Chapter 20: Elaborating the accounts

(moved upwards, revised title and revised content)

(OLD Chapter 18: Elaborating and presenting the accounts)

A. Introduction

20.1 The preceding chapters explain both the accounting aspects of the SNA and the sequence of economic accounts, including supply and use tables and more detailed tables on the inputs used in the production of goods and services, labour and capital. This chapter builds on this information to describe how to elaborate the SNA in a way that better suits the needs of users.

20.2 Historically, the national accounts have typically been produced on an annual basis. Annual series are adequate to identify long term shifts in the economy, but to assess what is happening in the short term, higher frequency statistics – typically quarterly – fill the gap between short term indicators – typically monthly – and fully elaborated accounts and tables. Section B provides an overview of the key issues that need to be taken into consideration in producing quarterly national accounts.

20.3 Another important dimension of the accounts is that of regional accounts, where a region is typically a subdivision of a country. These accounts are particularly important where there are significant differences in economic circumstances between regions, and are useful for regional economic planning and development. An overview of aspects of regional accounting is provided in Section C.

20.4 Although no account or table in the previous chapters has illustrated it, the prime use of the SNA is in a time series context so that users of the accounts can assess how the economy is evolving and developing over time. To meet this requirement, it is essential that national accounts compilers maintain high-quality time series. Aspects associated with this are discussed in Section D.

20.5 A further issue to be considered in the compilation of the national accounts is that of high inflation. A method of measurement which gives acceptable approximate measures in more or less normal conditions may no longer be acceptable for countries with significant inflation. Section E describes how to handle high inflation when compiling the national accounts.

20.6 To explain all of the topics covered in this chapter in detail would require far more extensive discussion than is appropriate for the SNA, particularly detail regarding practical compilation issues. Accordingly, this chapter provides summary information with references, where appropriate, to manuals and compilation guidance where more detail can be found.

B. Quarterly national accounts

1. Introduction

20.7 The main purpose of quarterly national accounts (QNA) is to provide a picture of current economic developments that is timelier than that provided by annual national accounts (ANA), and more comprehensive than that provided by individual short term indicators. In addition, as with the annual accounts, QNA provide a coordinating conceptual framework for the design and collection of economic source data and a framework for identifying major gaps in the range of available short term indicators.

20.8 The QNA adopt the same concepts, principles, definitions, and structure as the ANA. In principle, the QNA cover the entire sequence of economic accounts, including balance sheets, in the SNA. In practice, the constraints of data availability, time, and resources, including collection costs, mean that QNA are usually less complete than ANA. However, the compilation of the QNA should not be considered in isolation but should be coherent and consistent with the ANA. In this regard, the benchmarking of QNA series to the relevant ANA series, as described below, is an important feature of QNA compilation.

20.9 The coverage of the QNA system in a country usually evolves. In the initial stage of development, only estimates of GDP with a split by industry and/or type of expenditure may be derived. Gross national income (GNI), saving, and consolidated accounts for the economy often follow next. Extensions can be made as the use of the system becomes more established, data sources become available, and users become more familiar with the data. Additional breakdowns of GDP, institutional sector accounts and balance sheets, and supply and use tables may be added.

20.10   Detailed information on compiling QNA is available in International Monetary Fund's *Quarterly National Accounts Manual* (2017) and the material in this section is a summary of information contained in the Manual. Eurostat's *Handbook on Quarterly National Accounts* (2013) also provides guidance on the compilation of quarterly accounts.

2.   Time of recording

20.11   The general time of recording principle in the SNA is the accrual basis. This principle applies to both annual and quarterly national accounts. Under the accrual principle, flows are recorded at the time economic value is created, transformed, exchanged, transferred, or extinguished. The application of accrual principles may present specific practical and conceptual problems for quarterly flows. These situations typically arise when the monthly or quarterly statistics on which the QNA are based record flows referring to economic events that accrue to periods longer (or shorter) than a calendar month or quarter. For example, wage arrears may be recorded in a particular month although they may accrue to several past payroll periods. The accrual recording is more complicated when there is a significant delay between the reporting period and the full-accrual event, which may give rise to revisions of quarterly estimates.

