in the SNA. This section provides an overview of a set of accounts that encompass all aspects of capital measurement, including wealth stocks, productive stocks, depreciation, revaluation, other changes in volume of assets and liabilities, and capital services. These measures are all closely associated with the PIM, and if they are compiled in an integrated manner, the quality of key measures such as net domestic product, net worth and productivity will be enhanced. These measures encompass at least fixed assets and natural resources, but more broadly could encompass other non-financial assets that might be compiled using the PIM including inventories, valuables and consumer durables (which are allowed as a supplementary item on the balance sheet).

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commentation from GN CM.4 that chapter 17 "should provide an all-inclusive coverage of measuring capital: all stocks and flows of fixed assets, natural resources and land. The new chapter should cover and explain the differences between both wealth and productive capital stocks." The section also includes the content of the 2008 SNA section E, "A supplementary table on capital services", as its final subsection.

## 1. Basics of capital measurement

17.70 Because capital plays two basic roles in the SNA, as a contributor to wealth and income and as a contributor to the production process, the capital measures in the SNA fit in two broad categories. Wealth stocks represent the value of the capital stock and show how these add to the net worth of institutional sectors and the total economy. Associated with wealth stocks are flows such as capital formation, depreciation, and other changes in assets and liabilities that are related to the measurement of net value added from production, net income and the acquisition of wealth. These measures are associated with changes from period to period in the value of the wealth stock and contribute to the important net measures that appear in the national accounts, institutional sector accounts and balance sheets. The second category of measures is associated with the efficiency of the stock of assets in providing capital services. A measure of stock that is adjusted for current and past declines in efficiency is called the productive stock, and it is used in preparing aggregate measures of capital services. The set of measures that focus on capital services are used especially for estimating productivity and the contribution of the capital stock to economic growth. While both sets of measures are constructed from the same capital flows, it is important that compilers and users of the data should clearly distinguish between the two.

17.71 Before getting into the details of measurement, it is appropriate to recall briefly the various simplifying assumptions that underlie the numeric examples in the chapter, assumptions that would be totally inappropriate in serious estimation of capital service flows. The most important are:

a. Somewhat different figures would emerge if any of the tables were to be calculated for the start of year, end of year or mid-year. Mid-year flows need to be discounted by half the annual discount rate to give start of year figures, for example.

b. The assumption that there is no price inflation, either overall or between different assets, is clearly unrealistic. Changes due to price movements need to be separately identified and included in the revaluation account.

c. The general preference for an age-efficiency approach to determine the value of capital stock should not be taken to mean that information on age-price decline, when such exists, is to be ignored. The solution is to find an age-efficiency pattern that matches the observed decline in prices. Where such a match can be made, this may inform the choice of age-efficiency declines where no matching price information is available. Use of geometric depreciation simplifies this choice by using a single depreciation rate to describe both the age-efficiency and age-price patterns.

17.72 There is a question about the appropriate level of detail to be used for assets. They are very diverse and even products that appear superficially similar, such as aircraft, may have quite different specifications. This is a problem that must be resolved whatever means of determining a stock figure for assets is used. The final choice may be a source of inaccuracies, or conversely, may lead to extra resource cost for little improvement in the results.

17.73 So far, this chapter has mostly focused on a single asset, for which it is assumed that the owner of the asset is able to calculate, at least approximately, its capital service—the contribution of the asset in the production process—over the anticipated life of the asset. Using this information, it is possible to derive the basic stocks and flows associated with the asset.

17.74 For national accounts compilers, the situation is different. There is a vast variety of assets, including nonproduced natural resources and fixed assets of different ages. Information on capital services is not readily available and must be inferred from other information. Prices of fixed assets may only be observed when the asset is initially acquired. The assets can be organized by classifications, such as the SNA's classifications of fixed assets and of natural resources, and possibly by more detailed classifications such as the Central Product Classification, Version 2.1. The data on fixed assets recorded in company accounts may be of limited usefulness to compilers because it is recorded at historical cost.

17.75 In practice, the measurement of capital is usually based in part on estimates that may have been prepared as part of the compilation of GDP. These estimates need to be organized in time series to support a PIM. For fixed assets, including cultivated biological resources yielding repeat products, the basic information required for the PIM is:

a. Time series of estimates of gross fixed capital formation (GFCF) by type of asset (according to the

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SNA's classification of fixed assets) at current prices and in volume terms;

- b. Time series of price indices that can be used as deflators for each type of asset;
- c. An age-price profile (or an associated age-efficiency profile) for each type of asset. If geometric depreciation is used (as the SNA recommends as a default option—see paragraph 7.280), then the only information needed is a depreciation rate for each type of asset. In paragraphs 17.22 to 17.24, one can see that in the case of geometric depreciation, the age-price profile and the age-efficiency profile are the same. If geometric depreciation is not used, the age-price profile must be derived from the age-efficiency profile (or vice versa) to ensure that the two profiles are consistent (see Annex D of Measuring Capital).
- d. If other changes in the volume of assets are relevant for a type of asset, those other changes in volume should be added to the value of the assets.
- e. To support the calculation of net value added and net operating surplus by industry, as well as multifactor productivity estimates by industry, the PIM will need to be calculated by industry as well as by type of asset. Therefore, time series of fixed capital formation and other changes in volume of assets by type of asset need to be prepared for each industry.
- f. To support wealth and depreciation estimates for institutional sector accounts, the PIM will need to be calculated by institutional sector as well as by type of asset. Therefore, time series of fixed capital formation and other changes in volume of assets by type of asset need to be prepared for each institutional sector. Typically, price indices and depreciation rates differ across types of assets but are assumed not to differ between institutional sectors for each type of asset.

# 2. Calculating depreciation

- 17.76 Depreciation is defined as "the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage" (see paragraph 7.264). A decline in value during the accounting period can be understood as the sum of two components. One component is the price change that reflects the price movement of the asset class under consideration, given a particular age (and measured, for example, by comparing the price of a new asset at the beginning of the period with the price of a new asset at the end of the period). Another component is the price change that reflects the ageing of the asset given a particular price level for the asset class (and measured, for example, by comparing the price of a one-year-old asset). Depreciation is measured as the price change due to ageing, thereby controlling for the overall movements in asset prices. This fits with the idea that "depreciation must be measured with reference to a given set of prices, i.e. the average prices of the period" (see paragraph 11.218).
- 17.77 The measurement of depreciation is directly associated with the age-price profile of an asset or of a cohort of assets. The rate of depreciation of a t-year-old asset is the difference in the price of a t-year-old asset and a t+1-year-old asset, expressed as a proportion of the t-year old asset. For geometric depreciation, this proportion is constant for all years t.
- 17.78 Careful consideration should be given to selecting the depreciation rates, or more generally, the age-price profiles. Some fixed assets (such as motor vehicles) have prices from sales of used, or second-hand assets that can be used to directly estimate the depreciation rate. In other cases, information on the typical service lives of the asset can be used. The selection of depreciation rates is discussed in more detail in *Measuring Capital*.

# 3. Calculating the net ("wealth") stock

17.79 The stock of assets surviving from past periods and corrected for depreciation is the "net" or "wealth" capital stock. The net stock is valued as if the capital good (used or new) were acquired on the date to which a balance sheet relates. The net stock is designed to reflect the wealth of the owner of the asset at a particular point in time. Hence, the notion of "wealth" stock seems more descriptive than "net" stock before a other types of "net" capital measures. The wealth stock is the measure that enters balance sheets of the

# national and of institutional sectors.

## 4. Calculating productive stock

17.80 The stock of a particular type of asset surviving from past periods and corrected for its loss in productive efficiency is the productive capital stock. Productive stocks constitute an intermediate step towards the measurement of capital services. The flow of capital services is assumed to be proportional to the productive stock of an asset class. If the factor of proportionality is constant, the rate of change of capital services will equal the rate of change of the productive stock. The rate of change of the productive stock is assumed to be the volume component when it comes to splitting the change in the total value of capital services at current prices into a price and a volume component. The concept of a productive stock is combined with the corresponding capital service price, the resulting value represents the flow of capital services, which is the relevant variable for aggregation across different types of assets.

# 5. Perpetual inventory model for non-renewable mineral and energy resources

17.81 For non-renewable mineral and energy resources, the PIM should be applied for each type of asset, with the resulting estimates then summed across asset types for wealth stocks or aggregated using chain indices for volume estimates. Data may be available on stocks and extraction in physical volume terms. The valuation of stocks is explained in paragraphs 14.56 to 14.57 and the measurement of depletion is explained in 11.232 to 11.234. A PIM for each type of asset can be calculated in physical terms or in constant prices. Compared with fixed assets, the PIM for a mineral resource is simpler in that depreciation does not need to be calculated. The opening stock for each year is carried forward from the closing stock of the previous year. There is no gross capital formation, so additions to the stock consist solely of other changes in the volume of assets (if any), which might include new discoveries, for example. Extraction of the resource is recorded as depletion and is subtracted in the calculation of the closing stock. The closing stock at the end of the year is equal to the opening stock plus other changes in the volume of assets less depletion.

# 6. User costs

- 17.82 Capital services are considered the appropriate measure of capital input in the production process, but to make them useful one needs to develop measures of value, price and volume of capital services. Depreciation does not represent the full cost of using a fixed asset, as one can see by imagining a case where the fixed asset is leased by its owner to another unit that uses it in production. The owner will charge a rental price that includes not only depreciation but also a net return on capital that reflects the financing costs of capital.
- 17.83 If there are rental markets, observed rentals could provide a first approximation to the user cost of capital for owner-users of the same assets. While rental markets may be common for some types of assets, such as dwellings, for most asset types rental prices are not available. Thus, various components of cost must be added up to approximate the cost of capital services. In the simplest case, three main cost elements are considered: (i) the cost of financing or the opportunity cost of the financial capital tied up through the purchase of the asset (which is used for calculating the return on non-financial assets used in producing non-market output) (ii) depreciation, i.e. the value loss due to ageing; (iii) revaluation, i.e. the expected price change of the class of assets under consideration. National accounts data on depreciation and prices can be used for estimating components (ii) and (iii), while component (i) might be based on gross operating surplus (along with a portion of gross mixed income) as part of the calculation of the net return to capital. Implementing the user cost methodology requires various assumptions that are discussed in *Measuring* (financial).

# 7. Aggregation

17.84 The final step in the compilation of capital stock and capital service statistics is to aggregate across asset

types to calculate aggregate stocks for institutional sectors, industries or the total economy. In current prices, aggregation is taken as the simple summation of stocks or capital services across asset types. Balance sheets are generally compiled in the current prices of the beginning/end of the period.

17.85 For aggregation in volume terms, the calculations described in chapter 18 are typically applied. Because the wealth) stock is presented in current prices in the balance sheet, it may not be necessary to calculate it in volume terms. But if desired, the volume measure of the wealth stock can be calculated.

# 8. A table on capital services

- 17.6817.86 This section describes a table that can be compiled to compare data coming from the standard national accounts tables for the elements of gross value added with those derived from applying the theory of capital services to the national accounts data on capital stock. The table can be prepared in current prices and in volume terms, with the capital service values in volume terms used for analysis of capital and multifactor productivity as described in section F of chapter 18.
- 17.6917.87 The first level of detail that might be examined is given in table 17.11. This assumes that information on value added by institutional sector is available. The figures for operating surplus for non-financial and financial corporations may be compared with capital services from fixed assets used by these sectors adjusted as necessary for non-produced natural resources, other non-produced non-financial assets and inventories. The figures for operating surplus of general government and NPISHs and those for capital services of those sectors must be equal except for possible adjustments for inventories and depletion. This is because by convention the net return to capital on assets used in non-market production is derived from an opportunity cost perspective when output is estimated as the sum of costs (see paragraphs 4.295 and 4.296). [The capital services for other household dwellings should match operating surplus for households and the figure for capital services for other household unincorporated enterprises is to be compared with the national accounts figure for mixed income (which should include a labour remuneration element also).

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ational accounts data	Total/Gross	<b>Depreciation</b>	<b>Depletion</b>	Net
ross value added				
Remuneration of employees				
Mixed income				
Operating surplus				
Non-financial corporations				
Financial corporations				
General government				
NPISHs				
Households				
axes less subsidies on production				
pital services		Capital services	Decline in value	Return to capital
economy				
xed assets				
Aarket producers (excluding house	eholds)			
Non-financial corporations				
Financial corporations				
Non-market producers				
General government				
NPISHs				
Households				
Dwellings				
Other unincorporated enterprise	s			
atural resources				

# Chapter 18: Measuring prices, volumes and productivity (revised title and revised content) (OLD Chapter 15: Price and volume measures)

# A. Introduction

- 18.1 Chapter <u>14-15</u> describes how the goods and services account may be compiled and elaborated within a supply and use table. The changes in the values of flows of goods and services can be directly factored into two components, one reflecting changes in the prices of the goods and services concerned and the other the changes in their volumes. One major advantage of compiling price and volume measures within an accounting framework, such as that provided by the supply and use tables, is that a check is provided on the numerical consistency and reliability of the set of measures as a whole. This is particularly important when every flow of goods and services in the economy has to be covered, including non-market goods and services whose valuation is even more difficult in volume terms than at current prices.
  - 18.2 Another advantage of compiling price and volume measures within an accounting framework is that implicit price or volume measures can be derived for certain important balancing items. In particular, gross value added can be measured in real terms by subtracting intermediate consumption in volume terms from output in volume terms, the so-called "double deflation" method. Double deflation may be used at the level of an individual enterprise, industry or sector. However, the primary objective of the SNA is not simply to provide guidelines on measures of changes in prices and volumes for the main aggregates of the SNA but to assemble a set of interdependent measures that make it possible to carry out systematic and detailed analyses of inflation and economic growth.

#### 1. Index number theory

- 18.3 Section B gives an overview of the theory of index numbers as applied in the SNA. New mManuals have been published on the theory and practice of consumer price indices (CPIs) and on producer price indices (PPIs). These are Consumer Price Index Manual: Theory and Practice Concepts and Methods, (International Monetary Fund, International Labour Organization, International Monetary Fund, International Labour Organization, International Monetary Fund, Statistical Office of the European Union (Eurostat), United Nations Economic Commission for Europe, Organisation for Economic and Co-operation and Development, Eurostat, United Nations Economic Company of Practice, (International Labour Organization, International Monetary Fund, Co-operation and Development, United Nations, Economic Commission for Europe and the World Bank (2004).) A further manual on export and import price indices (XMPIs), Export and Import Price Index Manual: Theory and Practice (International Labour Organization, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, Economic Commission for Europe and the World Bank (2004).) A further manual on export and import price indices (XMPIs), Export and Import Price Index Manual: Theory and Practice (International Labour Organization, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations Economic Commission for Europe and World Bank (2009). In particular chapter 2 of the CPI manual, chapter 14 of the CPI-and-PPI manuals and chapter 15 of the XMPI manual outline how such indices fit into the framework of the SNA.
- 18.4 The first topic in section B concerns the choice of an appropriate methodology for compiling inter-temporal price and volume measures for flows of goods and services in a national accounting context. Section B also deals with the consequences of price variation due to price discrimination; that is, how to treat goods or services that are sold to different purchasers on the same market in the same period at different prices. Such differences need to be clearly distinguished from price differences attributable to differences in qualities. This section also discusses the treatment of changes in quality over time, including the appearance of new products and the disappearance of old products.

### 2. Inter-temporal price and volume series

18.5 Section C shows how the considerations in section B can be applied to the SNA and time series of volumes and prices

**Commented [ED1]:** References to several manuals or handbooks have been updated to reflect new editions published since 2008. be derived. It discusses not only the elements of the goods and services account but also how stocks of non-financial assets can be decomposed into price and volume elements. <del>Further, the section addresses the question of expressing key aggregates of the SNA that do not themselves have price and volume components in real terms, allowing an analysis of the immact of terms of trade on national income. For instance.</del>

18.6 Like section B, section C does not aim to be exhaustive in its coverage but draws on, and refers to, other manuals, specifically the Handbook on Prices and Volume Measures in National Accounts (Eurostat, 20012016) and chapter IX of Quarterly National Accounts Manual (International Monetary Fund (IMF), 2017).

# 3. Real income

18.7 Section D addresses the question of expressing key aggregates of the SNA that do not themselves have price and volume components in real terms, allowing an analysis of the impact of terms of trade on national income, for instance.

### 4. Volume measures for particular products

18.8 The methods discussed in Section C of this chapter can be used to appropriate derive volume and price measures for most products. For a few products that have unusual characteristics, this general guidance may not be sufficient, and Section E provides more specific guidance for those cases. The specific guidance in this section draws from handbooks such as Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2016 edition and other handbooks that are cited in the section.

# 5. Productivity

18.9 Section F describes measures of productivity, which measure changes in the volume of output relative to changes in the volume of inputs. These measures are ratios in which the numerator is a volume measure of output or value added and the denominator is a volume measure of one or more inputs, especially of labour, capital or the combined contributions of labour and capital. This section draws on the handbooks, *Measuring Capital* (Organisation for Economic Co-operation and Development (OECD), 2009) and *Measuring Productivity* (OECD, 2001).

# 3.6. International price comparisons

- 48.7<u>18.10</u> Although most price and volume index numbers were developed to measure changes in prices and volumes over time, they can also be adapted to compare levels of prices and volumes between different regions or countries in the same period of time. Such comparisons are needed in order to be able to compare standards of living, levels of economic development or levels of productivity in different countries.
- 18.8.18.11 These topics are addressed in section DG, first in theoretical terms and then in terms of the implications for national accountants. <u>Measuring the Real Size of the World Economy: The Framework</u>, <u>Methodology, and Results of the International Comparison Program—ICP</u> (World Bank, 2013) describes the methodology underlying the International Comparison Program (ICP).

# 4.7. Further information

18.918.12 This chapter aims to do no more than introduce the most important concepts and considerations of the application of index number theory to the derivations of volume series within the SNA. Further information should be sought from the other manuals cited.

### **B.** An overview of index number theory

1. Quantities, prices and values

**18.1018.13** For each individual type of good or service it is necessary to specify an appropriate quantity unit in which that good or service can be measured. Goods or services may be supplied in units that are either discrete or continuously variable. Automobiles, aircraft, microcomputers, haircuts and appendectomies are examples of goods or services provided in discrete or integral units. The quantities of such goods and services are obtained simply by counting the number of units. Oil, electricity, sugar and transportation are examples of goods or services provided in units that vary continuously in respect of characteristics such as weight, volume, power, duration and distance. The choice of physical unit, and its price in relation to the unit selected, is therefore a matter of convenience. For example, the price quoted per tonne is one thousand times greater than one quoted per kilo. As long as the price is expressed in a manner consistent with the unit of volume, the value (v) at the level of a single, homogeneous good or service is equal to the price per unit of quantity (p) multiplied by the number of quantity units (q), that is:  $v = p \ge q$ .

#### Additivity of quantities, prices and values

18.11-18.14 Certain important properties in relation to the additivity of quantities, prices and values may be briefly noted:

- a. Quantities are additive only for a single homogeneous product. For example, it is not economically meaningful to add 10 tonnes of coal to 20 tonnes of sugar. Less obviously, the addition of 10 automobiles of one type to 20 automobiles of another type would not be economically meaningful either if they differ in quality.
- b. The price of a good or service is defined as the value of one unit of that good or service. It varies directly with the size of the unit of quantity selected and in many cases can be made to vary arbitrarily by changing the unit of quantity, for example, by choosing to measure in tonnes instead of in kilograms. Prices, like quantities, are not additive across different goods or services. An average of the prices of different goods or services has no economic significance and cannot be used to measure price changes over time.
- c. Values are expressed in terms of a common unit of currency and are additive across different products. Values are invariant to the choice of quantity unit.
- 18.1218.15 In a market system, the relative prices of different goods and services should reflect both their relative costs of production and their relative utilities to purchasers, whether the latter intend to use them for production or consumption. Relative costs and relative utilities influence the rates at which sellers and buyers are prepared to exchange goods and services on markets. An aggregation of the values of different goods and services have been produced and consumed at the currently prevailing prices.

#### Volume, quantity, price and unit value indices

- 18.1318.16 A volume index is an average of the proportionate changes in the quantities of a specified set of goods or services between two periods of time. The quantities compared over time must be those for homogeneous items and the resulting quantity changes for different goods and services must be weighted by their economic importance, as measured by their relative values in one or other, or both, periods. For this reason volume is a more correct and appropriate term than quantity in order to emphasize that quantities must be adjusted to reflect changes in quality.
- 18.1418.17 Unfortunately, it may sometimes happen, especially in the field of foreign trade statistics based on customs documentation, that the data from which price and volume indices have to be calculated are not sufficiently detailed or are otherwise inadequate for the purpose. For example, the basic information available may be limited to the total number of units of some group of products imported or exported, or their total weight, for example, the total number of pairs of shoes, or total weight of a certain type. Indices built up from information of this kind are not volume indices when the numbers, or weights, cover different items selling at different prices. They are sometimes described as "quantity indices" for this

reason. The "price" indices associated with such indices are usually described as average or "unit value" indices. Unit value indices measure the change in the average value of units that are not necessarily homogeneous and may be affected by changes in the mix of items as well as by changes in their prices. Unit value indices cannot therefore be expected to provide good measures of average price changes over time for groups of non-homogeneous items.

# 2. Inter-temporal index numbers of prices and volumes

18.1518.18 The index numbers of interest within the SNA are designed to decompose changes in value aggregates into their overall change in price and volume components. A price index can be written and calculated as a weighted average of the proportionate changes in the prices of a specified set of goods and services between two periods of time, say a reference period 0 and current period *t*. Similarly, a volume soft a specified set of goods and services between two periods of time, say a reference period 0 and current period 1. There are many index number formulae differing from each other mainly in the weights which they attach to the individual price or quantity relatives and the particular form of average used, whether it is arithmetic, geometric, harmonic, etc. These alternative formulae, their properties and relative merits, are outlined in detail in the CPI and PPI manuals.