20.12   Transactions that have a fixed relation to a particular period (e.g., accrued in a previous period or accrued over a number of accounting periods) should be allocated to the periods in which they accrued. Examples are taxes on incomes and products that may be collected in a subsequent period and employee vacation leave entitlements that build up over time and are paid when the vacation is taken. If source data are on an accrual basis then adjustments are not likely to be needed, but if they are on some other basis (e.g., cash) then adjustments should be made. For example, in the case of taxes on income and production an appropriate time shift of the tax receipts may be an approach to obtain data on a quarterly basis.

20.13   Uncertainty in the amount to be allocated is another element that may complicate the compilation of quarterly data on an accrual basis. For example, the amount of a tax that is paid at the end of the year may not be known at the beginning of the year. In such cases, initial estimates based on the expected amounts should be calculated, and replaced when actual amounts are known, respecting the coherence between the QNA and ANA. Similar uncertainty exists in the allocation of expected crops output.

20.14   Work-in-progress concerns production that goes beyond one period and the measurement of such production must be split into separate periods. Because of the shorter accounting period, these difficulties are relatively more significant for the QNA than for the ANA. In the QNA, work-in-progress should be recorded for economic activities in which the production cycle goes beyond the quarter. Work-in-progress can be particularly important for industries such as agriculture, manufacturinge of ships and airplanes, and construction activities. See chapters 7 and 11 for more discussion on the measurement of work in progress.

3.   Definitions involving a year or more

20.15   The qualifying criterion for a fixed asset is that it should be used in production for more than one year. For consistency between the QNA and ANA, this period is maintained even for quarterly accounts. Similarly, the distinction between short term and long term in the classification of financial assets remains one year in the QNA.

4.   Coverage of quarterly national accounts

20.16   It is possible in principle to compile the whole set of accounts in the SNA, including balance sheets, on a quarterly basis. The most common sets of ~~quarterly national accounts~~QNA, though, are for the goods and services account, the income components of value added, government expenditure, the financial account and the balance sheet for financial assets and liabilities. The quarterly goods and services account should also be compiled in volume terms.

5.   Measuring GDP and its components

20.17   Measurement of GDP constitutes a core part of the QNA. As explained in chapter 19, there are three approaches to measuring GDP: (a) the production approach, (b) the expenditure approach, and (c) the

income approach.

20.18   The various approaches use specific source data and allow a distinct perspective on development and level of GDP by providing different breakdowns of GDP. They also facilitate cross-checking of data as, conceptually, the three measures should provide the same estimate of GDP. Therefore, it is recommended that countries estimate quarterly GDP using at least two of the three approaches.

20.19   The production approach is widely used for measuring quarterly GDP, in part because of a traditional focus in many countries on short term statistics on indicators of production, which can be used as inputs for QNA compilation. This approach involves calculating output, intermediate consumption, and value added at current prices as well as in volume terms by kind of economic activity. In most countries, output data are reasonably well covered for manufacturing, but the coverage of construction and services is usually less comprehensive. Components missing from output, intermediate consumption, and value added are typically estimated using ratios that reflect fixed coefficients; for example, intermediate consumption may be assumed to be ~~a~~ in a fixed proportion to output in the short term. Single indicator-based estimates will be biased to the extent that the ratios vary with factors such as seasonal effects, capacity utilisation, input composition, technological change, and productivity trends.

20.20   The expenditure approach usually has two strong pillars of quarterly data: namely, merchandise trade and government consumption. The other categories—in particular, household final consumption—are often less well covered. The major components of external transactions are usually available from the balance of payments and through merchandise trade statistics that often have a strong basis in comprehensive data collection for customs purposes. Data on government consumption can be derived from government administrative data, but directly observed data on fixed capital formation and, in particular, changes in inventories may be lacking. Nevertheless, it may still be possible to derive a useful split of GDP by categories of expenditure. For example, if GDP is estimated using the production approach and the compiler can estimate key expenditure components using available sources, then the missing components may be presented as a residual. These could be reduced over time if more expenditure data becomes available. One such missing component may be changes in inventories, because quarterly source data are often unavailable, or otherwise incomplete or inadequate. Although not an independent check of the GDP estimates, incomplete estimates of GDP by categories of expenditure (i.e., with some components derived as a residual) are useful for analysis in addition to providing some plausibility checks of GDP.

20.21   The expenditure approach provides particularly useful data for business-cycle and macroeconomic policy analysis and for forecasting. Also, this approach is typically most useful for policy reasons because, over the short term, demand can generally be more easily influenced than supply.

20.22   The income approach avoids some of the problems that may arise in using the production and expenditure approaches, such as the reliance on fixed ratios used in production data. The income approach may have a sound underpinning in statistics on the remuneration of employees or in administrative data on this remuneration (for instance, for social security purposes). Quarterly observations of operating surplus/mixed income are often unavailable although the increasing use of business accounting software is leading to the wider availability of income data on a quarterly basis, even for many small businesses in the formal sector. Even if income data are incomplete, it may still be possible to derive an income split where one of the categories (usually gross operating surplus) is derived as a residual. The distribution of income from GDP provides a useful alternative perspective on economic development. The income approach also provides necessary data for compiling the income accounts in the sequence of economic accounts.

20.23   The weaknesses of the various methods for compiling quarterly GDP can be mitigated by combining production and expenditure data using the ~~commodity~~ product flow method. This method is based on the fundamental national accounting identity shown in the goods and services account and supply and use tables (SUTs). The compilation of SUTs on a quarterly basis using the structures derived from the annual ~~supply and use tables~~SUTs provide a coherent framework for estimating quarterly GDP in both current price and volume terms. However, not all the required data are likely to be available on a quarterly basis and various assumptions using fixed ratios are required. Nonetheless, quarterly SUTs can provide a key tool for the compilation of the QNA or, as a minimum, a validation tool to help improve the QNA. SUTs are described in detail in chapter 15.

20.24   Compilers of quarterly GDP should ensure that the informal economy is covered, although it may not be well represented in source data. A common assumption in the QNA is that informal activities move together with formal ones. This assumption is not always plausible across time, particularly in countries with large shares of informality undergoing rapid changes. In such cases, compilers should periodically

reassess the ratio between informal and formal activities.

20.25   As discussed in chapter 1, NDP measures are conceptually superior to measures of GDP, but they may be more difficult to compile in practice because of the need for estimates of depreciation and depletion. Nonetheless, compilers of QNA are encouraged to compile estimates of NDP in addition to GDP. Even when separate quarterly estimates of depreciation and depletion are unavailable, the extrapolation and interpolation of statistics discussed below can be applied to annual estimates. As these components tend to be reasonably stable in the shorter term, they lend themselves quite readily to this approach.

6.   Quarterly accounts by institutional sector

20.26   Countries are encouraged to compile quarterly institutional sector accounts. These could be introduced simultaneously or, more commonly, be gradually developed in several stages. Accounts for the general government and the financial corporations sectors may be introduced first because of the availability of source data, the analytical usefulness of the statistics, and the desirability to have the data in a national accounting framework that would allow these sectors to be linked to the rest of the economy.

20.27   On the other end of the spectrum, separate quarterly data for the households and NPISHs sectors are usually more difficult to obtain, and these sectors may be combined in the QNA. In the absence of direct data, indicators, such as retail sales, can be used to estimate particular components. In the absence of any source data of sufficient quality, these sectors could initially be calculated as a residual. However, given the importance of the household sector, particularly household income accounts, for the analysis of economic well-being, compilers are encouraged to develop data sources that would enable the compilation of quarterly household sector for at least the income accounts.