### Laspeyres and Paasche indices

 $\frac{18.1618.19}{18.00}$  The two most commonly used index formulae are the Laspeyres and Paasche indices. The Laspeyres price index (*Lp*) is defined as a weighted arithmetic average of the price relatives using the value shares of the reference period 0 as weights:

$$L_{p} = \sum_{i=1}^{n} \left( \frac{p_{i}^{t}}{p_{i}^{0}} \right) S_{i}^{0} = \frac{\sum_{i=1}^{n} \left( \frac{p_{i}^{t}}{p_{i}^{0}} \right) p_{i}^{0} q_{i}^{0}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}} \equiv \frac{\sum_{i=1}^{n} p_{i}^{t} q_{i}^{0}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}}$$
(1)

That is, where  $p_{i_i}^0 q_i^0$  and  $v_i^0 = p_i^0 x q_i^0$  are the prices, quantities and values in period 0 of i = 1, ..., n products and  $s_i^0 = v_1^0 / \sum_{i=1}^n v_{i_i}^0$  the value shares in period 0. Similar expressions with superscripts *t* refer to period *t*.

18.1718.20 Note from (1) that the Laspeyres price index can be defined as the change in value of a basket of products whose composition is kept fixed as it was in the reference period 0. The Laspeyres volume index (LQ) can be similarly defined as the change in the value of a basket whose composition every period is updated but the prices of the reference period 0 are applied to the new quantities (or volumes), that is:

$$L_{Q=} \sum_{i=0}^{n} \left( \frac{q_{i}^{t}}{q_{i}^{0}} \right) S_{i}^{0} \equiv \frac{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{t}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}}$$
(2)

18.1818.21 Paasche indices also exist in both price and volume forms. The Paasche index differs from the Laspeyres index in two respects. It uses a harmonic mean instead of an arithmetic average and the fixed period volumes or prices are those of the current period t. The Paasche price index is given by:

$$P_{p} = \left[\sum_{i=1}^{n} \left(\frac{p_{i}^{t}}{p_{i}^{0}}\right)^{-1} S_{i}^{t}\right]^{-1} \equiv \frac{\sum_{i=1}^{n} p_{i}^{t} q_{i}^{t}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{t}}$$
(3)

and a Paasche volume index, with fixed current period weights or prices, by:

$$P_{Q=}\left[\sum_{i=1}^{n} \left(\frac{q_{i}^{t}}{q_{i}^{o}}\right)^{-1} S_{i}^{t}\right]^{-1} \equiv \frac{\sum_{i=1}^{n} p_{i}^{t} q_{i}^{t}}{\sum_{i=1}^{n} p_{i}^{t} q_{i}^{o}}$$
(4)

Deflation and volume series using Laspeyres and Paasche formulae

**18.19** 18.22 The index of the change in monetary values between two periods,  $I_{\nu} = \sum_{i=1}^{n} v_i^t / \sum_{i=1}^{n} v_i^{t-1}$ , reflects the combined effects of both price and quantity changes. When Laspeyres and Paasche indices are used, the value change will exactly decompose into a price index times a volume index only if the Laspeyres price index is matched with the Paasche volume index, that is:  $L_p \times P_Q = I_V$  or the Laspeyres volume index is matched with the Paasche price index. For example, a price index, 1.05 representing a 5 per cent change multiplied by a volume index of 1.08, an 8 per cent change, yields a value change index of 1.134, a 13.4 per cent change.

# Laspeyres and Paasche indices reflects the combined effects

**18.20**<u>18.23</u> This relationship can be exploited whenever the total current values for both periods are known and either of a price or volume index. Suppose, for example, compilers want to derive a volume index. Laspeyres and Paasche volume indices are derived by dividing (deflating) the value change by appropriate price indices:  $L_Q = I_v/P_p$  and  $P_Q = I_v/L_p$  respectively. Note that  $L_Q$  from the right-hand side of equation (2) generates a time series of Laspeyres volume indices, for periods t = 1,...,T of:

$$\frac{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{1}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}}, \frac{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{2}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}}, \dots, \frac{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{T}}{\sum_{i=1}^{n} p_{i}^{0} q_{i}^{0}}$$
(5)

Multiplying through the series by the common denominator  $\sum_{i=1}^{n} p_{1}^{0} q_{i}^{T}$  yields the volume series:

$$\sum_{i=1}^{n} p_i^0 q_i^1, \sum_{i=1}^{n} p_1^0 q_1^2, \dots, \dots, \sum_{i=1}^{n} p_1^0 q_i^T$$
(6)

The relative movements from period to period for this series are identical with those of the associated Laspeyres volume indices given by (5), the two series differing only by a scalar that is the value in period 0.

18.2118.24 Series using the prices of a base year throughout, as illustrated by (6), are easy to understand but are not best practice in national accounts if the time period T is a lengthy one over which there are changes in the structure of the economy. For example, if volume changes are measured over a 10 year period, say 2010 to 2020, at constant 2010 prices, then the volume movements in later years are based on a price configuration that is likely to have changed. A better practice is to change the weights of (rebase) the Paasche deflator in 2015 and link the resulting index to the 2014 one. The resulting volume series over the 10 year

Formatted: Font: (Default) +Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight period will no longer be at constant <u>2010</u> prices, but be a more representative volume index. Even better practice, resources permitting, is to form a series of annual bilateral links of constant price comparisons <u>(see paragraphs</u>). It is preferable to use the term volume series to describe such series rather than "in" or "at constant prices".

The relationship between Laspeyres and Paasche indices

18.2218.25 Before considering other possible formulae, it is useful to establish the behaviour of Laspeyres and Paasche indices vis-à-vis each other. In general, a Laspeyres index tends to register a larger increase over the base year than a Paasche index, that is, in general:

both  $L_P > P_P$  and  $L_Q > P_Q$  (7)

It can be shown that relationship (7) holds whenever the price and quantity relatives (weighted by values) are negatively correlated, that is, as prices go up the quantities purchased go down or vice versa. Such negative correlation is to be expected for price takers, including consumers and firms purchasing intermediate inputs, who react to changes in relative prices by substituting goods and services that have become relatively less expensive for those that have become relatively more expensive. A positive correlation would be expected for price setting firms that substitute output towards goods and services that have become relatively more expensive. In such circumstances the inequalities in equation (7) would be reversed.

- 18.2318.26 Consumers are assumed to maximize utility, which in turn is related to combinations of goods and services purchased. Theoretical cost of living indices (COLIs) are defined as the ratio of the minimum expenditures required to enable a consumer to attain a fixed level of utility under the two sets of prices. The COLI increases if it becomes more expensive to maintain the same level of utility. A Laspeyres COLI would hold the preferences and utility fixed in the reference period and a Paasche COLI would hold them fixed in the current period.
- 18.2418.27 The Laspeyres price index provides an upper bound to the oretical Laspeyres COLI. Under the COLI, consumers can substitute products that have become relatively less expensive for ones that have become relatively more expensive to obtain the same level of utility, whereas the fixed basket Laspeyres index does not allow such substitution. Similarly, the Paasche index can be shown to provide a lower bound to the theoretical Paasche COLI.

### Other index number formulae

- 18.2518.28 Because different formulae give different results, a consideration of alternative approaches to choosing among them is needed and this in turn gives rise to a consideration of further index number formulae.
- 18.2618.29 It is apparent from the Laspeyres and Paasche price indices in equations (1) and (3) that both indices hold the basket of quantities fixed. The formulae differ in that Laspeyres holds the basket fixed in the reference period and Paasche in the current period. If the objective is simply to measure the price change between the two periods considered in isolation, there is no reason to prefer the basket of the earlier period to that of the later period, or vice versa. Both baskets are equally justifiable from a conceptual point of view. Thus, although they yield different results, neither formula can be judged superior to the other.
- 18.2718.30 A compromise solution for the price index is to use a formula that makes symmetric use of the base and current period information on quantities. The Fisher index can be shown to be the most suitable in this regard. (For an explanation of why this is so, see chapter 15 of the PPI manual.) The Fisher index (F) is defined as the geometric mean of the Laspeyres and Paasche indices, that is, for price and quantity indices respectively:

 $F_P = \{L_P, P_P\}^{\frac{1}{2}} \text{ and } F_Q = \{L_Q, P_Q\}^{\frac{1}{2}}$  (8)

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- 18.2818.31 Economic theory postulates indifference curves that show how consumers would alter their expenditure patterns in response to changes in prices. Unless the utility functions the indifference curves represent are similar in periods 0 and t, a Laspeyres and a Paasche index for this period will each refer to a differently shaped utility function. In general, the Laspeyres index will provide an upper bound to its underlying utility function while the Paasche index will give a lower bound to its underlying utility functions will be different.
- 18.2918.32 In order to resolve this dilemma, a series of indices called superlative indices have been derived that relate to utility functions that adapt over time to the changes in quantities brought about by changes in prices. The Fisher index is one example of a superlative index; a Törnqvist index is another example. A Törnqvist index is the geometric average of the price relatives weighted by average expenditure shares in two periods. Thus the Törnqvist price and volume indices are defined as:

$$T_{P} = \prod_{l=1}^{n} \left(\frac{p_{l}^{i}}{p_{0}^{0}}\right)^{\left(s_{l}^{0} + s_{l}^{1}\right)/2} \text{ and } T_{Q} = \prod_{l=1}^{n} \left(\frac{q_{l}^{i}}{q_{0}^{0}}\right)^{\left(s_{l}^{0} + s_{l}^{1}\right)/2}$$
(9)

Both Fisher and Törnqvist indices utilize and attach equal importance to information on the value shares in both periods for weighting purposes. For this reason they may be expected to lie between the bounds of Laspeyres and Paasche indices, as is desired. The difference between the numerical values of the Törnqvist and Fisher indices and other such symmetric indices is likely to be very small. Neither Törnqvist or Fisher volume indices use the prices of a specific single period. The term "at constant prices" is a misnomer for such series; the correct term is a series in volume terms.

18.3018.33 The above analysis has been from the consumer's or purchaser's perspective. Economic theory also defines Laspeyres and Paasche bounds from the producer's perspective. Revenue maximizing producers are expected to increase the relative quantities they produce in response to increases in relative prices. The resulting LaspeyresPaasche bounds are the reverse of those described above, as quantities produced are substituted towards commodities with above average changes in prices. But the implication for removing substitution bias by the use of Törnqvist and Fisher indices still holds.

# Desirable index number characteristics

- 18.3118.34 There are two frequently quoted characteristics that it is felt index numbers for deflating national accounts should satisfy. These are the "time reversal" and "factor reversal" tests. The time reversal test requires that the index for period t compared with period 0 should be the reciprocal of that for period 0 compared with t. The factor reversal test requires that the product of the price index and the volume index should be equal to the proportionate change in the current values. It follows from the discussion in the preceding section that Laspeyres and Paasche indices on their own do not pass either of these tests. However, it follows from the definitions of Fisher indices in (8) that the Fisher index does pass these tests.
- 18.3218.35 The Fisher index therefore has a number of attractions that have led it to be extensively used in general economic statistics. Indeed, Fisher described his index as "ideal". However, the Fisher index requires both reference and current period information for weights, which may affect the timeliness of the index, nor is it as easy to understand as Laspeyres or Paasche indices.
- 18.3318.36 The PPI manual provides in chapters 15, 16 and 17 an extensive account of the various approaches to choosing among index numbers. Also included in chapter 16 is the stochastic approach that favours the Törnqvist index. What is apparent from this extensive body of work is that all three approaches favour the Fisher index; that superlative indices such as the Fisher and Törnqvist indices produce very similar results and can all be justified from the economic theoretical approach and that the difference between superlative indices or their spread, is due to substitution bias.

# Index numbers in practice

1

18.3418.37 The Laspeyres price index in equation (1) has the same price and weight reference period 0. In practice, especially for CPIs where timeliness is of the essence, the price reference period 0 differs from the earlier weight reference period, say b, since it takes time to compile the results from the survey of households, establishments and other sources for the weights to use in the index. The Laspeyres index given by the first expression in equation (1) may have as its weights  $S_l^b$  instead of  $S_l^0$ . This index is a Young index and, like the Laspeyres index, has the undesirable property of failing the time reversal test.

 $\frac{18.3518.38}{18.38}$  Statistical offices often try to overcome this by adjusting the value shares used as weights by the changes in prices between *b* and 0 to form a Lowe index given by:

$$L_{oweP} = \frac{\sum_{i=1}^{n} \left(\frac{p_{i}^{i}}{p_{i}^{b}}\right) \left(\frac{p_{i}^{b}}{p_{i}^{b}}\right) v_{i}^{b}}{\sum_{i=0}^{n} v_{i}^{b} \left(\frac{p_{i}^{b}}{p_{i}^{b}}\right)} \equiv \frac{\sum_{i=1}^{n} p_{i}^{t} q_{i}^{b}}{\sum_{i=1}^{n} p_{i}^{a} q_{i}^{b}}$$
(10)

#### 3. Chain indices

# The rebasing and linking of indices

- 18.3618.39 As noted in the previous section, over time the pattern of relative prices in the base period tends to become progressively less relevant to the economic situations of later periods to the point where it becomes unacceptable to continue using them to measure volume changes from one period to the next. It is then necessary to update the weights. With long time series, it is as inappropriate to use the most current weights for a date long in the past as it is to use the weights from a long time in the past for the current period. It is therefore necessary to link the old series to the new reweighted series by multiplication. This is a simple numerical operation requiring estimates for an overlapping period of the index or series calculated using both the old and new weights.
- 18.3718.40 The linking calculation can be undertaken in a number of ways. The current index on the new weights can be multiplied by a linking coefficient of the old to new index to convert the new index to the old index reference period. Alternatively, the index may have its reference period changed at the time of the introduction of new weights and the old index may be revised by dividing it by the linking coefficient. The process of linking an old series and a new one by means of a link for an overlap period is referred to as chaining. Numerical examples of linking and other chain index calculations are available in chapter 8 of Quarterly National Accounts Manual.
- 18.3818.41 Whether the chaining is done so as to preserve the earlier reference period in the new series or to change the reference period of the old series to the new one, the calculations have to be undertaken at each level of aggregation. Each component as well as each aggregate has to be linked individually because of non-additivity.

# Chaining each period

18.3918.42 The more frequently weights are updated the more representative will the resulting price or volume series be. Annual chain indices result from compiling annual indices over two consecutive years each with updated weights. These "links" are combined by successive multiplication to form a series. In order to understand the properties and behaviour of chain indices in general, it is necessary to establish first how chain Laspeyres and Paasche indices behave in comparison with fixed base indices.

# Chain Laspeyres and Paasche indices

18.4018.43 A chain Laspeyres volume index,  $L_Q$ , connecting periods 0 and t, is an index of the following form:

$$L_Q = \frac{\sum_{i=1}^{n} p_i^0 q_i^1}{\sum_{i=1}^{n} p_i^0 q_i^0} \times \frac{\sum_{i=1}^{n} p_i^1 q_i^2}{\sum_{i=1}^{n} p_i^1 q_i^1} \times \dots, \frac{\sum_{i=1}^{n} p_i^{t-1} q_i^t}{\sum_{i=1}^{n} p_i^{t-1} q_i^{t-1}}$$
(11a)

The corresponding chain Paasche volume index, PQ, has the following form:

$$P_Q = \frac{\sum_{l=1}^{n} p_l^1 q_l^1}{\sum_{l=1}^{n} p_l^1 q_l^0} \times \frac{\sum_{l=1}^{n} p_l^2 q_l^2}{\sum_{l=1}^{n} p_l^2 q_l^1} \times \dots, \frac{\sum_{l=1}^{n} p_l^t q_l^t}{\sum_{l=1}^{n} p_l^t q_l^{t^{-1}}}$$
(11b)

Laspeyres and Paasche price indices are obtained by interchanging the p's and q's in the expressions for the volume indices.

- 18.4118.44 In general, if fixed base indices are replaced by chain indices, the index number spread between Laspeyres and Paasche is likely to be greatly reduced. Chain indices thus have an advantage over fixed base ones. The relationship between a fixed base index and the corresponding chain index is not always the same, however, as it depends upon the paths followed by individual prices and quantities over time.
- 18.42<u>18.45</u> If individual prices and quantities tend to increase or decrease steadily over time it can be shown that chaining will significantly reduce the index number spread, possibly almost eliminating it. Chapters 9 and 19 of the PPI manual provides illustrative examples and chapter 15 explains the theory underlying these findings
- 18.4318.46 On the other hand, if individual prices and quantities fluctuate so that the relative price and quantity changes occurring in earlier periods are reversed in later periods, chaining will produce worse results (in comparison with the Fisher index) than a simple index.
- 18.4418.47 On balance, situations favourable to the use of chain Laspeyres and Paasche indices over time seem more likely than those that are unfavourable. The underlying economic forces that are responsible for the observed long-term changes in relative prices and quantities, such as technological progress and increasing incomes, do not often go into reverse. Hence, it is generally recommended that annual indices be chained. The price and volume components of monthly and quarterly data are usually subject to much greater variation than their annual counterparts due to seasonality and short-term irregularities. Therefore, the advantages of chaining at these higher frequencies are less and chaining should definitely not be applied to seasonal fluctuations.

### Annually chained quarterly Laspeyres-type indices

18.4518.48 Quarterly chain indices can be constructed that use annual weights rather than quarterly weights. Consider a quarterly Laspeyres-type volume index that measures the volume change from the average of year y-1 to quarter c in year y.

$$L_{Q}^{\overline{(y-1)} \to (c,y)} = \frac{\sum_{i} P_{i}^{y-1} q_{i}^{c,y}}{\sum_{i} P_{i}^{y-1} Q_{i}^{y-1}} = \sum_{i} \frac{q_{i}^{c,y}}{Q_{i}^{y-1}} s_{i}^{y-1}$$
(12a)

The upper case letters P and Q denote average quarterly values over a year, while p and q denote specific quarterly values. The superscripts denote the year (y) and quarter (c).  $P^{y-1}$  denotes the average price of item i in year y-l

and  $p_{cy}$  denotes the price of item *i* in quarter *c* of year *y*-1

and  $s^{y-1}$  is the base period value share, that is the share of item *i* in the total value in year *y*-1.

Thus:

$$P_{l}^{y-1} = \frac{\sum_{c} p_{i}^{(y-1)} q_{l}^{(y-1)}}{\sum_{l} q_{l}^{(y-1)}}; Q_{l}^{y-1} = \frac{\sum_{c} q_{l}^{(y-1)}}{4}; and$$

$$S_{l}^{y-1} = \frac{p_{i}^{y-1} Q_{l}^{y-1}}{\sum_{p,a} e^{y-1}} = \frac{\sum_{c} p_{l}^{(cy-1)} q_{c}^{(y-1)}}{\sum_{p,p} e^{xp-1} q_{c}^{(y-1)}}$$
(12b)

- 18.4618.49 The quarterly Laspeyres-type volume indices can then be chained together with annual links. One of two alternative techniques for the annual chaining of quarterly data is usually applied, annual overlaps and one-quarter overlaps. In addition to these two conventional chaining techniques, a third technique sometimes is used based on changes from the same period in the previous year (the "over-the-year technique"). While in many cases all three techniques give similar results, in situations with strong changes in relative quantities and relative prices, the over-the-year technique can result in distorted seasonal patterns in the chained series. While standard price statistics compilation exclusively uses the one-quarter overlap technique, the annual overlap technique and the over-the-year technique do not result in data that aggregate exactly to the corresponding direct annual index. In contrast, the one quarter overlap technique and the over-the-year technique do not result in data that aggregate exactly to the corresponding direct annual index. The one-quarter overlap provides the stronges transition between each link in contrast to the annual overlap technique, which often introduces a step between each link, that is, between the fourth quarter of one year and the first quarter of the following year.
- 18.47]8.50 The technique of using annual overlaps implies compiling estimates for each quarter at the weighted annual average prices of the previous year, with subsequent linking using the corresponding annual data to provide linking factors to scale the quarterly data upward or downward. The technique of one-quarter overlaps requires compiling estimates for the overlap quarter at the weighted annual average prices of the current year in addition to estimates at the average prices of the previous year. The ratio between the estimates for the linking quarter at the average prices of the current year in addition to estimates at the average prices of the average prices of the previous year. The ratio between the current year then provides the linking factor to scale the quarterly data up or down. The over-the-year technique requires compiling estimates for each quarter at the weighted annual average prices of the current year in addition to estimates at the average prices of the current year of the current year technique requires compiling estimates for each quarter at the weighted annual average prices of the current year in addition to estimates at the average prices of the previous year. The vertex on-year changes in these volume series are then used to extrapolate the quarterly volume series of the chosen reference period.
- 18.4818.51 Discrepancies between an annual chain volume series and the sum of the four quarters of an annually chained quarterly volume series derived using the one-quarter overlap technique can accumulate over time. Hence, quarterly chain volume series derived this way are usually benchmarked to the corresponding annual chain volume series using a procedure that minimizes the disturbance to the quarterly volume series whilst achieving consistency with the annual chain volume series. There is discussion on this in chapter <u>6</u> of Quarterly National Accounts <u>Manual</u>.
- 18.4918.52 If annual volume series are derived from data balanced in a supply and use table expressed in the prices of the previous year as recommended in section C, then it is standard practice to benchmark quarterly data to the corresponding annual balanced estimates. The benchmarking eliminates all discrepancies between the quarterly and annual chain volume series, including those arising from the use of the one-quarter overlap technique.
- 18.5018.53 To conclude, chaining using the one-quarter overlap technique combined with benchmarking to remove any resulting discrepancies between the quarterly and annual data gives the best result. In many circumstances, however, the annual overlap technique may give similar results. The over-the-year technique should be avoided.