20.28   Financial accounts by institutional sector may be easier to implement than the income and capital accounts, because data on transactions and stocks of financial assets or liabilities by counterpart sectors are often available as a by-product of regulation or monitoring of the financial sector.

20.29   A helpful principle in compiling institutional sector accounts is making use of counterparty information: that is, in any transaction involving two parties, information can be collected from the party from which it can be most efficiently collected. For instance, data on interest payable by government to households can be obtained from one or a relatively small number of government agencies, rather than many households. Counterparty information becomes particularly important in a quarterly context when there are more likely to be gaps in data. One issue to be considered is that data providers may not always be able to provide data on the institutional classification of the counterparts so some estimation may be required.

20.30   As previously mentioned, the income approach to measuring GDP is a foundation for the income accounts by institutional sector. The availability of data on GDP by income component and by institutional sector enables the earned income accounts to be completed by institutional sector. Thus, countries that compile quarterly estimates of GDP using the income approach typically have better-developed quarterly accounts by institutional sector.

20.31   Data for estimates of capital formation by institutional sector should be collected from the purchaser rather than the supplier of the capital, as the supplier may not know what institutional sector is acquiring the assets. These estimates are an important component of the capital accounts. For institutional sector data, it is necessary to cover the second-hand assets; while for the total economy, transactions in existing assets largely cancel out (except for transactions with non-residents, which can be obtained from trade and balance of payments statistics, and sales of used vehicles from businesses and governments to households). The same considerations apply to the stocks of non-financial assets for balance sheets. Similar to the stocks for the whole economy, they are likely to be stable in aggregate, although transactions in second-hand assets may be a more significant issue.

20.32   The financial accounts and the financial components of the balance sheets are usually among the more complete institutional sector data. Balance sheet data are often already collected from financial corporations. If the counterparts in each transaction, or financial asset or liability position are classified by institutional sectors, there is a strong basis for compiling the data for all the sectors, not only the financial corporations themselves. In addition, data from the balance of payments and the international investment position (IIP) would show transactions and financial asset and liability positions between non-residents and residents, which provide another critical element in institutional sector financial accounts.

20.33 Attention should also be paid to financial transactions and stocks of assets and liabilities not included in financial sector and balance of payments data, such as household equity in corporations, ~~as well as other accounts receivable/payable~~or particular types of liabilities of non-financial corporation. In these cases~~For example~~, stock exchanges and security holding databases may~~can~~ provide additional information ~~about particular types of liabilities of non-financial corporations~~.

20.34 If the accounts are derived independently, net lending/net borrowing for both the capital and financial accounts will act as checks on each other. Alternatively, if only one account is available, the balancing item can be used as a starting point for compiling the other. For a more general discussion on this point, see chapter 19.

7. Source data issues

20.35 QNA data sources are generally more limited in detail and coverage than those available for the annual estimates. QNA data sources need to be more timely than the data for the annual estimates, a factor that could affect data availability and may increase data collection costs. As a result, QNA compilation may rely on indicators that best capture the movements in the target variable in the past and in the future. Therefore, the basic principle in selecting and developing sources is to obtain indicators that best reflect the economic activity being measured. In some cases, source data are available in a form ready for use in compiling QNA with little or no adjustment. In other cases, the source data may differ substantially from the ideal and will need to be adjusted. These adjustments may typically be ~~established~~ determined using ratios established in benchmark years for which additional data sources—such as the results of more comprehensive and detailed surveys or censuses—may be available. In these cases, the QNA estimates are anchored to these main benchmark years and the regular source data are used as indicators to update the benchmark estimates (extrapolation). See section D for more information on extrapolation.