### Chain Laspeyres or chain superlative indices?

18.5118.54 As explained earlier, the index number spread between Laspeyres and Paasche indices may be greatly reduced by chaining when prices and quantities move smoothly over time. In such circumstances the choice of index number formula assumes less significance as all relevant index numbers lie within the bounds of the Laspeyres and Paasche indices. Nevertheless, there may still be some advantages to be gained by choosing an index for chaining, such as the Fisher or Törnqvist, that treats both periods being compared

# symmetrically.

18.55 Such indices are likely to approximate more closely the theoretical indices based on underlying utility or production functions even though chaining may reduce the extent of their advantages over their Laspeyres or Paasche counterparts in this respect. A chain symmetric index, such as Fisher or Törnqvist, is also likely to perform better when there are fluctuations in prices and quantities. Chain Laspeyres indices, however, do not require current period data for weights and thus may lead to more timely estimates. Retrospective studies of the difference in national accounts estimates from using chain Laspeyres as against chain Fisher or Törnqvist can help in determining the advantage of using the latter formulae.

# Annually chained quarterly Fisher-type indices

18.5318.56 Just as it is possible to derive annually chained Laspeyres-type quarterly indices, so it is possible to derive annually chained Fisher-type quarterly indices. For each pair of consecutive years Laspeyres-type and Paasche-type quarterly indices are constructed for the last two quarters of the first year, year y-1 and the first two quarters of the second year, year y. The Paasche-type quarterly indices are constructed as backward-looking Laspeyres-type quarterly indices and then inverted. This is done to ensure that the Fisher-type quarterly indices are derived symmetrically. In the forward-looking Laspeyres-type indices the annual value shares relate to the first of the two years, whereas in the backward-looking Laspeyres-type indices the annual value shares relate to the second of the two years.

$$L_{q}^{\overline{(y-1)} \rightarrow c} = \frac{\sum_{l} P_{j}^{y-1} q_{l}^{c}}{\sum_{l} P_{l}^{l-1} Q_{l}^{l-1}} = \sum_{l} \frac{q_{l}^{c}}{Q_{l}^{y-1}} S_{l}^{y-1}$$
(13)  
$$P_{Q}^{\overline{y} \rightarrow c} = \left[ L_{Q}^{\overline{y} \rightarrow c} \right]^{-1}$$
(14a)  
$$L_{Q}^{\overline{y} \rightarrow c} = \frac{\sum_{l} P_{j}^{y} q_{l}^{c}}{\sum_{l} P_{j}^{y} Q_{l}^{c}} = \sum_{l} \frac{q_{l}^{c}}{Q_{l}^{y}} S_{l}^{y}$$
(14b)

and  $q_i^c$  is the quantity of item *i* in quarter *c* in the second two quarters of year *y*-*1* or the first two quarters of year *y*.

- 18.5418.57 For each of the four quarters a Fisher-type index is derived as the geometric mean of the corresponding Laspeyres-type and Paasche-type indices. Consecutive spans of four quarters can then be linked using the one-quarter overlap technique. The resulting annually chained Fisher-type quarterly indices need to be benchmarked to annual chain Fisher indices to achieve consistency with the annual estimates.
- 18.5518.58 A difficulty arises at the end of the series because it is not possible to construct Paasche-type quarterly indices that use annual weights for the current year, at least using actual observed data. One solution is to construct "true" quarterly chain Fisher indices for the latest year or two and use these to extrapolate the annually chained Fisher-type indices. But this should only be done using seasonally adjusted data. As long as the irregular variation in quarterly price and volume relativities is not very great, quarterly chain Fisher indices of seasonally adjusted data can be expected to produce satisfactory results in most circumstances.

# Chaining and data coverage

18.5618.59 One major practical problem in the construction of index numbers is the fact that products are continually disappearing from markets to be replaced by new products as a result of technological progress, new discoveries, changes in tastes and fashions, and catastrophes of one kind or another. Price and volume indices are compiled by comparing the prices or quantities of goods of the same characteristics or quality

Formatted: Font: (Default) +Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight (that is, homogenous goods) over time. This is not easy in product areas such as personal computers where quality changes rapidly.

18.5718.60 Chaining helps ameliorate the problems of such constant quality comparisons since the likelihood of an overlap of a product in two consecutive price periods is almost bound to be greatest and the chain indices can accommodate the changes in weight that accompany a new and a disappearing product.

#### Additivity and chaining

- 18.5818.61 An aggregate is defined as the sum of its components. Additivity in a national accounts context requires this identity to be preserved for a volume series. Although desirable from an accounting viewpoint, additivity is actually a very restrictive property. Laspeyres volume indices are the only index number formulae considered here that are additive.
- 18.5918.62 A single link in a chain index is sufficient to destroy additivity even when additive indices, such as Laspeyres volume indices, are linked together. Consequently, if chain volume indices are converted into time series of values by using the indices to extrapolate the values of the base period, the index components may fail to add to aggregates in later periods. A perverse form of non-additivity can occur when the chain index for the aggregate lies outside the range spanned by the chain indices for its components, a result that may be regarded as intuitively unacceptable by many users. Whether published in monetary terms or indices, it is advisable to inform users via a footnote or other meta-data that chain volume series are not additive.
- 18.6018.63 There is a general tendency for the discrepancies from chaining to become larger the further a period is away from the reference year. If the reference year is chosen to be near the end of the series then the discrepancies will be relatively small for the latest quarters. Indeed, if the chain Laspeyres formula is used and if the reference year is chosen to coincide with the latest base year then the quarters following the reference year are additive. Another advantage of having the reference year near the end of chain volume series is that when they are expressed as monetary values their magnitudes do not differ greatly from the current values for the latest periods if price change is occurring at a modest rate. Maintaining this situation requires rereferencing the series every year when a new link is added to the chain and this entails revising the chain volume series for their entire lengths. Note that rereferencing entails revising levels but not growth rates.
- 18.6118.64 Although additivity may be preserved by never undertaking a weight change this advantage is significantly outweighed by the disadvantage of increasing irrelevance of the weights in use. Rates of change for subperiods of a series, including annual rates, can be usefully phrased in terms of contributions to change, as explained below.

#### Variables that change sign

18.6218.65 Index number formulae are generally not applicable to time series that can take positive, negative and zero values. Nevertheless, there are ways of deriving pseudo chain volume series expressed in terms of monetary values in such cases. The most commonly used approach is to identify two associated time series that take only positive values and are such that when differenced yield the target series. An example is the stock of inventories at the start and end of the period as opposed to the change during the period. Chain volume series are not additive and so it is evident that this is an imperfect method since by construction an additive relationship is produced. It follows that the series to be differenced should be as closely aligned in terms of price and volume composition as possible with the target series. Hence, a chain volume series of opening inventories is derived as a chain volume series of closing inventories less a chain volume series of opening inventories. Sometimes public gross fixed capital formation can take negative values as a result of the sale of assets to the private sector, in which case the chain volume series of acquisitions and sales could be differenced.

### **Contributions to growth**

18.6318.66 When the Laspeyres formula is used and the base year and reference year coincide, the resulting volumes are additive in subsequent periods and the contribution by a component Ii to the growth of an aggregate, such as GDP, between two periods (t-n) and t can be obtained readily as follows:

$$\%\Delta_{i}^{(t-n)\to t} = \frac{100(l_{i}^{t} - l_{i}^{t-n})}{\Sigma_{i} l_{i}^{t-n}}$$
(15)

When chain volume series are derived using either the Laspeyres formula for annual indices or the annual chaining of Laspeyres-type quarterly indices, then year-to- year or quarter-to-quarter contributions to growth can be derived easily using data expressed in the prices of the previous year prior to chaining. Such data are additive and so equation (15) can be used with n=1. If contributions to growth are not published by the national statistical office, the user can estimate them. Assuming the one-quarter overlap technique has been used, the formula for calculating the contribution to the percentage change from period t-1 to period t is:

$$\%\Delta_{i}^{(t-1)\to t} = \frac{100.(l_{i}^{t} - l_{i}^{t-1})S_{i}^{t-1}}{\sum_{i} l_{i}^{t-n}S_{i}^{t-1}}$$
(16)

where the s are the shares of the items in the total as in equations (12).

## 4. Causes of price variation

1

### Price variation due to quality differences

- 18.6418.67 In general, most types of goods or services, whether simple food products such as potatoes or high technology products such as computers, are available on the market in many different qualities whose physical characteristics differ from each other. For example, potatoes may be old or new, red or white, washed or unwashed, loose or pre-packed, graded or ungraded. Consumers recognize and appreciate the differences and are prepared to pay different prices. For some goods and services, such as personal computers and telecommunication services, there is a rapid turnover in the highly differentiated varieties and this, as considered below, creates severe problems for the measurement of price changes.
- 18.6518.68 The same generic term, such as potato, computer or transportation is used to describe goods and services that differ from each other in their price-determining characteristics. The price or quantity of a good or service of one quality cannot be directly compared to that of a different quality. Different qualities have to be treated in exactly the same way as different kinds of goods or services.
- 18.6618.69 Differences in quality may be attributable to differences in the physical characteristics of the goods or services concerned and be easily recognized, but not all differences in quality are of this kind. Goods or services delivered in different locations, or at different times, such as seasonal fruits and vegetables, must be treated as different qualities even if they are otherwise physically identical. The conditions of sale, or circumstances or environment in which the goods or services are supplied or delivered can make an important contribution to differences in quality. For example, a durable good sold with a guarantee, or free after-sales service is higher quality than the same good sold without guarantee or service. The same goods or services sold by different kinds of retailers, such as local shops, specialist shops, department stores or supermarkets may have to be treated as different qualities.
- 18.6718.70 It is generally assumed in economic analysis that whenever a difference in price is found between two goods and services that appear to be physically identical there must be some other factor, such as location, timing or conditions of sale, that is introducing a difference in quality. Otherwise, it can be argued that the difference could not persist, as rational purchasers would always buy lower priced items and no sales would take place at higher prices.
- 18.6818.71 When there is price variation for the same quality of good or service, the price relatives used for index number calculation should be defined as the ratio of the weighted average price of that good or service in the two periods, the weights being the relative quantities sold at each price. Suppose, for example, that a

Formatted: Font: (Default) + Headings CS (Times New Roman), Complex Script Font: + Headings CS (Times New Roman), Don't snap to grid, Not Highlight certain quantity of a particular good or service is sold at a lower price to a particular category of purchaser without any difference whatsoever in the nature of the good or service offered, location, timing or conditions of sale, or other factors. A subsequent decrease in the proportion sold at the lower price raises the average price paid by purchasers for quantities of a good or service whose quality is the same and remains unchanged, by assumption. It also raises the average price received by the seller without any change in quality. This must be recorded as a price and not a volume increase.

# Price variation without quality differences

- 18.6918.72 Nevertheless, it must be questioned whether the existence of observed price differences always implies corresponding differences in quality. There are strong assumptions underlying the standard argument which are seldom made explicit and are often not satisfied in practice: for example, that purchasers are well informed and that they are free to choose between goods and services offered at different prices.
- 18.7018.73 In the first place, purchasers may not be properly informed about existing price differences and may therefore inadvertently buy at higher prices. While they may be expected to search for the lowest prices, costs are incurred in the process. Given the uncertainty and lack of information, the potential costs incurred by searching for outlets in which there is only a possibility that the same goods and services may be sold at lower prices may be greater than the potential savings, so that a rational purchaser may be prepared to accept the risk that he or she may not be buying at the lowest price. Situations in which the individual buyers or sellers negotiate, or bargain over prices, provide further examples in which purchasers may inadvertently buy at a higher price than may be found elsewhere. On the other hand, the difference between the average price of a good purchased in a market or bazaar in which individual purchasers bargain over the price and the price of the same good sold in a different type of retail outlet, such as a department store, should normally be treated as reflecting differences in quality attributable to the differing conditions under which the goods are sold.

#### **Price discrimination**

18.7118.74 Secondly, purchasers may not be free to choose the price at which they purchase because the seller may be in a position to charge different prices to different categories of purchasers for identical goods and services sold under exactly the same circumstances, in other words, to practise price discrimination. Economic theory shows that sellers have an incentive to practise price discrimination as it enables them to increase their revenues and profits. However, it is difficult to discriminate when purchasers can retrade amongst themselves, that is, when purchasers buying at the lowest prices can resell the goods to other purchasers. While most goods can be retraded, it is usually impossible to retrade services, and for this reason price discrimination is extensively practised in industries such as transportation, finance, business services, health, education, etc., in most countries. Lower prices are typically charged to purchasers with low incomes, or low average incomes, such as pensioners or students. When governments practise or encourage the practice of price discriminate in favour of households with low incomes as this may enable them to increase their profits. Thus, when different prices are charged to different consumers it is essential to establish whether or not there are in fact any quality differences associated with the lower prices. For example, if senior citizens, students or schoolchildren are charged lower fares for travelling on planes, trains or buses, at whatever time they choose to travel, this must be treated as pure price discrimination. However, if they are charged lower fares on condition that they travel only at certain times, typically off-peak times, they are being offered lower fares on condition that they travel only at certain times, typically off-peak times, they are being offered lower fares on condition that they travel only at certain times, typically off-peak times, they are being offered lower fares on condition.

## The existence of parallel markets

18.7218.75 Thirdly, buyers may be unable to buy as much as they would like at a lower price because there is insufficient supply available at that price. This situation typically occurs when there are two parallel markets. There may be a primary, or official, market in which the quantities sold, and the prices at which they are sold, are subject to government or official control, while there may be a secondary market, either a free

market or unofficial market, whose existence may or may not be recognized officially. If the quantities available at the price set in the official market are limited there may be excess demand so that supplies have to be allocated by rationing or some form of queuing. As a result, the price on the secondary or unofficial market will tend to be higher. It is also possible, but less likely, that lower prices are charged on the secondary or unofficial market, perhaps because the payment of taxes on products can be evaded in such a market.

- 18.7318.76 For the three reasons just given, lack of information, price discrimination or the existence of parallel markets, identical goods or services may sometimes be sold to different purchasers at different prices. Thus, the existence of different prices does not always reflect corresponding differences in the qualities of the goods or services sold.
- 18.7418.77 When there is price variation for the same quality of good or service, the price relatives used for index number calculation should be defined as the ratio of the weighted average price of that good or service in the two periods, the weights being the relative quantities sold at each price. Suppose, for example, that a certain quantity of a particular good or service is sold at a lower price to a particular category of purchaser without any difference whatsoever in the nature of the good or service offered, location, timing or conditions of sale, or other factors. A subsequent decrease in the proportion sold at the lower price raises the average price paid by purchasers for quantities of a good or service received by the seller without any change in quality. This must be recorded as a price and not a volume increase.
- 18.7518.78 It may be difficult to distinguish genuine price discrimination from situations in which the different prices reflect differences in quality. Nevertheless, there may be situations in which large producers (especially large service producers in fields such as transportation, education or health) are able to make the distinction and provide the necessary information. If there is doubt as to whether the price differences, as they have always been assumed to do so in the past.

# 5. The measurement of changes in quality over time

- 48.7618.79 Goods and services and the conditions under which they are marketed are continually changing over time, with some goods or services disappearing from the market and new qualities or new goods or services replacing them. National accountants use disaggregated price indices to deflate changes in consumption, production and investment values as the principle means of determining volume changes in such aggregates. Deficiencies in price indices carry over to estimates of volume changes, for example, estimates of price indices for computers that do not fully incorporate the increases in quality over time will overstate price changes and understate volume changes. National accountants need to be aware of the extent and nature of methods used by price compilers to take account of such quality changes, if they are to use them properly as deflators. This in turn requires that price compilers keep explanatory notes on such methods used, a policy advocated by chapter 7 of the CPI manual and chapter 8 of the PPI manual.
- 18.7718.80 There are, of course, costs associated with implementing quality adjustment procedures tailored to the specific product groups. What is important for national accountants and price index compilers to appreciate is that quality change is an increasing feature of product markets. The default procedures of dealing with quality change, specifically by treating all replacements as comparable, or dropping varieties from the sample if missing, implicitly incorporate valuations of quality differences. Such valuations are unlikely to be appropriate and improvements can and should be made.
- 18.7818.81 An unfortunate common procedure to deal with missing values is to carry forward the price from the previous period into the current period. This may well bias the index and is strongly discouraged.
- 18.7918.82 A brief overview of some of the more common techniques follows. More extensive discussion can be found in all the three price manuals, those for CPI, PPI and XMPI. The techniques can be divided into those that are direct or explicit methods and those that are indirect or implicit.

# **Direct methods**

18.8018.83 In principle, the price relatives that enter into the calculation of inter-temporal price indices should measure pure price changes by comparing the prices of a representative sample of identical goods and services in different time periods. This is called the matched-models method. Price index compilers maintain detailed product descriptions of the items being priced in successive periods to ensure proper matching. When a model is missing because it is obsolete, a problem of quality adjustment arises. A number of methods can be used to take account of the quality change in order to continue the series.

- 18.8118.84 One possibility is to use the estimated relative costs of production as the basis for estimates of their relative prices and hence their relative qualities. It may often be feasible for producers to provide such estimates. If, however, the new quality feature was available as an option in the previous period, but now is a standard feature, the estimate of the valuation of the quality change may be based on the (relative) price of this option.
- 18.8218.85 An extension of the costs of production approach is known as model pricing. It is often applied to products made to order. A particular case in point is measuring building costs. The characteristics of buildings and other structures are so variable that it may be almost impossible to find identical buildings and structures being produced in successive periods of time. In these circumstances, a small number of hypothetical and relatively simple standard buildings and structures may be specified and their prices estimated in each of the periods. The specifications of these standard buildings or structures are chosen on the advice of construction experts who are also asked to estimate what their prices would be in each of the periods. Model pricing for services is described in Methodological Guide for Developing Producer Price Indices for Services. (Eurostat and the Organisation for Economic Co-operation and Development, 2005)

### Hedonics

- 18.8318.86 A more general and powerful method of dealing with changes in quality is to make use of estimates from hedonic regression equations. Hedonic regression equations relate the observed market prices of different models to certain-measurable price-determining characteristics. Provided sufficiently many differentiated models are on sale at the same time, the estimated regression equation can be used to determine by how much prices vary in relation to each of the characteristics or to predict the prices of models with different mixes of characteristics that are not actually on sale in the period in question.
- 18.8418.87 Hedonic regression equations have been estimated for high technology goods such as computers and electronic goods and for services such as air transportation. The technique has also been used for housing by regressing house prices (or rents) on characteristics such as area of floor space, number of rooms or location. The method has been used not only for inter-temporal price measurements for goods but also for services in the index. The assumptions behind such imputations are less soundly based than those behind the more targeted imputation. In either case, items subject to quality change tend to be atypical and unrepresentative, so that assuming that their prices change at the same rate as for goods or services whose characteristics do not change is questionable.
- 18.85 18.85 The hedonic approach is most useful when the market does not directly reveal the price and quality characteristics, but they can be inferred from prices of many varieties with different characteristics. To implement the hedonic approach, one needs to compile a data set consisting of prices and characteristics for many varieties. A sufficiently large data set with substantial variability in the mix of characteristics allows the hedonic regression to produce estimates of the implicit prices of the characteristics. For example, extensive data on the prices and characteristics of varieties of consumer goods can often be collected from the websites of retailers with relative case.
- 18.8618.89 The hedonic regression is usually conducted using a semilogarithmic form. That is, the logarithm of the price of a variety in the sample is regressed against a standard set of characteristics given by

 $\frac{\ln p = \beta_0 + z_1 \beta_1 + z_2 \beta_2 + z_3 \beta_3 + \dots + z_n \beta_n + c}{\sin \alpha + \cos \alpha}$ where  $\varepsilon$  is an error term that is assumed to satisfy the standard set of assumptions used in regression analysis. For the semilogarithmic form, logarithms are taken only of the left-hand side variable (that is, *Price*). Each of the characteristics,  $z_i$ , enters the equation without taking logarithm (though it is possible for the analyst to take logarithms if it would provide a better fit). The semilogarithmic form allows the use of indicator variables (or dummy variables) that take a value of one if the variety has a feature and zero if it does not. **Commented [ED2]:** This subsection has been slightly expanded to provide a better introduction to this topic which is of growing importance. The main source of new material is *Consumer Price Index Manual: Concepts and Methods* (2020 edition), paras. 6.136-6.223. The coefficients,  $\beta$ , can be interpreted as the percentage or proportional change in the price associated with a one-unit change in the characteristic.

18.8718.90 There are two ways in which hedonic quality adjustments can be applied to the estimation of price indexes. The first way is described as "patching" and is a way of dealing with noncomparable product substitutions in the matched-model method. It involves making an explicit quality adjustment to the price of an old variety that has dropped out of a sample to make it comparable to the new variety that has replaced it. The second way is a more comprehensive process that is used for rapidly changing products that are experiencing substantial changes in quality within relatively short periods. That process, known as hedonic price indices, requires a sample to be drawn in each period and controls for quality differences in the hedonic regression. Hedonic price indices are discussed in the *Consumer Price Index Manual: Concepts and Methods*, 2020 edition, 6.136–6.223.

Table 18.1 Hedonic Regression Imputation of New Variety's Price

Variety/ Period	t	1+1	t+ 2	t + 3	1+4
1	$p_i^*$	$p_{\lambda}^{r+1}$	$p_{1}^{r+2}$	$p_{i}^{i+3}$	$p_i^{t+k}$
m	$p'_m$	$p_{m}^{r+1}$	$p_{m}^{r+2}$		
n			$\tilde{\rho}_{a}^{t+2}$	$p_a^{r+2}$	$p_{a}^{t+4}$

**18.8818.91** Consider the sample for a matched model index in Table 18.1 where variety *l* is available in all periods, the "old" variety *m* is only available in periods *t*, *t* + 1, and *t* + 2, and the replacement variety *n* is only available in periods t, t + 1, and t + 2, and the replacement variety *n* is only available in periods t + 3 and t + 4. Variety m's replacement n is noncomparable, so  $p_m^{t+2}$  cannot be directly compared with  $p_n^{t+3}$ . The hedonic *imputation* approach would predict the price of variety *n* in period t + 2 using a hedonic regression estimated in period t + 2 and the characteristics of the new variety *n* from period t + 3. Alternatively, if data are not available to support estimation of regression coefficients each period, an alternative approach would be the hedonic quality-adjustment method.

 18.89
 The compilers of price indices should consider the limitations and challenges of implementing the hedonic approach:

- a. The hedonic approach requires staff to possess sufficient expertise and understanding of regression methodology to interpret the results and diagnostic statistics of the models.
- b. The estimated coefficients require regular updating, which entails updating of the data sets used to prepare estimates and updating of the estimates themselves.
- c. The sample of prices and characteristics used for the hedonic adjustments need to be representative of markets during the period that the adjustments are applied.
- d. The functional form and choice of variables to include in the model need to be carefully considered.
- e. The resources required for gathering and maintaining the data for estimating the hedonic regressions should be considered.
- f. The staff resources required for devising the specification, estimation and validation of the hedonic model and its regular updating should be considered.

## **Indirect methods**

18.9018.93 When the two qualities are not produced and sold on the market at the same time it becomes necessary to resort to indirect methods of quantifying the change in quality between the old and new

qualities. In such cases it is necessary to estimate what would be the relative prices of the old and new models, or qualities, if they were produced and sold on the market at the same time and to use the estimated relative prices to determine measures of the relative qualities.

- 18.9118.94 When a model is missing a replacement of a comparable quality may be found and the price comparisons continued. If there is no comparable replacement, the price in the missing period may be imputed using the measured price changes of a product group expected to experience similar price changes. Dropping the product from the calculation is equivalent to an imputation that assumes the price change for the missing model would follow those of all goods and services in the index. The assumptions behind such imputations are less soundly based than those behind the more targeted imputation. In either case, items subject to quality change tend to be atypical and unrepresentative, so that assuming that their prices change at the same rate as for goods or services whose characteristics do not change is questionable.
- 18.9218.95 If the replacement model is not directly comparable in quality, then the price change of the new model may be readily linked to the price series of the old one if the two models are for sale in the market at the same time, in an overlap period. The implicit assumption is that the difference in prices at the time of the overlap link is a good valuation of the difference in quality, an assumption that will not be valid if the overlap period is at an unusual point in time in the model's life cycle, for example when it is about to become obsolete and discontinued or has just been introduced at an unusually high price to obtain temporary monopoly profits in a segmented market.

### Rapidly changing differentiated product markets

- 18.9318.96 Problems of adjusting price changes for changes in quality in product markets with a rapid turnover of differentiated varieties require special consideration. The matched model method breaks down. Models of like quality can only be compared over relatively short periods and are not representative of the overall market. The summation in index number formulae such as the Laspeyres price index in equation (1) is misleading since in period the n items produced or consumed may be quite different from those on the market in period 0.
- 18.9418.97 Price index number compilers use a short-run formulation to ameliorate the difficulties of comparing the prices of like with like when there is a rapid turnover in differentiated goods and services. A Laspeyres price index, for example, comparing prices in period 0 and t, is given as:

$$L_{P} = \frac{\sum_{l=1}^{n} p_{l}^{0} q_{l}^{0} \left( \frac{p_{l}^{t-1}}{p_{l}^{0}} \right) \left( \frac{p_{l}^{t}}{p_{l}^{t-1}} \right)}{\sum_{l=1}^{n} p_{l}^{0} q_{l}^{0}}$$
(17)

- 18.95\_18.98 If a new type of good, for example a digital camera, is introduced in period t-1 to replace a nondigital one, then the compiler has only to wait for the good to be on the market for two successive periods before it can be included in the index. This provides a mechanism for changing the representative items to include the new, higher quality, item within a product category that has an assigned weight. Additional weighting information may be required to augment the weighting given to cameras within the wider group. However, a chain formulation in which weights are regularly updated would be a better mechanism to achieve this.
- 18.99 While a chain index with a short-run formulation such as in equation (17) will ameliorate the measurement problem in markets with a rapid turnover of differentiated varieties, it cannot take account of the effect on the overall price change from period *t-1* to period t of the new variety introduced in period t and of the old model that was dropped in period *t-1*. Two successive price quotes are required to implement the formula in (17) and a chain index. Hedonic indices are a means of incorporating such affects. They can take a number of forms, but essentially the prices and values of price-determining quality characteristics, say the speed, RAM, etc. of different varieties of personal computers are collected in each period. A Paasche-type hedonic imputation (or characteristics) price index would be derived by first estimating a

hedonic regression of price on quality variables based on period t-I data and then using the estimated coefficients to impute for t-I the prices of the varieties available in period t, including those not available in t-I. Prices for period t characteristics valued at period t prices can be directly compared with the estimated period t-I valuation of period t characteristics to yield a Paasche-type price index. A Laspeyres-type hedonic index can be similarly defined using an estimated period t regression and constant period t-I characteristics set, as can a Fisher-type hedonic index as a geometric mean of the two. An alternative formulation is to pool the two sets of observations in period  $\theta$  and t and include a dummy variable in the hedonic regression equation to distinguish observations in one period from those in the other. The coefficient on the dummy variable would be an estimate of the price change between the two periods having controlled for the effect of quality changes.

### Further elaboration

- 18.9718.100 A detailed account of all the methods referred to above is available in chapters 6 and 7 of the CPI manual and chapters 7 and 8 of the PPI manual. These chapters include the use of imputations, overlap prices, comparable replacements, non-comparable replacements using estimates from production costs, option costs and hedonic regressions, as well as methods for markets with a rapid turnover of differentiated varieties including short-run relatives, chaining, product augmentation and hedonic indices.
- 18.9818.101 Further discussion of this topic can also be found in Handbook on Hedonic Indices and Quality Adjustments in Price Indexes: Special Application to Information Technology Products (Organisation for Economic Cooperation and Development, 2004).

#### 6. Practical advantages of compiling chain indices

- 18.9918.102 It has been shown on theoretical grounds that long time series of volume and price indices are best derived by being chained. The question is how often in the time series should a link occur. It has been argued that annual chaining is generally best on theoretical grounds, but what of the practicalities? There are a number of matters to consider, including data requirements, computing requirements, human resource requirements, loss of additivity, revisions and informing users.
  - If annual current values and corresponding volume or price data are available, then annual chaining is possible. No other data are required.
  - b. The computing requirements of deriving annual chain indices are greater than those for fixed-weighted Laspeyres-type indices and should not be attempted without adequate, tailored software, though improvements in the computational capacity of software used for compilation have made this objection less important. The complexity of the software needed depends on the formula used and the method of linking. For instance, it is quite simple to develop software to derive annually chained Laspeyres type quarterly volume measures using the annual overlap method.
  - c. Experience has shown that if the benefits of chain volume measures, along with the loss of additivity, are carefully explained to users via documentation and seminars before their introduction, chain volume measures are generally accepted. Particular attention should be given to informing the key users, including economic journalists, well beforehand.
  - d. When volume estimates are rebased, say every five or ten years, <u>without chaining annually</u> then it is typically the case that the growth rates are revised. If price and volume relativities have been changing rapidly, then the changes in the growth rates can be dramatic. Such is usually the case for any aggregate in which computers have a significant share. With annual chaining history is only "rewritten" a little each year, not in one large jump every five or ten years. Not surprisingly, the sort of big revisions associated with chaining only every five or ten years can have a detrimental effect on user confidence in the national accounts, not least because users learn they can expect similar revisions in the future. Annual chaining not only measures changes better, it is likely to increase confidence in the resulting national accounts volume indices.

# C. Derivation of volume measures in the national accounts

# 1. Introduction

- 18.10018.103 This section is concerned with the application of the theory described in section B to the practice of deriving volume measures of parts of the SNA. The parts concerned are primarily the components of the goods and services account. Ideally this should be done within the context of supply and use tables, as explained below. Just as flows of capital formation can be expressed in volume terms, so can stocks of non-produced assets. It is not considered possible to separate all income flows into price and volume components but some limited measures of real income are possible, as also explained below.
- 18.10118.104 The ideal way of producing volume estimates of macroeconomic aggregates is to work at a very detailed level, deflating each component by a strictly appropriate price indices. There are cases, though, where this approach is not possible; either appropriate price indices do not exist, or there may be inconsistencies in the current value data or the price indices, that make the results of deflation questionable. In such cases, alternative approaches must be considered including the possibility of projecting (or extrapolating) forward estimates for earlier years or using alternative indicators of the volume growth in a particular case.
- 18.10218.105 Once a set of volume measures is available for a given period, it needs to be presented with data for other periods in time series form. This is when chaining should be introduced for data derived by deflation of individual components. As recommended in section B, this should ideally be done annually using price indices of the previous year but if this is not possible, chaining over a longer period should be adopted. Major changes in economic structure, such as the impact of rapid fluctuations in oil prices on an oil exporting economy indicate that using the same base year before and after the change is likely to give quite misleading indications of the evolution of the economy. Chaining becomes essential rather than just desirable in such cases.

#### Terminology for volume estimates

- 18.10318.106 When time series are constructed by dividing the current values for each year at the most detailed level possible by fixed base year Laspeyres price indices, it is appropriate to describe the resulting series as being at the constant prices of the base year. (This is because as long as the work is done at a sufficiently detailed level, the result approximates using a Paasche price index.) However, when each year's value is deflated by a price index with a different base year, it is no longer strictly correct to describe the resulting time series in this way. More accurate terms are "chain volume series", "chain volume measure" or "chain volume index" if the series is expressed in index number form. If it is desirable to specify the reference year in the term, then "chain volume series in reference year [currency units]" may be used.
- 18.104<u>18.107</u> The use of the term "at constant prices" is also inappropriate for series that are linked less frequently than annually and to volume series based on the use of Fisher or Törnqvist formulae, whose price configurations are not constant over the duration of the series. For such series the terms "volume series" or "volume index" are appropriate to describe a series or index.
- 18.105<u>18.108</u> The change of terminology also reflects the loss of additivity of the resulting time series since only series expressed in the same set of prices throughout, for example by using Laspeyres indices, are additive.

# 2. Price deflation vs. quantity revaluation

- 18.106\_18.109 Volume and price indices can only be derived for variables that have price and quantity elements. All transactions involving the exchange of goods and services and the levels of stocks of non-financial assets have this characteristic but income flows and financial assets and liabilities do not. Some balancing items have the characteristic but others do not and so they need to be considered individually.
- 18.107<u>18.110</u> While both volume and price measures are of major importance in the national accounts, the principal focus of users is on the growth rates of volume measures, rather than prices. The compilation of the national accounts in volume and current value terms reflects this priority, with the price aggregates being derived implicitly, by dividing the current values by the corresponding volumes.
- 18.10818.111 When independent, reliable and comprehensive data are available at current values it is generally
not necessary to construct volume measures by aggregating quantity relatives. In most cases it is preferable and more practicable to use price indices to deflate current value data. Even for cases like electricity where the volume measure seems to be easily available, a direct volume measure is inappropriate because of the treatment of prices applying in different markets as explained in paragraphs <u>is is 0.69</u> to <u>is 18.75</u>. A change in the composition of the type of user leads to a change in the price and volume of electricity in the SNA even though the physical measure of electricity distributed may not have changed.

- 18.10918.112 As explained in section B, price information is easier to collect and aggregate than volume information because all prices are expressed in a common unit whereas volumes come in a multitude of units. Further, price relatives for a representative sample of goods and services can be used as typical for all goods and services in the same group in a way that volume measures would not be representative. More importantly, the volume changes associated with new and disappearing products can be properly reflected when current values are deflated by price indices as described in section B.
- 18.11018.113 For some products, for example closely specified agricultural products or minerals, it may be that the current value data have been constructed by multiplying a volume measure by an appropriate price. These are instances when there is no aggregation problem across the group of products and adjustments for quality differences are more easily and more satisfactorily made to the volume measures directly. While some such products may be of significant value in some countries, it will be a small number of the total number of products that can best be treated in this way.
- 18.11118.114 To obtain a Laspeyres volume measure the appropriate price index used to deflate the current value is a Paasche index and vice versa. However, the available price indices are nearly always constructed using the Laspeyres or Lowe formulae, because construction of a Paasche price index has exactly the same data requirements as the direct derivation of a Laspeyres volume index and faces the same problems. If robust current value data and Laspeyres price indices are available at a sufficiently detailed level then Paasche volume indices, at the detailed level, can be aggregated using the Laspeyres formula to obtain an approximation of a true Laspeyres volume measure of the aggregate.
- 18.112 <u>18.115</u> A Fisher volume index can be obtained either by taking the geometric mean of Laspeyres and Paasche volume indices or by deflating an index of the current values by a Fisher price index.

#### 3. Available price indices

- 18.11318.116 There are four major types of price index available to derive volume measures in the national accounts: consumer price indices (CPIs), producer price indices (PPIs), export price indices (XPIs) and import price indices (MPIs). CPIs are measures of purchasers' prices and PPIs are measures of basic prices. XPIs are measures of FOB prices; MPIs may measure FOB or CIF prices.
- 18.11418.117 There are two defining aspects of recording transactions: timing and valuation. It is therefore critical that the price indices and the current values they are used to deflate correspond in both these aspects, as well as scope. The four types of price indices are usually available monthly and so quarterly and annual deflators can be obtained for flow and stock variables by averaging the monthly indices appropriately to centre the average at the desired valuation point. For flow variables this is usually the mid-point of the period, while for stock variables it is usually, but not always, the end of the period. For flow variables, the average price of the period should reflect known variations within the period. This is particularly important when there is a strong seasonal pattern, large irregular movements in certain months or hyperinflation. When none of these factors is present, the average price will be close to the observed price at the middle of the time period. The fact that this is frequently the case does not imply that the midperiod price is always the conceptually correct one to take, however.

#### 4. The supply and use tables as the basis for volume measures of GDP

18.11518.118 Chapter 14-15 describes the supply and use tables. It explains how the supply table itemizes the products each industry produces which are then identified in the use table where the allocation of each product between intermediate consumption and final demand is spelled out. Compiling supply and use tables at current values ensures consistency in the different measures of GDP. More powerfully, compiling supply

and use tables in volume terms ensures that both the volumes and prices in the SNA are consistent. In principle, tables at current values and in volume terms should be compiled at the same time in order to make the best use of all the information available to the compiler.

- 18.116\_18.119 It is often the case that not all the detailed data required for compiling supply and use tables are available each period and estimates have to be made to fill the empty cells. For example, detailed data for intermediate consumption by product by industry are often collected infrequently. It is generally better to make an initial assumption of a constant composition of intermediate inputs over time in volume terms than in current values. Furthermore, adjustments to the raw and estimated data can be greatly assisted by evaluating growth rates in prices and volumes from the previous or following period. For these reasons it is recommended that supply and use tables should be compiled at current values and in volume terms at the same time and balanced simultaneously.
- 18.11718.120 In order to derive a set of supply and use tables in volume terms that are additive, the appropriate way to proceed is first to express the table in the prices of the previous year, that is, as Laspeyres volume indices linking the previous year to the current year, referenced to the values in the previous year. In order to obtain annual chain Fisher volume measures, it also necessary to derive supply and use tables of the previous year in the prices of the current year. Such values are in effect backward-looking Laspeyres indices. Fisher volume indices are obtained by taking the inverse of the Laspeyres and Paasche volume indices net net be derived as the geometric mean of the Laspeyres and Paasche volume indices between two adjacent years.

## 5. Volume measures of the output estimate of GDP

### Market output

- 18.118<u>18.121</u> In principle, PPIs can be compiled for all market output and then they can be used to deflate current values to obtain volume estimates.
- 18.11918.122 In practice, there are some products for which it is very difficult to derive price indices and special steps must be taken to derive the corresponding volume measures. A particular case is those of margin industries including financial services. Output of a margin industry is usually calculated as the margin rate times the value of a transaction. To determine a volume figure the base year rate is applied to the value of the transaction suitably deflated to base year values. As explained in section E.7 of this chapter, in the case of implicit financial services on loans and deposits, the reference rate and the rates of bank interest are used in conjunction with figures of loans and deposits deflated by the general price increase since the base year.
- <u>18.12018.123</u> In other cases where there is no suitable deflator to apply to a current value, volume indices may be derived by extrapolating the current values in the base period by suitable indicators.

# Non-market output of government and NPISHs

- 18.12118.124 The current value of the output of non-market goods and services produced by government units or NPISHs is estimated on the basis of the sum of costs incurred in their production, as explained in chapter 67. This output consists of individual goods and services delivered to households and collective services provided to the community as a whole. The fact that such output is valued on the basis of the value of inputs needed to produce them does not mean that it cannot be distinguished from the inputs used to produce it. In particular, the change in the volume of output can be different from the change in the volume of inputs. Changes in productivity may occur in all fields of production, including the production of non-market services.
- 18.12218.125 In practice, there are three possible methods of compiling volume estimates of the output of non-market goods and services. The first is to derive a pseudo output price index such that when it is compared to the aggregate input price index the difference reflects the productivity growth thought to be occurring in the production process. Pseudo output price indices can be derived in various ways, such as by adjusting the input price index according to the observed productivity growth of a related production process or by basing the growth of the pseudo output price index on the observed output price indices of similar products.

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However, such data are rarely available for the goods and services produced by government and NPISHs.

- 18.12318.126 The second approach, the "output volume method," is recommended for individual services, in particular, health and education. It is based on the calculation of a volume indicator of output using adequately weighted measures of output of the various categories of non-market goods and services produced. These measures of output should fully reflect changes in both quantity and quality.
- 18.124<u>18.127</u> The third approach, called the "input method", may be used for collective services such as defence for which the "output volume method" is hardly applicable because there are, in general, no adequate quality-adjusted quantity measures of output. The "input method" consists of measuring changes in output by changes in the weighted sum of volume measures of all the inputs. The latter should fully reflect both changes in quantity and quality. They are generally best derived by deflating the various input costs by corresponding constant-quality price indices, or when such price indices are unavailable, using volume indicators that reflect input volume change (for example, number of hours worked by employees).
- 18.12518.128 It is useful at this stage to define the terms input, activity, output and outcome. Taking health services as an example, input is defined as the labour input of medical and non-medical staff, the drugs, the electricity and other inputs purchased and the <u>depreciation</u>-of the equipment and buildings used. These resources are used in the activity of primary care and in hospital activities, such as a general practitioner making an examination, the carrying out of a heart operation and other activities designed to benefit the individual patient. The benefits to the patient constitute the output associated with these input activities. Finally there is the health outcome, which may depend on a number of factors apart from the output of health care, such as whether or not the person gives up smoking.
- The measurement of the volume of output of non-market individual services should avoid two 18.12618.129 pitfalls. The first of these is that it should not be restricted to reflect the inputs or the activity of the unit producing the services. Inputs are not an appropriate measure and while activities may be the only available indicator and hence have to be used, they too are an intermediate variable. What should be measured is the service rendered to the customer. The second risk is that if outcome is defined in terms of the welfare objectives of the non-market service (for example, changes in the quality of health for the measurement of the health service, or changes in the quality of education for the measurement of the education service) the change in the volume of the output of the non-market unit cannot be reflected by the change in the indicators of outcome. This is because indicators of outcome can be affected by other aspects that are not directly related to the activity of the non-market services. For example, in the case of health, it is well- known that there are many factors other than the output of the non-market health units, such as sanitation, housing, nutrition, education, consumption of tobacco, alcohol and drugs, pollution, whose collective impact on the health of the community may be far greater than that of the provision of health services. Similarly, the output of education services is quite different from the level of knowledge or skills possessed by members of the community. Education services consist principally of teaching provided by schools, colleges, universities to the pupils and students who consume such services. The level of knowledge or skills in the community depends in addition on other factors, such as the amount of study or effort made by consumers of education services and their attitudes and motivation.
- 18.12718.130 In the light of these observations, the "output volume method" is the recommended method for compiling indicators of volume change of non-market services. The method is based on quantity indicators, adequately quality- adjusted, weighted together using average cost weights. Two criteria should be respected to compile adequate indicators of volume change. In the first place, the quantities and costs used should reflect the full range of services for the functional area under review and cost weights should be updated regularly. If part of the costs of the functional area is not covered by the quantity indicator, it should not be assumed that the uncovered part follows the changes of the part that is covered. If no direct output volume method is applicable for this part, an input method should be used for it. Secondly, quantity indicators should be adjusted for quality change. For example, services should be sufficiently differentiated with the aim of arriving at categories that can be regarded as homogeneous. An aspect of quality change is then captured by changes in the proportions of different categories if the weights assigned to each category are frequently updated. In addition, the quantity indicator of each category can be augmented by an explicit quality adjustment factor. One way of identifying explicit quality adjustment factors is by reviewing the effects that the service has on measures of outcome. When feasible, direct volume measures should be preferred for individual non-market services as described in the Handbook on prices and volume measures in national

accounts (Eurostat, 2016) or the handbook *Towards measuring the volume of health and education and* services (Organisation for Economic Co-operation and Development, 2009). Compilers should take account that quite some progress has been made to derive volume estimates of output, especially for education and health, that take account of changes in the quality as well as the quantity of the services provided.

- 18.12818.131 It is recommended these volume indicators be tested for a substantial period of time with the aid of experts in the domain prior to their incorporation in the national accounts. Expert advice is particularly relevant in the areas of health and education, which usually dominate the provision of individual services. Further, the consequences of the estimates including the implications for productivity measures should be fully assessed before adoption. Unless and until the results of such investigations are satisfactory, it might be advisable to use the second best method, the "input method".
- 18.12918.132 Measuring changes in the volume of collective services is generally more difficult than measuring the volume changes in individual services because the former are hard to define and to observe. One reason is that many collective services are preventative in nature, protecting households or other institutional units from acts of violence including acts of war, or protecting them from other hazards, such as road accidents, pollution, fire, theft or avoidable diseases are concepts that are difficult to translate into quantitative measures. This is an area in which further research is needed.
- 18.13018.133 When it is not possible to avoid using an input measure as a proxy for an output measure, the input measure should be a comprehensive one, it should not be confined to labour inputs but cover all inputs. In addition, explanatory information should accompany the national estimates that draw users' attention to the methods of measurement.