20.36 The choice of a suitable indicator is based on the assumption that it is able to reflect the changes in the target variable. However, these indicators should be reviewed on a regular basis because the economic conditions (e.g., production relationships or price relationships of the variable) may have changed over time. The suitability of an indicator must first be assessed qualitatively by examining the similarities and differences with the target variable in terms of scope, definitions, frequency, coverage, and so forth. The most desirable indicators differ only slightly from those used in ANA, for example, by being based on a sound sample but with less detailed data. Less satisfactory are indicators that cover only a part of the total, such as the key products or a subset of producers in an industry. However, if these indicators display growth rates that are consistent with the variable being measured, then they could be quite useful. Even less satisfactory are indicators that measure a variable related to the process or population of the target variable, but less directly, such as labour inputs as an indicator of the output of market services.

20.37 Indicators that apply past trends or measure a variable that is connected to the target variable only by a behavioural relationship or statistical correlation should be avoided, because the underlying relationships can be expected to be less stable than is the case of an indicator with a direct intrinsic relationship to the target variable.

20.38 The quality of source data for QNA can be assessed by comparing growth rates derived from the sum of four quarter estimates compiled using the QNA source data with those derived from annual estimates (when the annual estimates are compiled from independent, higher-quality, source data). This should be done before the quarterly estimates are benchmarked to the annual estimates, as discussed below. If there are significant discrepancies, then ways of making improvements to the source data, or improvements in the way the source data is used in the QNA compilation should be considered. This is especially important where indicators that are used to measure a target variable by way of a ratio derived from historical relationships, as these relationships can change over time as economies evolve.

8. Volume and price measures

20.39 For consistency reasons, ANA and QNA volume data should be derived using the same formula index. Conceptually, a superlative index, such as the Fisher index, is the preferred formula for aggregating elementary price and volume indices in the QNA. An acceptable, and likely more practical, alternative is to use a Laspeyres formula for volumes with the implicit Paasche formula for prices. If Fisher indices are used, quarterly indices should be calculated using quarterly weights and chain-linked using the one quarter overlap technique. The quarterly chain Fisher series should be benchmarked to the corresponding annual chain Fisher series.

20.40 When the Laspeyres volume index is chosen, quarterly volume measures should be derived using annual weights from the previous year. Quarterly volume measures based on the Laspeyres formula can be chain-linked using either the one-quarter overlap, typically using the fourth quarter of the previous year as the overlap quarter, or the annual overlap technique. The one-quarter overlap technique is the best choice to preserve the time-series properties of the volume series, but should always be used in conjunction with benchmarking to remove inconsistencies with the annual chain-linked data. Instead, the annual overlap technique can be used to derive quarterly volume measures that are automatically consistent with the corresponding annual ones. When the annual overlap technique is preferred, tests should be run to verify that there are no artificial steps between years in the chain-linked series.

20.41 Because chain volume data in monetary terms are typically not additive, the discrepancy between chain-linked components and chain-linked aggregates should not be removed.

20.42 The expenditure split is generally the most practical to measure quarterly GDP in volume terms because there is a relatively clear concept of price and volume for each demand category. In contrast, the price and volume dimensions of value added are more complex because value added cannot be directly observed and quarterly data on outputs and, more probably, intermediate consumption may not be available. The income approach is not suited for price and volume measures, although some analysts may be interested in deriving estimates of real income (see chapter 18 for a description of the measurement of real incomes.) For a more comprehensive discussion of volume and price measure see chapter 18.

9.   Seasonal effects

20.43 QNA series will display seasonal variations when they measure economic flows that are influenced by weather conditions, administrative reasons, trading day variations or other recurrent within-a-year patterns. These factors are often predictable. ANA variables, in contrast, do not contain seasonal patterns because the seasonal movements disappear when the quarterly data are aggregated into annual data.