#### Output for own final use

- 18.131 Output for own final use falls into two categories, goods produced and consumed by households and fixed assets produced for own use. Included in the above are changes in inventories of finished goods and work-in-progress.
- 18.132\_18.135 For most output for own final use the use of pseudo output price indices is an effective, low-cost option. For goods produced and consumed by households, CPIs are likely to be available for similar goods. (However, for agricultural output grown and consumed by households, the price index used should not include any margins or taxes not actually incurred.) Similarly, there are likely to be output price indices available for fixed assets such as equipment, buildings and structures produced for own use as capital formation. For some types of fixed asset produced on own account there may be no output price indices available for similar products and different strategies may need to be considered. This is discussed further in the section on gross fixed capital formation.

#### Intermediate consumption

- 18.13318.136 As noted earlier, the most robust way of estimating intermediate consumption in volume terms is within the framework of a supply and use table in volume terms where information on volume growth rates as well as price information may be used.
- 18.134<u>18.137</u> Countries that compile PPIs generally do so for outputs, though countries with developed statistical systems may also compile input PPIs. Such input PPIs are directly applicable to the deflation of intermediate consumption.
- 18.135<u>18.138</u> If input PPIs are not compiled, output PPIs, MPIs and, to a limited extent, CPIs may be used instead. Intermediate consumption is valued at purchasers' prices, while output PPIs are valued at basic prices. There is thus a margin between the valuation of goods used as intermediate consumption at purchasers' prices and output PPIs, which is accounted for by transportation costs (unless the producer provides these services without a separate invoice), possible insurance costs, wholesale and retail trade margins and taxes less subsidies on products. The size of this margin will depend on circumstances. Often trade margins on goods for intermediate consumption are much smaller than for final consumption and the taxes may be smaller under a VAT system. For services used as intermediate consumption, the difference

in valuation usually consists of only taxes less subsidies on products.

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18.13618.139 Chapter 14.15 describes how the intermediate consumption part of the use matrix can be partitioned to show the domestic inputs at basic prices, imports, margins and taxes separately. If this information is available, the quality of the resulting deflation exercise will be improved since it will not be necessary to use the assumption that import, tax and margin proportions apply uniformly across the elements of the rows of the use matrix.

### Gross domestic product and gross value added

- 18.13718.140 When gross domestic product (GDP) is derived by summing final domestic expenditures and exports and subtracting imports, or by subtracting intermediate consumption from output and adding taxes less subsidies on products, volume measures of GDP can be obtained provided that the volumes being aggregated are additive, (that is, are based on the Laspeyres formula).
- 18.13818.141 Central to the production measure of GDP is value added, the balancing item in the production account. The most common practice is to deflate the values of output and intermediate consumption independently, industry by industry, and then derive the difference as value added for each industry. (This is known as the double deflation method.) Different price indices are necessary for two reasons. The first is because the goods and services included in intermediate consumption for any industry are not the same as the output of that industry. The second reason is that intermediate inputs are always measured at purchasers' prices whereas output is measured at either basic prices or producers' prices.
- 18.13918.142 The gross value added of an establishment, enterprise, industry or sector is measured by the amount by which the value of the outputs produced by that establishment, enterprise, industry or sector exceeds the value of the intermediate inputs consumed. This may be written as:

 $\sum PQ - \sum pq$  (18a)

where the Q's refer to outputs, P's their basic prices, q's to intermediate inputs and p's their purchasers' prices. Value added in year t at prices of year t is given by:

 $\sum P^t Q^t - \sum p^t q^t \tag{18b}$ 

while value added in year t at the prices of the base year, 0, is given by:

 $\sum P^0 Q^t - \sum p^0 q^t \qquad (18c)$ 

This measure of value added is generally described as being obtained by "double deflation" as it can be obtained by deflating the current value of output by an appropriate (Paasche-type) price index and by similarly deflating the current value of intermediate consumption.

- 18.140\_18.143 While the double deflation method is theoretically sound, the resulting estimates are subject to the errors of measurement in the volume estimates of both output and intermediate consumption. This may be especially true if output PPIs are applied to inputs, many of which are imported. Because value added is the relatively small difference between two much larger figures, it is extremely sensitive to error. It is therefore advisable to compare the growth rates of output and volume measures of value added over recent years with the corresponding growth rates of output and intermediate inputs and, if possible, with volume estimates of inputs of labour and capital services to check for plausibility.
- 18.141\_18.144 \_\_\_\_Because of the possible problems in trying to estimate value added using the double deflation approach, it is also common to estimate the volume movements of value added directly using only one time series, that is a "single indicator" method instead of double deflation. One such single indicator method is to extrapolate value added in proportion to the volume changes in the corresponding levels of output.

18.14218.145 The choice to be made between the use of a single indicator method (which may yield biased

**Commented [ED3]:** Paragraph drawn from para. 18.27 of 2008 SNA

results) or a double deflation method (which may yield volatile results) must be based on judgement. The same choice need not be made for all industry groups. Further, the single indicator method may be used for quarterly figures until the year is complete and better double deflation estimates are available.

- 18.143\_18.146 In certain non-market service industries, it may be necessary to estimate movements in the volume of value added on the basis of the estimated volume changes of the inputs into the industries. The inputs may be total inputs, labour inputs on their own or intermediate inputs on their own. For example, it is not uncommon to find the movement of the implicit volume of value added estimated by means of changes in remuneration of employees at constant wage rates, or even simply by changes in numbers employed, in both market and non-market service industries. (There is extensive work being carried out to improve these working assumptions by trying to measure the outputs of government-provided health and education more objectively.)
- 18.14418.147 Compilers of data may be forced to adopt such expedients, even when there is no good reason to assume that labour productivity remains unchanged in the short- or long-term. Sometimes, volume changes for intermediate inputs may be used, for example, short-term movements in value added in real terms for the construction industry may be estimated from changes in the volume of building materials consumed such as cement, bricks, timber, etc. The use of indicators of this kind may be the only way in which to estimate short-term movements in output or value added, but they are not acceptable over long time periods.
- 18.14518.148 There is also interest in trying to associate movements in value added, after price effects have been eliminated, with changes in labour and capital inputs. These measures of multifactor productivity are discussed in Section F.3 of this chapter.

# 6. Volume measures of the expenditure estimate of GDP

- 18.14618.149 The measure of GDP easiest to express in volume terms is that of expenditure. As long as appropriate price indices exist, the estimates of final consumption expenditure of households, general government and NPISH, capital formation, exports and imports can be deflated without much conceptual difficulty. It is desirable to work at as great a degree of detail as possible using the product detail available for each aggregate. Care must be taken, as explained in section B.5 of this chapter, to ensure that differences in quality are properly accounted for in the price deflators. This is especially important in the case of capital formation where many items such as computers are subject to rapid technological change and many items are customized, for example large construction projects or pieces of heavy machinery built to individual specifications.
- 18.147<u>18.150</u> Each of the components of the expenditure estimate of GDP should be expressed in volume terms. The main approaches to deriving these estimates are described in turn below.

# Household final consumption expenditure

- 18.14818.151 Household consumption expenditure should be deflated at as detailed a degree as possible. In general this will involve making use of CPIs though care is needed to ensure that the coverage of the CPI being used matches the category of consumption expenditure being deflated. Even where detailed estimates of consumption expenditure are not compiled from household surveys and other primary sources, having an estimate of household consumption expenditure by type of product from a supply and use table for deflation will significantly improve the estimate of consumption expenditure in volume terms as compared with the single deflation of a total figure only.
- 18.14918.152 A major component where CPIs are unlikely to be available is the measure of the rental services of owner-occupied dwellings. Three alternative approaches are outlined in chapter 11 of the CPI manual, but only the use-based approach is recommended for measuring the consumption of housing services in the national accounts. This approach can take either a user-cost formulation that attempts to measure the changes in the cost to owner-occupiers of using the dwelling, or a rental-equivalence formulation based on how much owner-occupiers would have to pay to rent their dwellings. The latter method is more generally adopted for CPIs.

**Commented [ED4]:** This paragraph is an abbreviated version of para. 18.28 of 2008 SNA.

**Commented [ED5]:** This paragraph was moved from para. 18.25 of 2008 SNA.

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# Final consumption expenditure by government and NPISHs

18.150 The final consumption expenditure of general government and NPISHs consists of their nonmarket output less any revenue from incidental sales plus the value of goods and services purchased from market producers for onwards transmission to individual households at prices that are not economically significant less any partial payments. (The derivation of this identity is discussed in chapter 910.)

18.15118.154 Each of these items should be expressed in volume terms separately. The problem of measuring non-market output in volume terms is discussed above. For goods and services transferred to households, the price indices used should be those paid for the goods less the proportion that households pay. If the proportion of the price paid by government (or NPISHs) alters from one year to another, this is seen as a volume change in expenditure on the part of both general government (or NPISHs) and households.

 18.15218.155
 Price indices for services are more difficult to compile than for goods and this is especially so for non-market services. Because the current values of non-market services are usually determined as the sum of costs, the obvious approach is to deflate each of these (including calculating remuneration of employees at constant remuneration rates). However, this does not allow for any change in the quality of services provided and in particular for the impact of any productivity changes that may have been achieved. When feasible, direct volume measures should be preferred for individual non-market services as described in Handbook on prices and volume measures in national accounts and Towards measuring the volume of health and education and services.

## Gross fixed capital formation

18.153 18.156 The availability of appropriate price indices for gross fixed capital formation varies considerably between different types of asset.

- 18.15418.157 There are often CPIs-house price indices for new dwellings and PPIs for new buildings and structures. The costs of ownership transfer should be deflated separately. The current value and volume estimates are usually derived from separate estimates of the constituent parts, legal fees, transport and installation costs etc.
- 18.155 [18.158 For standard products used as capital formation, PPIs are likely to be available but much capital formation is specific to the purchaser and appropriate indices may have to be developed using the best information available.
- 18.15618.159 Price indices for equipment vary considerably in their growth rates. For example, price indices for computer equipment have fallen rapidly year after year while price indices for transport equipment have tended to increase. It is important in such cases that the different types of equipment are deflated separately using the matching price indices (or, equivalently, an appropriately weighted Paasche price index is used to deflate the aggregate).

18.15718.160 Intellectual property products are generally not well covered by available price indices. There are several reasons for this. One is that many intellectual products are produced for own use and there may be no observed market prices. Another is that intellectual property products are very heterogeneous. However, these are not insurmountable difficulties and there are strategies for addressing them. As examples, the two major items in this category, software and databases and research and experimental development, are considered. Techniques for deriving volume measures of software and databases are described in section E of this chapter, with additional guidance on measuring the prices and volumes of software and data provided in section E of chapter 22. For research and experimental development (R&D), although it is often undertaken on own account, given its heterogeneous nature the choice for deflation lies between deriving pseudo output price indices and using input price indices.

Research and experimental development (R&D) is another activity that is often undertaken on own account. However, given the heterogeneous nature of R&D, the choice for deflation lies between deriving pseudo output price indices and using input price indi Commented [ED6]: Paragraph based on para. 18.26 of 2008 SNA.

### **Changes in inventories**

- 18.15818.161 Although changes in inventories may be small relative to other components of GDP, the fact that their relative size might change quite significantly from one period to the next means that they can make a significant contribution to changes in the size of GDP particularly in the quarterly national accounts. For this reason, the calculation of changes in inventories in volume terms is particularly important. However, it is also a challenging task. As noted in paragraph 15.62, 18.62, because changes in inventories can take positive, negative or zero values, a chain index should not be derived directly. Chain volume estimates of changes in inventories should be derived by first deriving chain volume estimates of the opening and closing stocks of inventories and then differencing them.
- 18.15918.162 Volume estimation should be undertaken at a detailed level for different types of inventories, (work-in-progress, finished goods, materials and supplies, goods for resale). Deflation of stocks of inventories must be related to the composition of those inventories in terms of products rather than to the industry holding those inventories. PPIs, MPIs, CPIs and labour cost indices are all commonly used in deriving deflators, with adjustments to the appropriate valuation basis. It is important to understand how enterprises value their inventories as this can provide information on not only the type of products but also the average length of time over which goods are kept in inventories.
- 18.160\_18.163 When goods are sent abroad for processing without a change of ownership, it must be remembered that some inventories may be held outside the national territory but national prices should be applied to them to derive their corresponding volumes.

#### Acquisition less disposal of valuables

18.16118.164 National statistical offices generally do not compile specific price indices for valuables. The major constituents should be deflated using the most suitable price indices available.

#### **Exports and imports**

- 18.162 Exports and imports consist of both goods and services. For both exports and imports, goods and services are expressed in volume terms using quite different deflators because of the very different sources available for goods and services. Improvements have been made to price indices for external trade in services that have led to improved data in this area.
- 18.16318.166 The valuation of imports and exports of goods is discussed in chapter 1415. In principle, they should be valued when change of ownership between a resident unit and a non-resident owner takes place and include or exclude transportation costs according to whether the supplier does not or does include transportation to the purchaser in the price charged. In practice, however, many countries are dependent for data on imports and exports of goods on customs declarations that value imports on a CIF basis but exports on a FOB basis. This assumes that change of ownership always takes place at the border of the exporting country. For balance of payments purposes, imports of goods should be converted to a FOB basis also but this is usually done at an aggregate level and may only be disaggregated in the supply and use context if at all.
- 18.164<u>18.167</u> Given the existence of detailed XPI and MPI for goods, it should be a simple matter to deflate the current value estimates of exports and imports of goods at as detailed a level as practical in order to approximate the use of Laspeyres volume or Paasche price indices. In order to compile detailed volume estimates of imports of goods in the supply and use tables either the CIF estimates should be put onto a FOB basis or the MPIs need to be adjusted to a CIF basis. The usual working assumption is that CIF and FOB approximate purchasers' and basic prices respectively but as explained in chapter <u>1415</u>, the adequacy of the approximation depends on circumstances surrounding transport margins.
- 18.165\_18.168 \_\_\_\_XPIs and MPIs are compiled by three general methods the nature of which is largely dependent on the source data used. The first and predominant method, at least in terms of the number of countries using it, is unit value indices compiled from detailed import and export merchandise trade data derived from administrative customs documents. As pointed out in section B, unit value indices are not price indices since

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their changes may be due to price and (compositional) quantity changes. However, they are used by many countries as surrogates for price indices. The second method is to compile price indices using data from surveyed establishments on the prices of representative items exported and imported. The surveyed prices will be of items that are defined according to detailed specifications so that the change in price of the same item specification can be measured over time. The third method is a hybrid approach that involves compiling establishment survey-based price indices for some product groups and customs-based unit value indices for others.

- 18.16618.169 The case for unit value indices derived from merchandise trade figures is based on the relatively low cost of such data. Their use as deflators requires some caution as they have been shown to be subject to bias when compared with price indices. The bias in unit value indices is mainly due to changes in the mix of the heterogeneous items recorded in customs documents, but also to the often poor quality of recorded data on quantities. The former is particularly important in modern product markets given the increasing differentiation of products. Unit value indices may suffer further in recent times due to an increasing lack of comprehensiveness of the source data with increasing proportions of trade being in services and by ecommerce and hence not covered by merchandise trade data. Further, countries in customs and monetary unions are unlikely to have intra-union trade data as a by-product of customs documentation. Finally, some trade may not be covered by customs controls, such as electricity, gas and water, or be of "unique" goods, such as ships and large machinery, with profound measurement problems for unit values.
- 18.167<u>18.170</u> As noted above, current data sources for price indices for international trade in services are less comprehensive than in other areas. If MPIs and XPIs are available for exports and imports of services they can be readily used to derive the required volume estimates. If they are not, volume estimates of exports of services can be mostly derived using an assortment of PPIs and CPIs. For example, volume estimates of freight transport services could be derived using PPIs according to the form of transport, while volume estimates of accommodation services could be derived using the appropriate CPIs. If MPIs are not available for imports of services then price indices of the countries exporting the services, adjusted for changes in the exchange rate, may have to be used.
- 18.168<u>18.171</u> It must be remembered that if imports of goods are valued including transport services, then these transport services should be excluded from total imports of services.

# 7. Volumes and prices for stocks of fixed assets and <del>consumption of fixed enpitaldepreciation</del>

18.16918.172 Derivation of Deriving volume estimates of depreciationstocks requires estimates of capital stock excluding the effects of price changes. The levels of capital stock are typically derived by cumulating capital formation in successive periods and deducting the amount that has been exhausted. It clearly makes no sense to aggregate estimates of capital formation at the prices actually paid since the effect of rising prices (even prices rising only moderately) will be to overstate the amount of "new" capital relative to "old".

- 18.17018.173 The preferred technique is to estimate all capital still in stock at the price of a single year and then revalue this to the price prevailing when the balance sheet is to be drawn up, typically the first and last day of the accounting period. This should be done at the most detailed level practicable. More on this can also be found in chapter 17.
- 18.174 Consider first a single type of fixed asset. The stock of this type of asset consists of a number of items, typically of different vintages, that are valued and aggregated with a consistent set of prices. "Consistent" is to be understood here meaning the prices relate to the same period or point in time and being based on the same price concept, such as purchasers' prices. Measuring stocks at historical prices, that is, by adding up quantities that have been valued with prices of different periods is therefore an inconsistent valuation. It is sometimes found in enterprise accounts but does not constitute an economically meaningful measure in the context of the SNA.
- 18.172<u>18.175</u> The price vector used to value the quantities of <u>fixed</u> assets has to refer to a point in time (beginning or end of period) when the values of stocks are compiled for the opening or closing balance sheets. For other purposes, quantities of assets may be valued with a price vector that refers to the average of an accounting period. For example, measures of <u>depreciation</u> may be derived by subtracting the closing stock of assets

**Commented [ED7]:** These two paragraphs are based on paras. 18.31-18.32 of 2008 SNA.

from the opening stock plus gross capital formation as long as average-period prices are used for each component in order to eliminate holding gains and losses (and assuming no other volume changes in assets).

- 18.173\_18.176 The process by which many capital stock measures are constructed is the perpetual inventory method (PIM). For a given type of fixed asset, time series of gross fixed capital formation are deflated by means of the purchasers' price index of the same asset type, so that the quantities of assets are expressed in volume terms of a particular reference period. These time series in volume terms are then aggregated to yield a stock measure, where account is taken of retirement, efficiency losses or depreciation, depending on the nature of the stock measure constructed. The resulting stock measure is thus expressed in volume terms of the reference period chosen. This reference period may be the current period and stock measures valued in this way have often been labelled "current price capital stocks". However, this is not entirely accurate, as the description of the PIM showed, deflation is needed to arrive at these measures. Thus, they constitute a special case of a constant price valuation, namely valuation at the price vector of the current period.
- 18.174<u>18.177</u> Even when the PIM is not applied, for example in the case of direct surveys of assets, the valuation of different vintages of a particular asset should not use book values that reflect historical prices. Consistent valuation requires that older vintages are valued by the prices of assets of specified ages at the point in time to which the survey refers.
- 18.175<u>18.178</u> The next step is to aggregate the movements in capital stocks of individual asset types in volume terms. The use of linked or chain indices, as discussed earlier, is appropriate when building up a series that extends to the distant past since the current period price configuration will not remain representative.
- <u>48.176</u><u>18.179</u> Further details on the PIM, on the different types of capital stocks and their measurement are provided in chapter <u>17</u> and in Measuring Capital.

## 8. Volume measures for stocks of non-produced natural resources and depletion

- 18.17718.180 For natural resources, estimates of the physical stocks of particular types of assets may be available, whereas observed market prices may not be available. As discussed in chapters 11 and 14, in this situation the net present value of future benefits may be used to estimate the values in monetary terms to be recorded in the SNA balance sheets. For a single, homogeneous natural resource, the volume estimates will be proportional to the physical stocks, but for aggregating different types of natural resources, index numbers are used to derive volume estimates.
- 18.17818.181 Depletion of non-produced natural resources reflects the decline in the quantity of a stock that is not offset by regeneration of the stock. In physical terms, depletion is the decrease in the quantity or value of the stock of a non-produced natural resource over an accounting period that is due to 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. For measuring depletion in volume terms, the valuation of the physical flows of depletion uses the price of the natural resource in situ in effect in the reference period. If price indices need to be calculated, they can be derived as the ratio of the value expressed in current prices to the volume measure.
- 18.182 The change in volume of the stock during any period of any individual non-produced natural resource-asset can be decomposed into the change in volume due to depletion, the change in volume due to capital formation (in the case of biological resources), and the change in volume due to other changes in assets (e.g., new additions to the stocks). The change in value of the stock in monetary terms is decomposed into depletion, other changes in assets, and revaluation. The depletion of non-produced natural resources in monetary terms is the change in physical stocks due to depletion multiplied by an average price in situ (i.e., the discounted unit resource rent) during the accounting period. The other changes in assets is the change in physical stocks due to other changes in assets times an average price in situ during the accounting period. The revaluation is the change in the price in situ multiplied by the average stock during the accounting period, though in practice it may be derived as a residual.
- 18.17918.183 For non-cultivated biological resources yielding once-only products, similar methodologies can be applied, albeit that the resource can also regenerate, thus giving rise to negative depletion. In the case of

**Commented [ED8]:** This is a new subsection largely drawn from Guidance Note WS.6

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cultivated natural resources yielding once-only products, the decrease in regenerative potential is recorded as depreciation, while an increase is recorded as fixed capital formation. For cultivated biological resources yielding repeat products, monetary values and volume estimates are typically compiled using the PIM methods as explained in the previous subsection, where the aggregation of volume estimates for individual asset types uses chain indices.

# 9. Components of value added

18.180\_18.184 The price and volume measures considered up to this point relate mainly to flows of goods and services produced as outputs from processes of production. However, it is possible to decompose some other flows directly into their own price and volume components.

### Compensation of employeesRemuneration of employees

18.18118.185 The quantity unit for remuneration of employees may be considered to be an hour's work of a given type and level of skill (see paragraphs 16.70 to 16.82 for more details). As with goods and services, different qualities of work must be recognized and quantity relatives calculated for each separate type of work. The price associated with each type of work is the compensation paid per hour which may vary considerably between different types of work. A volume measure of work done may be calculated as an average of the quantity relatives for different kinds of work weighted by the relative values of remuneration of employees in the previous year or a fixed base year. Alternatively, a "price" index may be calculated for work by calculating a weighted average of the proportionate changes in hourly rates of compensation for different types of work, again using relative remuneration of employees as weights. If a Laspeyres-type volume measure is calculated indirectly by deflating the remuneration of employees at current values by an index of hourly rates of compensation, the latter should be a Paasche-type index.

## Taxes and subsidies on products

18.18218.186 Taxes on products are of two kinds, specific taxes linked to the volume of the product and ad valorem taxes levied on the value of the product. A measure of the tax volume of the former can be derived by applying the base year rate of the specific taxes to suitably deflated current value figures of the items bearing the specific tax and for the latter by applying the base year ad valorem rates to current values of items subject to ad valorem taxes deflated by appropriate prices. It is possible to derive a ratio of the tax data in current values and in volume terms but it is difficult to interpret this as a price index since it reflects changing tax rates and changing composition of the purchases of items subject to tax. The calculation for subsidies is carried out in an analogous manner.

18.18318.187 There is more discussion on this in paragraphs 14.148 to 14.152.

#### Net operating surplus and net mixed income

- 18.184\_18.188 When GDP is determined as the difference between output and intermediate consumption plus taxes less subsidies on production, gross value added is derived as an accounting residual. This is so in both current values and volume terms. In order for there to be an identity between different estimates of GDP in volume terms, it is not possible to give a price and volume dimension to gross value added. Rather the residual item is described as being "in real terms". If volume estimates of depreciation and depletion and remuneration of employees are available, net operating surplus and net mixed income can be derived but only in real terms and without a volume approach since one item is always derived residually.
- 18.185<u>18.189</u> The limit to a set of integrated price and volume measures within the accounting framework of the SNA is effectively reached with net operating surplus. It is conceptually impossible to factor all the flows in the income accounts of the SNA, including current transfers, into their own price and volume components. However, any income flow can be deflated by a price index for a numeraire set of goods and services to

Formatted: Font: (Default) +Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight measure the increase or decrease of the purchasing power of the income over the numeraire but this is quite different from decomposing a flow into its own price and volume components. A particular instance where this is common is in the calculation of the terms of trade effect on real income as described in section D.

## 10. Quarterly and annual estimates

18.18618.190 In principle, the same methods used to derive annual volume estimates should be used to derive quarterly volume estimates. Guidelines on data sources and methods for compiling price and volume quarterly estimates are given in chapters 3 and 8 of the Quarterly National Accounts Manual. The main considerations are those described in paragraphs 18.45 to 18.50. In practice, annual data are generally more comprehensive and accurate than quarterly data. Although there are important exceptions, such as exports and imports of goods, the overall situation is one of a much richer and more accurate, albeit less timely, set of annual data than quarterly data. For this reason, a sound approach is to compile balanced annual supply and use tables expressed in current values and in the prices of the previous year and to derive quarterly estimates that are consistent with them. This approach lends itself to the compilation of annually chained quarterly Laspeyres volume measures, although it can be adapted to the compilation of annually chained quarterly Fisher measures, too.

#### 11. Supply and use tables in volume terms

- 18.18718.191 The rows of a use table show the way in which the total supply of a product is used for intermediate consumption, final consumption, capital formation and exports. This identity must hold in value terms. If the product in question is one where there is an unambiguous measure of quantity, the identity must also hold in volume terms. If the volume figures are derived by deflating the current values, the identity will only hold with certainty if each use category is deflated using a price index that is strictly appropriate to it.
- 18.18818.192 It is a good practice to compile supply and use tables in both current values and in volume terms at the same time so that the consistency of all the input data, including price indices, can be investigated together.

# 12. Summary recommendations

18.18918.193 The recommendations reached above on expressing national accounts in volume terms may be summarized as follows:

- a. Volume estimates of transactions in goods and services are best compiled in a supply and use framework, preferably in conjunction with, and at the same time as, the current value estimates. This implies working at as detailed a level of products as resources permit.
- b. In general, but not always, it is best to derive volume estimates by deflating the current value with an appropriate price index, rather than constructing the volume estimates directly. It is therefore very important to have a comprehensive suite of price indices available.
- c. The price indices used as deflators should match the values being deflated as closely as possible in terms of scope, valuation and timing.
- d. If it is not practical to derive estimates of value added in real terms from a supply and use framework and either the volume estimates of output and intermediate consumption are not robust or the latter are not available then satisfactory estimates can often be obtained using an indicator of output, at least in the short term. For quarterly data this is the preferred approach, albeit with the estimates benchmarked to annual data. An output indicator derived by deflation is generally preferred to one derived by quantity extrapolation.
- e. Estimates of output and value added in volume and real terms should only be derived using inputs as a last resort since they do not reflect any productivity change.
- f. The preferred measure of year-to-year movements of GDP volume is a Fisher volume index;

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changes over longer periods being obtained by chaining, that is, by cumulating the year-to-year movements.

- g. The preferred measure of year-to-year inflation for GDP and other aggregates is, therefore, a Fisher price index; price changes over long periods being obtained by chaining the year-to-year price movements, or implicitly by dividing the Fisher chain volume index into an index of the current value series.
- h. Chain indices that use Laspeyres volume indices to measure year-to-year movements in the volume of GDP and the associated implicit Paasche price indices to measure year-to-year inflation provide acceptable alternatives to Fisher indices.
- Chain indices for aggregates cannot be additively consistent with their components whichever formula is used, but this need not prevent time series of values being compiled by extrapolating base year values by the appropriate chain indices.
- j. A sound approach to deriving quarterly current value and volume estimates is to benchmark them to annual estimates compiled in a supply and use framework. This approach lends itself to the construction of annually chained quarterly volume measures using either the Fisher or Laspeyres formulae.

# D. Measures of real income for the total economy

# 1. The concept of real income

- 18.19018.194 Many flows in the SNA, such as cash transfers, do not have price and quantity dimensions of their own and cannot, therefore, be decomposed in the same way as flows related to goods and services. While such flows cannot be measured in volume terms they can nevertheless be measured "in real terms" by deflating their values with price indices in order to measure their real purchasing power over some selected basket of goods and services that serves as the numeraire.
- 18.19118.195 It is possible by use of a numeraire to deflate any income flow in the accounts and even a balancing item such as saving may be deflated by a price index in order to measure the purchasing power of the item in question over a designated numeraire set of goods and services. By comparing the deflated value of the income with the actual value of the income in the base year, it is possible to determine by how much the purchasing power of the income has increased or decreased. Income deflated in this way is generally described as "real income".
- <u>48.19218.196</u> Despite the terminology used, "real" incomes are artificial constructs that are dependent on two points of reference.
  - a. Real incomes are measured with reference to the price level in some selected reference year; they vary depending upon the choice of reference year.
  - Real incomes measure changes in purchasing power over some selected numeraire; they vary according to the choice of numeraire
- 18.193\_18.197 As there may often be no obvious or uncontroversial choice of numeraire there has always been some reluctance to show real incomes in national accounts on the grounds that the choice of numeraire should be left to the user of the statistics and not the compiler. However, when major changes in prices occur, it can be argued that compilers of statistics are under an obligation to present at least some measures of real income. Not all users of the accounts have the opportunity, inclination or expertise to calculate the real incomes which may be most suited to their needs. Moreover, there is a demand from many users for multipurpose measures of real income, at least at the level of the economy as a whole and the purpose of this section is to indicate how such measures may be compiled.

## 2. Trading gains and losses from changes in the terms of trade

18.194<u>18.198</u> In a closed economy without exports or imports, GDP is equal to the sum of final consumption plus capital formation. This sum is described as domestic final expenditures. GDP is also a measure of the income generated in the economy by production. Although income cannot be expressed as the product of prices and volumes, if GDP can be deflated, then in effect this must also be a measure of income in real terms. However, with the inclusion of imports and exports, GDP is no longer identical to domestic final expenditures. Even if imports and exports are equal in current values, they usually have different prices so there is an impact on real income measures of import and export prices. This is generally done by considering the terms of trade and calculating what is known as the trading gains and losses from changes in the terms of trade.

- 48.195<u>18.199</u> Further, the total real income that residents derive from domestic production depends also on the rate at which exports may be traded against imports from the rest of the world.
- 18.19618.200 The terms of trade are defined as the ratio of the price of exports to the price of imports. If the prices of a country's exports rise faster (or fall more slowly) than the prices of its imports (that is, if its terms of trade improve) fewer exports are needed to pay for a given volume of imports so that at a given level of domestic production goods and services can be reallocated from exports to consumption or capital formation. Thus, an improvement in the terms of trade makes it possible for an increased volume of goods and services to be purchased by residents out of the incomes generated by a given level of domestic production.
- 18.19718.201 Real gross domestic income (real GDI) measures the purchasing power of the total incomes generated by domestic production. It is a concept that exists in real terms only. When the terms of trade change there may be a significant divergence between the movements of GDP in volume terms and real GDI. The difference between the change in GDP in volume terms and real GDI is generally described as the "trading gain" (or loss) or, to turn this round, the trading gain or loss from changes in the terms of trade is the difference between real GDI and GDP in volume terms. The differences between movements in GDP in volume terms and real GDI and real GDI and if the commodity composition of the goods and services that make up imports and exports is very different, the scope for potential trading gains and losses may be large. This may happen, for example, when the exports of a country consist mainly of a small number of primary products, such as cocoa, sugar or oil, while its imports consist mainly of manufactured products. Trading gains or losses, T, are usually measured by the following expression:

$$T = \frac{X-M}{P} - \left\{\frac{X}{P_x} - \frac{M}{P_m}\right\}$$
(19)

where

X = exports at current values

- M = imports at current values
- $P_x$  = the price index for exports
- $P_m$  = the price index for imports
- P = a price index based on some selected numeraire.

 $P_x$ ,  $P_m$  and P all equal 1 in the base year. The term in brackets measures the trade balance calculated at the export and import prices of the reference year whereas the first term measures the actual current trade balance deflated by the numeraire price index. It is perfectly possible for one to have a different sign from the other.

 18.198
 18.202
 In addition to changes in the terms of tradel another factor that may affect real income measures is changes in the relative price of traded goods and services (measured as the average of import prices and export prices) with respect to the price of nontraded goods and services. This factor is known as the real exchange rate effect. The effects of changes in the real exchange rate depend on the position of the trade

**Commented [ED11]:** This new paragraph acknowledges a point raised in an article in Review of Income and Wealth (2022) that real income measures are affect by real exchange rate effects as well as terms of trade effects.

account. For given terms of trade, if imports exceed exports, then a depreciation of the domestic currency (that is, an increase in the price of traded goods and services relative to nontraded goods and services) results in a decline in real income. On the other hand, if exports exceed imports, then these effects go in the opposite direction.

- 18.19918.203 There is one important choice to be made in the measurement of trading gains or losses, the selection of the price index P with which to deflate the current trade balance. There is a large but inconclusive literature on this topic, but one point on which there is general agreement is that the choice of P can sometimes make a substantial difference to the results. Thus, the measurement of real GDI can sometimes be sensitive to the choice of P and this has prevented a consensus being reached on this issue.
- 18.20018.204 It is not necessary to try to summarize here all the various arguments in favour of one deflator rather than another, but it is useful to indicate the main alternatives that have been advocated for P. They can be grouped into three classes, as follows.
  - a. One possibility is to deflate the current balance, X-M, either by the import price index (which has been strongly advocated) or by the export price index, with some authorities arguing that the choice between *P<sub>m</sub>* and *P<sub>x</sub>* should depend on whether the current trade balance is negative or positive.
  - b. The second possibility is to deflate the current balance by an average of  $P_m$  and  $P_x$  various different kinds of averages have been suggested, simple arithmetic or harmonic averages, or more complex trade weighted averages.
  - c. The third possibility is to deflate the current balance by some general price index not derived from foreign trade; for example, the price index for gross domestic final expenditure, or the consumer price index. An advantage of a general price index not derived from foreign trade (such as the price index for gross domestic final expenditure) is that it incorporates real exchange rate gains and losses in addition to terms-of-trade gains and losses.
- 18.20118.205 The failure to agree on a single deflator reflects the fact that no one deflator is optimal in all circumstances. The choice of deflator may depend on factors such as whether the current balance of trade is in surplus or deficit, the size of imports and exports in relation to GDP, etc. On the other hand, there is general agreement that it is highly desirable and, for some countries vitally important, to calculate the trading gains and losses resulting from changes in the terms of trade. In order to resolve this deadlock it is recommended to proceed as follows:
  - a. Trading gains or losses, as defined above, should be treated as an integral part of the SNA;
  - b. The choice of appropriate deflator for the current trade balances should be left to the statistical authorities in a country, taking account of the particular circumstances of that country;
  - c. If the statistical authorities within a country are uncertain what is the most appropriate general deflator P to be used, some average of the import and export price indices should be used, the simplest and most transparent average being an unweighted arithmetic average of the import and export price indices. (This is referred to in the specialist literature on the subject as the Geary method.)
- 18.20218.206 These proposals are intended to ensure that the failure to agree on a common deflator does not prevent aggregate real income measures from being calculated. Some measure of the trading gain should always be calculated even if the same type of deflator is not employed by all countries. When there is uncertainty about the choice of deflator, an average of the import and the export price indices is likely to be suitable.

# 3. The interrelationship between volume measures of GDP and real income aggregates

<u>48.20318.207</u> The usual way to calculate real income figures is to start from real GDI and then follow the normal sequence of income aggregates, but with every intervening adjustment deflated to real terms. This is

# illustrated as follows:

- a. Gross domestic product in volume terms;
- plus the trading gain or loss resulting from changes in the terms of trade;
- b. equals real gross domestic income;
- plus real earned incomes receivable from abroad;
- minus real earned incomes payable abroad;
- c. equals real gross national income;
- *plus* real current transfers receivable from abroad; *minus* real current transfers payable abroad;
- d. equals real gross national disposable income;
  - minus depreciation and depletion in volume terms;
- e. equals real net national disposable income.
- 18.204<u>18.208</u> The transition from (a) to (b) is the trading gain from changes in the terms of trade explained immediately above. The steps needed in order to move from (b) to (d) above involve the deflation of flows between resident and non- resident institutional units, namely, <u>earned incomes</u> and current transfers receivable from abroad and payable to abroad. There may be no automatic choice of price deflator, but it is recommended that the purchasing power of these flows should be expressed in terms of a broadly based numeraire, specifically the set of goods and services that make up gross domestic final expenditure. This price index should, of course, be defined consistently with the volume and price indices for GDP.
- 18.205<u>18.209</u> Each step in the process should first be calculated for adjacent years in additive volume terms and longer series derived as chain indices.
- 18.20618.210 A possible alternative approach is to move from GDP in volume terms to net domestic final expenditure in volume terms and then make a single adjustment for the impact on purchasing power of the current external balance using the deflator for net final domestic expenditure to reduce the current external balance to real terms. The advantage of this alternative is a single numeraire, the set of goods and services making up net domestic final expenditures being used throughout. It may be easier, therefore, to grasp the significance of real net national disposable income as this deflator is explicit.
- 18.20718.211 However, the alternative framework measures the trading gain or loss by using the deflator for net domestic final expenditures as the general deflator P, for the trading gain or loss from changes in the terms of trade whereas it can be argued that P ought always to be based on flows which enter into foreign trade. On balance, therefore, the original framework presented above is to be preferred.

# E. Volume and price measures for particular products or industries

- 18.20818.212 For most products and industries, the methods discussed in Section C of this chapter can be used to derive volume and price measures that are appropriate for national accounts. There are, however, several products that have somewhat unusual characteristics for which more specific guidance may be helpful. For a few particular products, this section provides a brief discussion of some of the challenges that arise for these products and explains some methods that some countries use to address these challenges. For further guidance on volume and price measurement for particular products or industries, please refer to handbooks on this topic, such as Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2016 edition and the other references cited in this section.
- 1. Agricultural output

**Commented [ED12]:** New section - Issue X.22 -Recommends adding new section on measuring prices, volumes for specific products.

**Commented [ED13]:** New subsection based on section 5.3.1 of Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2016 edition.

18.20918.213 As discussed in paragraphs 7.148-7.150, 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. For many crops the growing season will span three quarters of the year, with the harvest taking place in the third quarter, and preparation of the fields taking place in the last quarter of the preceding year.

18.21018.214 To derive volume measures of crop output, it is recommended that for each type of crop, the compilers distribute forecasts of the value of harvest output across the quarters in proportion to the input costs in each quarter. An alternative method is to assume that output in those quarters with no production of finished goods is equivalent to input costs. The alternative method avoids the necessity of deriving forecasts of the value of harvest output but could distort the quarterly pattern of output by assuming that the net operating surplus or net mixed income is entirely attributable to the quarter when the crop is harvested.

18.21118.215 When calculating the volume of quarterly agricultural output, the main difficulty is to decide which price index to use. Theoretically, the price to be applied should be the price prevailing during the period of production, but in practice the prices prevailing during quarters out of the harvest season might be rather unsuitable due to the scarcity of the crop outside of the harvest season. In such circumstances, it may be better to substitute prices related to the basic price forecast for final harvest output in place of the price prevailing in other quarters. If the alternative method discussed in the previous paragraph is used, it is important that one should continue to use a forecast of the product price as a deflator, since deflation by a price index for inputs would only generate the volume of inputs.

# 2. Large construction projects

- 18.21218.216 For construction, compilers are encouraged to avoid input cost methods and endeavor to develop output price indices that can be used for deflation. Compiling output price indices can be challenging, though, because each construction project tends to be unique in certain respects, so repricing identical models each period is challenging. For smaller projects, such as houses, small apartment buildings and small office buildings, it may be possible to collect information from construction enterprises on prices over time for a standardized "model" product, such as a typical family house with specified characteristics. For larger projects, such as large factories, highways, and reservoirs, the model pricing approach is not likely to be feasible and other methods must be considered.
- 18.21318.217 Specification pricing may be another possibility if it is possible to break down the attributes of the construction project into identifiable elements. This approach requires that the elements should be separately identifiable, their qualities and impact on the performance of the structure should be quantifiable, and prices for each element should be available in different periods. This approach has the advantage that it allows more flexibility than a standardized model, but in practice it may be difficult to identify the key elements of a project and to collect prices for each of those elements. A related method is the hedonic method, which also requires identifying characteristics that are thought to determine the price of the project, but uses regression methods rather than direct data collection to determine the price for each element.
- 18.21418.218 Although generally not the preferred method, the use of input prices may be acceptable when projects are so unique that it is not possible to use either specification pricing or the hedonic method to derive a price index.

#### 3. Digital goods and services

18.21518.219 As discussed in chapter 22, digital products include assets that exist only in digital form and services that are supplied over a computer network. Examples of digital assets include crypto assets, data and software. Examples of digital services include wholesale and retail e-commerce distribution services, priced and free services of online platforms, audio and video streaming, and digital financial and payment services such as mobile money services. Their production and consumption are enabled by ICT equipment, software, and data bases along with ICT consumer durable goods, and mobile and fixed line digital communication services. As an example, this section considers the volume and price measurement of software and databases.

18.21618.220 Volume and price measurement challenges are common for products affected by digitalization

**Commented [ED14]:** New subsection based on sections 2.5 and 4.6 of Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2016 edition.

**Commented [ED15]:** New section per DZ.1, DZ.3, DZ.8. These topics are covered in detail in chapter 22.

because innovation leads to rapid changes in the characteristics and sources of supply of digital products. New digital products regularly disrupt existing ones, new models or service contracts frequently embody quality improvements, digital intellectual property products and services with no physical units of measurement are growing in importance, and free products often appear or cease to be free.

18.21718.221 To deal with these rapid changes, the samples used to calculate the price indexes for digital products subject to frequent quality improvements need to be regularly refreshed to keep them representative of current consumption patterns. In addition, the appearance of new models and the exit of obsolete models must be handled in a way that reflects the value of the quality changes. In some cases, the prices of new characteristics may be observable from the price differences associated with various options that the seller offers to consumers. Another way of handling these quality changes is through explicit estimation of quality changes through hedonic methods.

18.218/18.222 These general issues and specific examples of volume and price measurement of digital products, including cloud computing and free products, are discussed in detail in section E of chapter 22. The example of software and databases is considered here.

- 18.21918.223 When deriving volume estimates of the capital formation of software and databases it is advisable to decompose software into three components: packaged (or off-the- shelf), custom-made and own account and to deflate them and databases separately. There are several reasons for doing this.
  - The three components of software and databases vary in the extent to which price data are available to compile price indices.
  - b. It is likely that their prices and volumes grow at different rates, particularly between packaged software, the other two software components and databases.
  - c. Despite the previous point, price indices for packaged software may be used to construct price indices for the other two software components if more appropriate price indices are unavailable.
  - d. Volume estimates of the items are useful indicators in their own right.
- 18.22018.224 Packaged software is purchased on a very large scale, generally via licences-to-use and there is an abundance of price data available. The challenge is to construct price indices free of the effects of changing specifications and any other aspects of quality change.
- 18.22118.225 Custom-made software is also sold on the market, but each custom-made software product is a one-off, which presents an obvious problem for compiling price indices. Although each custom-made product is different, different products may share common components, or a strategy used to develop one product may be able to be used for another. This not only suggests a possible way of compiling a price index, but also suggests means by which productivity gains could be made that would put downward pressure on prices. In sections B and E the use of model pricing is outlined for measuring price changes of custom-made buildings. A similar approach may be applied to custom-made software, or hedonic methods might be applied.
- 18.22218.226 Methods for compiling price indices for heterogeneous groups of products and products whose specifications are changing rapidly are described in the Handbook on Hedonic Indices and Quality Adjustments and in Producer Price Index Manual: Theory and Practice, (the International Labour Organization, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, Economic Commission for Europe and the World Bank, 2004).
- 18.22318.227 A substantial proportion of software in gross fixed capital formation is undertaken on own account. Hence, it is not possible to derive a true output price index for such software. It is then a matter of choosing between a pseudo output price index and an input price index, obtained by weighting together price indices of the inputs. As already noted, input volume estimates used as a proxy for output do not reflect any productivity growth and so this is not recommended. In the absence of a better alternative, the most obvious option is to use the price index for custom- made software.
- 18.224<u>18.228</u> Databases are generally heterogeneous products with a small market since most databases are made for in-house purposes. Volume and price measures for data are discussed in section E of chapter 22. For

Formatted: Font: (Default) +Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight own-account software, it is difficult, if not impossible, to develop a true output price index and once again the choice is between a pseudo output price index and an input price index though a pseudo output index may be difficult to envisage.

4. Passenger transport services and price discrimination	<b>Commented [ED16]:</b> Discussion of price discrimination is
18.22518.229 It is not unusual for two airline passengers sitting in adjacent seats to pay very different prices f	based on section 2.1.4 of Eurostat, <i>Handbook on prices and</i>
the same transport services. In some cases, there may be differences in the bundle of services provided wi	th
the ticket (for example, one ticket may provide for a refund if the ticket needs to be cancelled), but in oth	<u>er</u>
explained by price discrimination.	
18 22618 230 As explained in paragraph 18 71, price discrimination occurs when groups of purchasers who diff	er.
in their willingness to pay for a product are charged different prices by a seller who is able to segment the	he
market and charge different prices based on those differences in willingness to pay. Price discrimination	<u>on</u>
occurs more often in the provision of services than goods because goods can be retraded (and are the subject to arbitrage) whereas services generally are not retraded. Other examples of services for which private the	us ce
discrimination may be common include electricity distribution, financial services, education and health.	
18.22718.231 With respect to price and volume measurement, there are two key issues. The first is whether the	he
prices truly are homogenous, or whether there are subtle differences in quality between items that appear	to
be identical (except for a difference in price). For example, an airline can charge more for economy cla	SS
seats that other more leg room than other economy class seats, and that difference should be treated as difference in quality rather than price. It could also charge a different price for a seat purchased immediate	a lv
before a flight than one purchased several weeks in advance. The compiler of the price index should try	to
hold such subtle differences in characteristics constant when specifying the description of the ticket that	is th
no differences in quality, the differences should be attributed to price rather than volume.	
18.22818.232 One way to ensure that differences in price due to price discrimination are not mixed in wi	th
volume would be to divide the customers into homogeneous groups. For example, on an air flight travellin	ng
on a specific route, the passengers may be grouped into first class, premium economy, and economy clas	<u>85.</u>
For each group, the volume is measured by the number of passengers taking the trip and the price is the average price paid by passengers within each group. This decomposition could then be applied to	a a
representative sample of flights travelling on various routes to obtain price and volume indices for a	<u>ir</u>
transport services.	
5. Output of the central bank	<b>Commented [ED17]:</b> New subsection reflecting issue note
18.22918.233 As explained in chapter 7, central banks provide a variety of financial services, including moneta	X.3 and Issues note on action point A.9 (AEG meeting July
policy services, services related to promoting financial stability, services related to managing internation	<u>al</u> <u>10–13, 2023).</u>
reserves and payment systems and services related to acting as banker to government. In general, the	<u>se</u>
as a whole. These services of central banks are considered non-market output provided to the society as	
whole (i.e., collective services), and total output is to be valued at the sum of costs. Unless an indicator	of
productivity is available (which is unlikely because the services of central banks generally cannot be absorved) the most appropriate volume measure is the defletion of the input.	be
observed, the most appropriate volume measure is the defiation of the inputs.	
6. <u>Implicit financial services on loans and deposits</u>	<b>Commented [ED18]:</b> New subsection based on issue note
18.23018.234 As described in 7.179–7.188, implicit financial services on loans and deposits are implicit charge	volume measures in national accounts (2016 edition).
paid by depositors or borrowers to a financial institution such as a bank for the services associated wi intermediation. These charges are indirect because they are derived from the interest rates associated wi	th
the loans and deposits in relation to a reference rate of interest and are not explicit fees charged for service	<u>28.</u>
Thus, traditional methods of deflation are not available for these services and alternative methods must	be

used.

- 18.23118.235 Two main approaches have been used for volume and price measures of implicit financial services on loans and deposits. The *deflated stoicks approach* involves deflating the stocks of loans and deposits using a general price index and applying the previous year's (or base year) reference rates to arrive at borrower implicit financial services and depositor implicit financial services in volume terms. The *output indicators approach* focuses on indicators of specific services that <del>that</del> the financial institution provides to borrowers and depositors, such as debit and credit card transactions, automatic teller machine transactions, and cheque transactions, which serve as proxies for the volume of financial services provided by the financial institution.
- 18.23218.236 The output indicators approach is attemptingattempts to decompose the services provided by a financial institution such as a bank into the distinct activities that it undertakes on behalf of its customers. Advantages of this approach are that the indicators may directly reflect the provision of services that customers value and provide insight into the activities undertaken by the bank. In practice, this approach has also encountered several obstacles and disadvantages. Indicators may not be valiable for all the specific services provided by banks, and the omission of services that are poorly measured could bias the rate of growth of the overall volume measure. The approach requires that the various output indicators should be weighted, and because there is no observable price or revenue for these services, deriving appropriate weights can be a difficult and complex task. The data burden of compiling the output indicators and their associated weights is likely to be high, and the indicators and weights may tend to become outdated in the face of technological changes and increased digitalization of financial services. In general, it may also be difficult to maintain such a measure and keep the weighting and list of indicators current in the face of rapid changes in the ways that financial services are provided and paid for.
- 18.23318.237 The more commonly used method is the deflated stocks approach, in which the stocks of deposits and loans are deflated using a general price index. Rather than decomposing the specific activities undertaken by banks, the deflated stocks approach takes the broader view that intermediation services are ultimately related to allowing the borrower or depositor to engage in deposit and loan transactions, either in the current period or in a future period. The stock of loans or deposits is related to the capacity to engage in transactions, and those transactions are best measured in volume terms using a general price index. In applying the deflated stocks approach, compilers should apply a general price index appropriate for the country and apply the previous year's reference rates to arrive at borrower implicit financial services and depositor implicit financial services in volume terms. Furthermore, because different kinds of loans or deposits have different margins between their interest rate and the reference rate, each type of loan or deposit should be deflated separately, and then the various types of loans and deposits should be aggregated using a price index formula (such as the Paasche price index or Fisher price index that have been discussed in this chapter). The general price index used for deflation should, if possible, exclude implicit financial services on both conceptual grounds (the transactions supported by loans and deposits do not include implicit financial services) and practical grounds (the inclusion of these services would create a circularity in the calculation of the overall index, which could be problematic). Stocks associated with exports of implicit financial services should be deflated using a general domestic price index, while for imports the appropriate country price indices should be used (along with exchange rate adjustments if the stocks are held in a different currency of that of the domestic economy).
- 18.23418.238 In view of its relative simplicity, the deflated stocks approach is generally preferred for calculating volume measures of implicit financial services on loans and deposits. Countries should select a general price index for deflation that is accurate and appropriate for the types of transactions that are most often supported by loans and deposits in the country. The output indicator approach could also be used to calculate volume measures of implicit financial services.

### 7. Services of owner-occupied dwellings

18.235 As discussed in 7.126-7.128, households that own the dwelling they occupy are treated as owners of unincorporated enterprises that produce housing services consumed by those same households. When well-organized markets for rental 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

**Commented [ED19]:** New subsection based on section 4.12.2 of Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2016 edition and paragraphs 11.87 to 11.102 of *Consumer Price Index Manual*, 2020 edition adopted for goods or services produced on own account. In other words, the output of the housing service 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. Due to the absence of an explicit price for these services, indirect approaches must be used to derive volume and price measures.

- 18.23618.240 The stratification approach is generally recommended by Eurostat's Handbook on Prices and Volume Measures in National Accounts, 2016 edition. In a benchmark year (or annually if the necessary data and resources are available), compilers match actual rents paid by those renting in particular strata to similar dwellings used by owner occupants in equivalent strata to derive their rental equivalente value. The benchmark estimate makes use of detailed data on the housing stock broken down between owner-occupied and rented property and by the attributes of these properties that influence the rent, such as floor area, number of rooms, number of bathrooms, etc. This method is known as the 'stratification method' because it is based on the stratification of dwelling attributes and rent. The approach can be seen as providing price and quantity data at a detailed level for the estimation of output for a particular year.
- 18.23718.241 Estimates for years other than the benchmark year are estimated by projecting forward the housing stock and rents with indicators that reflect the development of these variables over time. The indicators are chosen to reflect adequately the three components of change: the change in price, change in the quantity of the stock, and change in the quality of the stock.
- 18.23818.242 If the stratification method cannot be used, then price indices or volume indicators need to be constructed. The *Consumer Price Index Manual*, 2020 edition, paragraphs 11.87 to 11.102, discusses ways to estimate a price index for the services of owner-occupied dwellings that are broadly consistent with the concepts used in the SNA. The index can be calculated, for example, from a sample of rented housing units that are weighted to reflect the current composition of owner-occupied units. This approach requires that a country have a transparent rental market and reliable information on rents by type of accommodation, location and other rent-determining factors. In general, if the volume of the services of owner-occupied dwellings is to be calculated by deflation, care should be taken to ensure that the concepts and coverage in the deflator match the concepts and coverage used to measure the value of those services in the accounts.
- 18.23918.243 Whether the stratification method or the price index method is used, subsidized and controlled prices should not be used in calculating the owners' equivalent rental series, though they should be used in calculating the prices of rented units.
- 18.24018.244 Another consideration in deriving price and volume measures of the services of owner-occupied dwellings is the growing importance of owners subletting part or all of a dwelling to tourists or travelers. In particular, new digital marketplaces for subletting have made it easier to sublet a dwelling and have led to substantial growth in this activity. Traditional housing surveys may have considered this type of subletting to be too unimportant to measure, which may lead to omission or undercounting of these transactions. For the volume measure of the services of owner-occupied dwellings, if the value of the services is based on the rental equivalence of similar rented dwelling that is not sublet, the value of the subletting needs to be deducted from the rental equivalence of the owner-occupant's unit to avoid double counting the services of the unit (as explained in paragraphs 7.127 to 7.128).

# 8. Education services

- 18.24118.245 In section C.5 of this chapter, the general principles for measuring volumes and prices of non-market output are explained. Here an example is provided of how the volume of output of non-market education services might be estimated in practice. The handbooks, Eurostat, Handbook on Prices and Volume Measures in National Accounts, 2016 edition and OECD, Towards Measuring the Volume Output of Education and Health Services: A Handbook, 2009, provide more detailed guidance on these services.
- 18.24218.246 For primary and secondary education, educational output can be measured based on the amount of teaching received by the students for each type of education. This can be measured as the number of student-hours, or if this measure is not available, the simple number of students or pupils can be used provided the hours of instruction remain broadly stable over time. For higher education, and especially for specialized schools, such as medical schools, there may be other aspects of training that are more resource intensive

**Commented [ED20]:** New subsection based on Eurostat, Handbook on Prices and Volume Measures, and OECD, Towards Measuring the Volume Output of Education and Health Services. and would not be captured by the hours of instruction. For those types of education, additional stratification and other indicators may need to be added.

# 9. Health services

18.24318.247 As for education services, we refer to section C.5 of this chapter for an explanation of the general principles for measuring volumes and prices of non-market output. Here an example is provided of how the volume of output of non-market health services might be estimated in practice. The handbooks, Eurostat, Handbook on Prices and Volume Measures in National Accounts, 2016 edition and OECD, Towards Measuring the Volume Output of Education and Health Services: A Handbook, 2009, provide more detailed guidance on these services.

- 18.24418.248 Health services are characterized by substantial heterogeneity in the conditions that are being treated and in the types of treatment that are appropriate for each condition. Because the treatment of a condition may involve a bundle of services provided over a period of time, including medical services, laboratory services, and in some cases hospital services, it may not be possible in practice to capture the full treatment of the condition. For hospital services, data may be classified based on the international classification of diseases (ICD) or on diagnosis related groups (DRG), which are systems used to classify medical conditions into relatively homogeneous categories.
- 18.24518.249 For market output of hospital services, a PPI or CPI that is representative and controls for quality may provide a good deflator. For non-market output of hospital services, volume estimates may be calculated on the basis of direct output measures such as number of discharges by ICD or DRG category weighted by appropriate cost or revenue weights. These methods should be applied at a detailed level to avoid mixing different types of treatments. The most used alternatives are either a unit cost index or a direct volume index, depending on data availability.

# F. Estimating labour and multifactor productivity

# 1. <u>Labour productivity</u>

- 18.24618.250 Volumes of output per hour worked (or per person employed) are described as measures of labour productivity. However, this is a somewhat unsophisticated measure because changes in this measure can reflect a number of factors other than just the number of hours of labour employed. In particular, increases in the amount of capital used can affect this ratio as can changes in the composition of the labour input over time. Volume measures of labour input are discussed in detail in section D of chapter 16, and the topics of labour, capital and multifactor productivity are discussed in detail in *Measuring Productivity*.
- 18.24718.251 Labour productivity shows the time profile of how productively labour is used to generate output in volume terms. Changes in labour productivity reflect the joint influence of changes in capital, intermediate inputs, as well as technical, organizational and efficiency change within and between enterprises, the influence of economies of scale, varying degrees of capacity utilization and measurement errors.
- 18.24818.252 Neither the number of employed persons nor full-time equivalent numbers on labour input are ideal measures for use in productivity studies. The series for total hours actually worked is preferred by many because it is a reasonable compromise between these cruder measures and data-intensive measures that adjust for differences in the qualifications, skill levels and composition of labour.
- 18.24918.253 Using total hours actually worked as the input measure for calculating labour productivity changes over time implicitly assumes that each hour worked is of the same quality. As discussed in paragraphs 16.95 to 16.97, it is possible to produce a quality-adjusted measure of the labour inputs that takes account of changes in the mix of workers over time by weighting together indicators of quality for workers with different levels of skill or education.
- 18.25018.254 Whichever labour measure is used in calculating productivity, it is very important to ensure that the coverage of the labour data is consistent with that of the national accounts. In other words, the labour inputs must be estimated within the same production boundary and using the same criteria for residence that are used in the national accounts. Typically, the topics that cause most difficulty are residence (particularly

**Commented [ED21]:** New subsection based on Eurostat, Handbook on Prices and Volume Measures, and OECD, Towards Measuring the Volume Output of Education and Health Services.

**Commented [ED22]:** New section that mostly draws from chapter 19, section E of the 2008 SNA, along with some material from pp. 14-18 of OECD, *Measuring Productivity*.

Formatted: Font: (Default) + Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight with border workers), defence force and diplomatic personnel (who are commonly not covered by the labour force surveys used to provide the basic data) and obtaining details of unpaid hours (for example, unpaid overtime) or of some self employment (for example, contributing family workers).

- 18.25118.255 Analysts are often interested in measuring productivity on an industry basis as well as for the economy as a whole. Calculating industry employment and working time by industry adds an additional degree of difficulty to the estimation process. Among other advantages, using hours worked overcomes the problems involved in measuring employment by industry when a worker has two or more jobs, not in the same industry.
- 18.25218.256 Labour productivity, including industry productivity, and multifactor productivity (see below) are all valid measures of an economy's performance. From a practical viewpoint, it is important to ensure that the employment and hours worked underlying these sets of estimates are consistent with each other as well as with output measures when calculating the productivity estimates.

# Data consistency

- 18.253 Examining the relative productivity performance of different industries is of interest to many analysts. In practice, the labour input estimates for the whole economy can be estimated either "bottom up" or "top down". In the former case, the totals for the economy as a whole will be completely consistent with the industry estimates because they are summed to derive the total labour estimates. However, in the case of a top-down approach, a range of different data sources may be used to obtain the disaggregation by industry. In such cases, it is important to ensure that the sum of the industry estimates is consistent with the national totals.
- 18.25418.258 Classifying labour input by industry is not always straightforward. The main issue is to ensure that the employment estimates for each industry are as consistent as possible with the national accounts values and volumes so that the productivity estimates are reliable. One particular problem that arises is where staff are recruited via an external recruitment agency. Maintaining consistency with the industry output means that employment should be classified to the industry of the establishment that legally employs the workers. In practice, this will be the establishment that pays the employee's wages and any associated social contributions, which will usually be the employment agency and so the employees will be classified to industry class 7491 *Labour recruitment and provision of personnel*. The output of this industry includes the revenue derived from the activity of hiring out staff to those establishments that need the staff; generally, those establishments will be in other industries. The establishments by the "using" establishments will be recorded as part of intermediate input for the using industry.
- 18.25518.259 Ideally, for productivity purposes both the output attributable to these staff and the hours they work would be recorded in the industry in which they are actually working rather than in the industry "Labour recruitment and provision of personnel". However, in practice, it is unlikely that the data can be collected to enable the output and hours worked to be classified this way. It may be useful for some purposes for the staff hired out by employment agencies to be allocated to the industries that actually use the staff. If such an allocation of labour input is performed, similar adjustments to intermediate consumption and value added of the relevant industries would also be required. However, any such allocation should be presented in a supplementary table and not in the main accounts.

## 2. <u>Capital productivity</u>

- 18.25618.260 Measures of capital productivity, calculated by dividing the volume of output (or volume of value added) by a volume index of capital services provided, suffer from similar drawbacks to labour productivity since they do not capture the effects of the amount of labour employed and the efficiency and composition of the capital inputs.
- 18.25718.261 The capital productivity index shows the time profile of how productively capital is used to generate value added or output. Capital productivity reflects the joint influence of labour, intermediate inputs, technical change, efficiency change, economies of scale, capacity utilization and measurement

Formatted: Font: (Default) +Headings CS (Times New Roman), 10 pt, Font color: Auto, Complex Script Font: +Headings CS (Times New Roman), 10 pt, Don't snap to grid, Not Highlight errors. Like labour productivity, capital productivity measures can be based on output volume or valueadded volume.

18.25818.262 The index of capital services is related to the capital services for the total economy, as shown in chapter 17, table 17.11. Volumes of capital services for the individual asset types and industries need to be aggregated using a Laspeyres or Fisher index to form an index of capital services for the total economy.

## 3. <u>Multifactor productivity</u>

- 18.25918.263 A measure that takes account of the contributions of both labour and capital to growth in output is multifactor productivity (MFP), which is sometimes referred to as total factor productivity (TFP). The advantage of using MFP as the measure of productivity is that it includes effects not included in the labour and capital inputs. This topic is discussed further in chapter 20 and in *Measuring Capital*.
- 18.26018.264 Capital-labour MFP is calculated as a volume index of value added divided by a volume index of combined labour and capital input. Capital-labour MFP indices show the time profile of how productively combined labour and capital inputs are used to generate value added. Conceptually, capital-labour productivity is not, in general, an accurate measure of technical change. It is, however, an indicator of an industry's capacity to contribute to economy-wide growth of income per unit of input. In practice, the measure reflects the combined effects of disembodied technical change, economies of scale, efficiency change, variations in capacity utilization and measurement errors.
- 18.26118.265 The productivity model can be extended to include other factors such as the energy and materials used in production. The abbreviation "KLEMS", standing for capital (K), labour (L), energy (E), materials (M) and purchased services (S), is often used for this extended productivity model. This can be extended to producing productivity estimates at the most detailed level of the supply and use tables. KLEMS MFP is calculated as a volume index of output divided by a volume index of combined inputs, including different types of labour, capital, energy, materials and services, each weighted with its share in total output. KLEMS MFP shows the time profile of how productively combined inputs are used to generate output. Conceptually, the KLEMS productivity measure captures disembodied technical change. In practice, it also reflects efficiency change, economies of scale, variations in capacity utilization and measurement errors.
- 18.262 18.266 An example of such work can be found in the EU-KLEMS project, which can be found on the project site https://www.rug.nl/ggdc/productivity/eu-klems/.

# G. International price and volume comparisons

#### 1. Introduction

- 18.263\_18.267 Users want to compare GDP and its components not only over time for a given country or countries in analyzing economic growth, for example, but also across countries for a given time period in analyzing relative economic size. A commonly used method of making such comparisons is to adjust national accounts values to a common currency using exchange rates, which has the advantage that the data are readily available and completely up to date. This is adequate if users need a ranking of a country's relative spending power on the world market. However, it is not adequate for comparisons of productivity and standards of living because it does not adjust for the differences in price levels between countries and thus does not give a measure of countries' relative sizes in the volume of goods and services they produce.
- 18.264<u>18.268</u> Purchasing power parities (PPPs) are used in producing a reliable set of estimates of the levels of activity between countries, expressed in a common currency. A purchasing power parity (PPP) is defined as the number of units of B's currency that are needed in B to purchase the same quantity of individual good or service as one unit of A's currency will purchase in A. Typically, a PPP for a country is expressed in terms of the currency of a base country, with the US dollar commonly being used. PPPs are thus weighted averages of the relative prices, quoted in national currency, of comparable items between countries. Used as deflators, they enable cross-country comparisons of GDP and its expenditure components.

18.26518.269 This section first examines the index number issues in aggregate comparisons of prices and

volumes across countries. The ICP produces internationally comparable economic aggregates in volume terms as well as PPPs and price level indices (PLIs). Established in 1968, the ICP has grown to cover all regions of the world <u>in combination</u> with the OECD/Eurostat PPP program.

18.26618.270 Compiling PPP-based data is a costly and time-consuming exercise, so it is not possible to make such comparisons as a matter of course. Worldwide coordination is required to collect the data and compile the PPP-based estimates. However, national accountants in participating countries need to understand the basic principles of the comparison and the practical demands that are made on them for data to compile PPP indices and thus GDP volume comparisons. This material is the subject of the last part of this section.

## 2. Index number issues

18.26718.271 The theory of index numbers developed in a time series context cannot be applied mechanically to international comparisons simply by replacing the term "period" by the term "country." International comparisons differ in a number of respects.

- a. Time series are ordered by the date of the observation, but countries have no such a priori ordering. In consequence there is no predetermined way to order countries when compiling chain indices.
- b. For international price comparisons different price collectors will be reporting on the prices of the items in different countries. There thus is a need for flexible but detailed structured product descriptions (SPDs) for each item so that only the prices of like items are compared, either by comparing the prices of exactly the same item specification drawn from the SPD in both countries, or by adjusting the prices of different specifications drawn from the SPD for quality differences.
- c. International comparisons are conducted on a less regular basis, in part because they present a large scale coordination challenge, involving the statistical offices of all participating countries as well as international organizations.
- 18.26818.272 At the heart of the PPPs are price comparisons of identical or closely similar product specifications. The 2005 ICP round used SPDs to define these specifications and to ensure the quality of the detailed price comparisons. For each item there is a specification describing the technical characteristics of the item in detail so a price collector can precisely identify it in the local market. Besides the technical characteristics, the specification also includes other variables that need to be considered when pricing the item, such as the terms of sales, accessories and transportation and installation costs. The database formed from these structured descriptions and the prices collected for them permit more precise matching of items between countries.

# Representativity versus comparability

- 18.26918.273 Two critical criteria in selecting products to be priced for calculating PPPs are "representativity" and "comparability". Representative products are those products that are frequently purchased by resident households and are likely to be widely available throughout a country. Representativity is an important criterion in the ICP because the price levels of non-representative products are generally higher than those of representative products. Therefore, if one country prices representative products while another prices non-representative products in the same expenditure category, then the price comparisons between the countries will be distorted. On the other hand, comparability relates to the physical characteristics of a product. Products are considered to be comparable if their physical characteristics, such as size and quality, and economic characteristics, such as whether candles are used as a primary source of light or are primarily decorative, are identical.
- 18.270\_18.274 In practice, difficult trade-offs are involved in selecting products that are both representative and comparable to use in calculating PPPs. The product lists for calculating PPPs are developed in a way that balances the competing aims of within-country representativity and cross-country comparability. In this respect, they are generally quite different from the products that would be priced by any individual country to compile its price indices (such as the consumer price index or any of a range of producer price indices) and which are used in producing the deflators used to calculate volume estimates in the time series national

accounts. In the case of time series within a country, representativity is the key criterion in selecting the products to be priced while comparability with other countries is unimportant. Once a representative product is selected for pricing, the important issue is to price the same product in subsequent periods so that price changes in the product can be measured over time. For the ICP, representativity is required only at a point in time and not over time

# Aggregation

48.271<u>18.275</u> PPPs are calculated and aggregated in two stages: estimation of PPPs at the level of basic headings and aggregation across basic heading PPPs to form higher-level aggregates. The estimation of basic heading level PPPs is based on price ratios of individual products in different countries. Typically no information about quantities or expenditures is available within a basic heading and, thus, the individual price ratios cannot be explicitly weighted when deriving PPPs for the whole basic heading. Two aggregation methods dominate PPP calculations at this level, the GEKS method (described below) and the Country Product\_Dummy (CPD) method. A description of these methods can be found in chapters <u>4 and 5</u> of <u>Measuring the Real Size of the World Economy</u>. Weights are of crucial importance at the second stage when the basic heading PPPs are aggregated up to GDP. The main approaches used in the aggregation are summarized in the paragraphs below.

### Binary comparisons

48.27218.276 As outlined in section C, the monetary value of GDP, or one of its components, (*I<sub>r</sub>*) reflects the combined differences of both price and quantities, that is: *LP PQ IV* or *LQ PP IV*. Price and volume indices may be compiled between pairs of countries using the same kinds of index number formula as those used to measure changes between time periods. A Laspeyres-type price index for country B compared with country A is defined as:

$$L_{p} = \sum_{i=1}^{n} \left( \frac{p_{i}^{B}}{p_{i}^{A}} \right) S_{i}^{A} \equiv \frac{\sum_{i=1}^{n} p_{i}^{B} q_{i}^{A}}{\sum_{i=1}^{n} p_{i}^{A} q_{i}^{A}}$$
(20a)

and a Paasche-type index as:

$$P_{p} = \left[\sum_{i=1}^{n} \left(\frac{p_{i}^{A}}{p_{i}^{B}}\right)^{-1} S_{i}^{B}\right]^{-1} \equiv \frac{\sum_{i=1}^{n} p_{i}^{B} q_{i}^{B}}{\sum_{i=1}^{n} p_{i}^{A} q_{i}^{B}}$$
(20b)

where the weights  $s_i^A$  and  $s_i^B$  are component shares of GDP at current values of countries A and B.

- 18.27318.277 Given the complementary relationships between Laspeyres and Paasche price and volume indices noted earlier, it follows that a Laspeyres-type volume index for B compared with A can be derived by deflating the ratio of the values in B to A, each expressed in their own currencies, by the Paasche-type price index (20b). A Paasche-type volume index is similarly derived by deflating the ratio of values of B to A by a Laspeyres-type price index (20a).
- 18.274<u>18.278</u> The differences between the patterns of relative prices and quantities for two different countries tend to be relatively large, compared with those between time periods for the same country. The resulting large spread between the Laspeyres- and Paasche-type intercountry price and volume indices in turn argues for an index number formula, such as Fisher, that makes symmetric use of both country's price and quantity information.

#### **Multilateral comparisons**

18.275 18.279 The need for multilateral international comparisons may arise, for example, to determine GDP aggregates for blocks of more than two countries or rankings of the volumes of GDP, or per capita GDP,

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for all the countries in a block. It is desirable that such rankings are transitive.

#### Transitivity

**18.276**<u>18.280</u> Consider a group of *m* countries. As binary comparisons of volumes and prices may be made between any pair of countries, the total number of possible binary comparisons is equal to m(m-1)/2. Let the price, or volume, index for country *j* based on country *i* be written as *ilj*. A set of indices is said to be transitive when the following condition holds for every pair of indices in the set:

# $_{i}\mathbf{I}_{j} \mathbf{x} \,_{i}\mathbf{I}_{k} = _{i}\mathbf{I}_{k}$ (21)

This condition implies that the direct (binary) index for country k based on country i is equal to the indirect index obtained by multiplying the direct (binary) index for country j based on country i by the direct (binary) index for country k based on country j. If the entire set of indices is transitive, the indirect indices connecting pairs of countries are always equal to the corresponding direct indices. In practice, none of the standard index formulae in common use, such as Laspeyres, Paasche or Fisher, is transitive.

18.277<u>18.281</u> The objective is to find a multilateral method that generates a transitive set of price and volume measures while at the same time assigning equal weight to all countries. There are four quite different approaches that may be used. The first approach achieves transitivity by using the average prices within the block to calculate the multilateral volume indices. The second approach starts from the binary comparisons between all possible pairs of countries and transforms them in such a way as to impose transitivity. The third method uses regression techniques to estimate missing prices by using price relatives for other products on a country-by-country basis. The fourth method is a multilateral chaining method based on linking bilateral comparisons such that countries that are most similar in their price structures are linked first.

#### The block approach

18.27818.282 The most widely used form of the block approach uses the average prices of the block to revalue quantities in all countries in the block. This automatically ensures transitivity. The volume index for country B relative to country A is defined in the first expression in equation (20) as:

$$GK_Q = \frac{\sum_{i=1}^{n} \bar{p}_i q_i^B}{\sum_{i=1}^{n} \bar{p}_i q_i^A} = \frac{\sum_{i=1}^{n} \bar{p}_i q_i^C}{\sum_{i=1}^{n} \bar{p}_i q_i^A} \chi \frac{\sum_{i=1}^{n} \bar{p}_i q_i^B}{\sum_{i=1}^{n} \bar{p}_i q_i^C}$$
(22)

and can be seen to be transitive. The average price  $p_i$  for each individual good or service is defined as its total value in the block, expressed in some common currency, divided by its total quantity:

$$\bar{p}_{i} = \frac{\sum_{j=1}^{m} c^{j} p^{j} q_{i}^{j}}{\sum_{j=1}^{m} q_{i}^{j}} \text{ where } \sum_{j=1}^{m} q^{j} = \sum_{j=1}^{m} \frac{v_{i}^{j}}{p_{i}^{j}}$$
(23)

18.27918.283 The most common block method is the Geary Khamis (GK) method in which the currency converters used in (23) are the PPPs implied by the volume indices defined by (20). In this method, the average prices and PPPs are interdependent being defined by an underlying set of simultaneous equations. In practice, they can be derived iteratively, initially using exchange rates as currency converters for average prices, for example. The resulting volume indices are then used to derive the implied set of PPPs, which are themselves used in turn to calculate a second set of average prices, volume indices and PPPs, etc.

18.28018.284 The advantages of a block method such as the GK method include:

a. The block of countries is recognized as an entity in itself;

- b. The use of a single vector of prices ensures transitivity and the volume measures are additively consistent and can be presented in value terms using the average prices of the block (it is possible to present the results for a group of countries in the form of a table with countries in the columns and the final expenditure components in the rows, in which the values add up in the columns as well as across the rows); and from them a set of m-1 transitive indices that resemble the original Fisher indices as closely as possible, using the least squares criterion. Minimizing the deviations between the original Fisher indices and the desired transitive indices leads to the so-called GEKS formula, proposed independently by Gini, Elteto, Koves and Szulc.
- c. It is possible to compare ratios, such as the shares of GDP devoted to gross fixed capital formation, because the same vector of prices is used for all countries.
- 18.281\_18.285 However, comparisons between any two countries, based on the multilateral block results, may not be optimally defined. It was shown in the description on transitivity that best practice price and volume comparisons between countries A and B should make symmetric use of information on their prices and quantities. If A's relative prices are higher than average and B's are lower, the use of average prices decreases A's expenditures expressed in average international prices and increases those of B relative to a country whose prices are close to the international average. Such a disparity is often noted in the case of services between developed and developing countries. Consequently, when using the GK method, PPP\_based expenditures are generally overstated for poor countries.

#### The binary approach

- 18.282
   18.286
   An alternative approach to the calculation of a set of multilateral volume measures and PPPs is to start from the binary comparisons between all possible m(m-1)/2 pairs of countries. If each binary comparison is considered in isolation, the preferred measure is likely to be a Fisher index.
- 18.28318.287 Fisher indices are not transitive but it is possible to derive and the summation is over the *m* different countries in the block. The term *cj* in expression (23) is a currency converter which could be either a market exchange rate or a PPP used to convert each country's expenditure on item i, *vi pi qi* into the common currency.
- 18.28418.288 The GEKS index between countries i and k is the geometric average of the direct index between i and k and every possible indirect index connecting countries i and k, in which the direct index is given twice the weight of each indirect index. Transitivity is achieved by involving every other country in the block in the GEKS index for any given pair of countries.

#### 18.28518.289 The GEKS index:

- a. provides the best possible transitive measure for a single aggregate between a pair of countries, in much the same way as a chain Fisher index may provide the best possible measure of the movement of a single aggregate over time;
- b. gives equal weights to the two countries being compared; and
- c. is not affected by the relative sizes of the countries, a desirable attribute.
- However, the consequences are similar to those for chain indices in a time series context. It is not possible to convert the <u>GEKS</u> volume indices for an aggregate and its components into a set of additively consistent values. This is in contrast to the GK method.

#### Ring comparisons

18.28618.290 The outline of the above methods assumes that there is one set of comparisons comprising all the countries in a block. As the number of countries participating increases, it becomes difficult to administer them as a single group. Moreover, it is difficult to find items that are both nationally representative and globally comparable at the same time for countries far apart both geographically and in their level of

development. There are thus advantages to a regionalized approach to the compilation of PPPs. Product specifications are prepared for each region and independent sets of PPPs prepared for countries on a region by region basis.

- 18.28718.291 While this approach probably improves the quality of PPPs at the regional level, there is still the need to combine the regions to obtain a global comparison. Traditionally, a "bridge country" was chosen to provide the link between regions. The bridge country participated in the price surveys of more than one region. The ring approach extends this idea and identifies a subset of countries in each region to act as "ring countries". These countries comprise a synthetic "region" that intersects with all of the regions whose comparisons are to be linked together. A global core list is added to the regional lists of goods and services for the main price survey on household consumption. This common list provides the basis to link the within-region PPPs across regions. Each region decides which elements of the core list will be part of its regional data collection. Thus, every country's data is used to estimate the between-region linking factors.
- 18.28818.292 The method chosen depends on a number of factors including the purpose of the analysis, level of aggregation, sparseness of data, whether the aggregation is within regions, across ring countries, or for the whole data set and the importance attributed to additivity and symmetric treatment of countries.

# 3. Practical considerations for national accountants

## PPPs and the national accounts

1

- 18.28918.293 One of most important uses of PPPs is to calculate comparable estimates of GDP and its major components, expressed in a common currency where the effects of differences in price levels between countries are removed. The national accounts are integral to PPP estimates in <u>three</u> ways. In the first place, the national accounts provide the weights that are used to aggregate prices from a detailed level to broader aggregates, up to GDP itself. Secondly, the national accounts provide the volumes (also referred to as "real expenditures") expressed in a common currency that enable GDP and its expenditure components to be compared between countries. <u>Thirdly, comparisons can be made of aggregates below the level of GDP.</u>
- 18.29018.294 The PPP exercise also produces comparative price level indices (PLI). A PLI is the ratio of the PPP for a country relative to the official exchange rate, both measured with respect to a reference currency. PLIs are generally expressed on a base of 100, with the base being either a single reference country or a regional average.
- 18.29118.295 If a country has a PLI less than 100, then its price level is lower than the numeraire country (or region). Similarly, any pair of countries can be compared directly. If one has a PLI less than the other, then the country with the lower PLI would be considered "cheap" by the other country, regardless of whether its PLI is above or below 100.
- 18.292<u>18.296</u> In practice, PPPs do not change rapidly over time and so a large change in a country's PLI is usually due to a large change in exchange rates.
- 18.29318.297 PPP-based volumes are often expressed as "time series", which they are not. Each year is a comparison between countries in isolation from other years. It is important that the volumes in the ICP not be confused with the time series volumes described earlier in this chapter because they are different measures, although there are some similarities in that they are both designed to measure values that have had the direct effects of price differences removed from them. In a time series of volumes, the effects of price changes from one period to another are removed to produce the volume measures from which rates of economic growth are calculated. In the case of an intercountry comparison, which is the basis for PPP- based volume measures, the effects of differences due to exchange rates and those due to different price levels within each country are removed from the national accounts values to provide a comparison between the volumes in the countries concerned.
- 18.294<u>18.298</u> The lowest level for which PPPs can be compared across all countries involved in a comparison is referred to as the "basic heading" and it is also the lowest level for which national accounts values are required as weights. In effect, the national accounts values provide the weights to aggregate the basic heading level data to broader national accounting aggregates, including GDP itself. The basic heading is

also the level at which product specifications are determined, with a number of products representative of the expenditure within each basic heading being specified for pricing.

- 18.29518.299 Expenditure-based estimates of GDP have been used in most PPP-based comparisons during the past half-century or so because the prices for final expenditures are more readily observable than those for outputs and inputs, which would be required for a comparison of the production- based estimates of GDP. Consistency in the national accounts is critical in producing comparable estimates across countries so the SNA has played an important part in PPP-based comparisons by providing the framework for obtaining consistent estimates of GDP and its major aggregates.
- 18:29618.300 The ICP is the broadest-based project to produce PPPs; the volume estimates produced from the ICP present a snapshot of the relationships between countries from all over the world, expressed in a common currency. The ICP is a very expensive and resource- consuming project and so it provides benchmarks at infrequent intervals. As a result, PPP benchmarks from the ICP have to be extrapolated using time series from the national accounts of the countries involved. It is interesting to compare the outcomes of an extrapolated series do not tie in exactly with the benchmarks and there are several reasons for the differences that arise. An important one is the issue of the consistency between the prices used in the time series national accounts and those used in calculating PPPs as explained in the section on representativity and comparability earlier. Further, the price and volume structure may change significantly over time in a way not picked up in the extrapolation techniques.

# Why ICP growth rates differ from national growth rates

- 18.297<u>18.301</u> The method commonly used to extrapolate PPPs from their benchmark year to another year is to use the ratio of the national accounts deflators from each country compared with a numeraire country (generally the United States of America) to move each country's PPPs forward from the benchmark. The PPPs derived are then applied to the relevant national accounts component to obtain volumes expressed in a common currency for the year in question.
- 18.29818.302 Theoretically, the best means of extrapolating PPPs from a benchmark year would be to use time series of prices at the individual product level from each country in the ICP to extrapolate the prices of the individual products included in the ICP benchmark. In practice, it is not possible to use this type of procedure in extrapolating PPP benchmarks because the detailed price data needed are not available in all the countries. Therefore, an approach based on extrapolating at a macro level (for GDP or for a handful of components of GDP) is generally adopted. Leaving aside the data problems involved in collecting consistent data from all the countries involved, a major conceptual question arises with this process because it can be demonstrated mathematically that it is impossible to maintain consistency across both time and space. In other words, extrapolating PPPs using time series of prices at a broad level such as GDP will not result in a match with the benchmark PPP-based estimates even if all the data are perfectly consistent.
- <del>18.299</del>18.303 \_One of the reasons for differences between GDP time series and PPP benchmark comparisons stems from the definition of a product. As explained in paragraphs 18.66 to 18.67, location is an essential product characteristic in the national accounts whereas the PPP comparisons use average prices of the whole country. Another problem is that the weighting patterns underlying the deflators in the time series national accounts will differ from those in the PPP benchmarks over time. In addition, as noted above, the products priced for the PPPs will differ from those underlying the time series because of the requirements in spatial price indices for representativity within each country and comparability between countries, while in time series the main requirement is for consistency over time. Generally, many more products will be priced for a country's price indices than it is possible to price for calculating PPPs. Finally and often most critically, the prices underlying the deflators in the national accounts are adjusted to remove changes in quality over time and the methods of making such quality adjustments can differ significantly between countries. In particular, the extent of using hedonic methods for adjusting products whose characteristics change rapidly varies significantly from country to country. Electronic products (such as computers) feature prominently in hedonic quality adjustment, although some countries also use hedonics to quality adjust products such as clothing and housing. Comparing price changes in a country that uses hedonics in quality adjusting the price indices underlying its national accounts deflators with those in one that does not do so will lead to potentially

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large inconsistencies between the benchmarks and the extrapolated series.

18.30018.304 Possibly the single biggest factor that affects the difference between extrapolated GDP series and PPP benchmark results is due to exports and imports. GDP volume measures in the national accounts are unaffected by changes in terms of trade whereas they influence real GDP in spatial comparisons directly. For example, an increase in energy prices results in an increase in nominal GDP. In a spatial comparison, the outcome will be an increase in GDP volumes for energy exporting countries relative to other countries because the net trade PPPs are based on exchange rates, which do not respond to a change in the terms of trade to a significant extent in the short term. The result is that the increase in the terms of trade is treated as a volume effect in the PPP-based benchmark. On the other hand, in the national accounts of energy exporting countries, GDP volumes remain unchanged if the same amount of energy is exported and so the increase in the terms of trade is treated as a price effect, which is observed in the GDP deflator used as the price extrapolator.

### Non-market services

- 18.301-18.305 Another area that leads to consistency problems between countries' PPP-based volumes is the group of so-called "comparison-resistant services". They are predominantly (although not exclusively) non-market services, with government services being a major part of the non-market services that have to be priced for PPP projects. The main problems in pricing non-market services relate to the quality of the services being produced and the productivity of the labour used in producing them. One of the conventions used in producing the estimates for the government sector in most countries' national accounts is that the value of output is measured as the sum of the labour and material inputs used in producing the services(s), which involves an assumption that an increase in costs translates into an equivalent increase in output. In addition, when output indicators are not available, an assumption that is <u>sometimes</u> made in the national accounts is that the productivity of the labour involved in producing such services does not change over time either. A similar assumption, that productivity is identical in all the countries in a comparison, generally has to be made between countries in calculating PPPs. It is a reasonable assumption when countries at roughly the same level of economic development are involved in the PPP comparison. However, when countries at very different levels of economic development are being compared then the validity of the assumption breaks down.
- 18.30218.306 The choices faced by the compilers of PPPs are either to assume that productivity levels are identical across countries, even when they are at very different stages of economic development, or to adjust the non-market services estimates in some way to account for productivity differences. Apart from the problems involved in determining an appropriate conceptual approach to adjust for productivity differences between disparate economies, obtaining the data required to make such adjustments also proves problematical particularly when the method involves adjustments based on relative levels of capital intensity in the countries involved. Despite the problems involved in doing so are rather less than the consequences of assuming equal productivity in all the countries in a comparison.

### Conclusion

18.30318.307 PPP-based comparisons of activity levels between countries are an important use of national accounts. Despite the conceptual and empirical difficulties, PPP-based volumes provide a much firmer basis for international comparisons than the commonly used alternative of converting national accounts aggregates to a common currency using exchange rates.

#### 4. **Productivity comparison across countries**

18.30418.308 Productivity growth is often expressed in percentage terms and comparisons across countries are made in terms of these percentages. Assuming similar methods have been used to compile the estimates for the countries being compared, and that they have roughly comparable levels of productivity, this sort of comparison is interesting and much simpler than the alternative of comparing levels. Measuring the relative

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levels of production (for example, the volume of GDP or of GDP per capita) or productivity between countries is more complicated because it is necessary to convert the national accounts data to a common currency. The best means of doing so is to calculate purchasing power parities (PPPs), which measure the rate of currency conversion that would be required to equalize the prices of a common basket of goods and services between the countries concerned. In practice, PPPs adjust for differences in price levels between countries as well as differences in exchange rates.

 18.305
 The PPP International comparisons of productivity below the level of GDP, such as by industry, are problematic. PPPs are calculated using the expenditure-based estimates of GDP so there are no PPPs for the individual industries that contribute to GDP. Therefore, it is necessary to make an assumption that the PPP for a single aggregate such as GDP is applicable to all industries. Examining the differences in the PPPs for the various expenditure components shows they can vary significantly so this is unlikely to be a very good assumption. Making robust international comparisons of productivity at disaggregated levels is thus a very demanding exercise, though considerable progress has been made in recent years.