20.44 Because users are often interested in removing predictable variation in order to highlight other changes in the series, it is common practice for QNA compilers to produce seasonally adjusted data based on well-established seasonal adjustment procedures that are described in the IMF's *Quarterly National Accounts Manual* (2017) and Eurostat's *ESS Guidelines on Seasonal Adjustment* (2015) and *Handbook on Seasonal Adjustment* (2018). Seasonally adjusted data retain the long term trend, the business-cycle movements, and the irregular effects in the series, but exclude seasonal and calendar effects. Simply adjusting for the number of days, or even trading days, in each period is not a substitute for seasonal adjustment as this technique does not take account of the impact of other seasonal affects.

20.45 Unadjusted data can also be useful in econometric models to exploit the information contained in the seasonal component of the series in modelling the dynamic relationship among the variables. In the context of QNA compilation, unadjusted series may be better suited for balancing purposes when the seasonal component is significant.

20.46 Seasonal adjustment procedures require that seasonal effects are relatively stable and ~~consistent for several years; usually a~~typically a minimum of ~~three~~ five years data is required to produce quarterly seasonally adjusted estimates. Seasonal adjustment procedures do not produce accurate results when the seasonal component has an unstable and fast-evolving pattern. ~~or when it shows breaks in the seasonal pattern~~. Structural changes in the seasonal patterns can be handled by seasonal adjustment procedures, although experts may be needed to provide practical advice. ~~However, C~~compilers should avoid that implausible or artificial seasonal effects are treated as true signals and passed on as such to the seasonal adjustment phase.

20.47 The seasonal pattern of QNA series should be checked and validated. In the assessment of seasonality, compilers should pay particular attention to possible breaks in the seasonal pattern. When these breaks are noted, it is necessary to investigate the causes behind these breaks and understand whether these events are temporary or permanent, which may influence their treatment in the seasonal adjustment procedure.

10.   Consistency between quarterly and annual accounts

20.48 To avoid confusion about interpreting economic developments, it is essential that the QNA are consistent with the ANA. Differences in growth rates between QNA and ANA estimates cause confusion for users

and uncertainty about the reliability of the actual measurements. Consistency means that the sums of the non-seasonally adjusted estimates for the four quarters of the year should be equal to the annual estimates. In the situation where the ANA or ANA components are built up from the QNA, consistency is achieved by construction. The ANA may, however, be based on different sources than the quarterly estimates, and therefore, differences are expected. To overcome this issue, the non-seasonally adjusted QNA data should be aligned with the annual data using benchmarking techniques. One advantage of benchmarking is that incorporating the usually more accurate annual information into the quarterly estimates increases the accuracy of the quarterly time series. Benchmarking also ensures an optimal use of the quarterly and annual source data in a time-series context. Benchmarking is discussed further in section D.

11.   Compilation of early estimates

20.49   Compilers of QNA may produce early estimates of quarterly GDP in response to a strong demand of users for a rapid measurement of macroeconomic developments, although the level of detail may be reduced due to a greater recourse to estimation methods. These early estimates are sometimes known as "flash" estimates. Early estimates typically use a similar compilation approach to that used for later estimates of the QNA, but are generally based on a partial set of source data. In some cases, non-official data sources such as business confidence or consumer confidence might be used; however such data sources need to be used with caution as they are not direct measures of economic activity. A greater use of statistical methods and assumptions is required to estimate missing observations at the time of the early estimate. In deciding the timing of early estimates, compilers should balance the trade-off between timeliness and reliability. As discussed in Section D, revisions studies should be conducted to analyse the revision process of early estimates and assess their reliability, including any early bias in the estimates. Eurostat's *Handbook on Rapid Estimates* (2017) provides further information on the compilation of rapid estimates.

20.50   Related to the compilation of "flash" estimates is the emerging field of nowcasting. The advances in technology in the first part of the twenty-first century have given rise to the field of big data and the development of various data science techniques to utilize such datasets. Nowcasting involves using mathematical algorithms to estimate current trends within a short timeframe. Nowcasting high level aggregates such as GDP is fraught with challenges, but can work well when the proxy indicators are related to the target variable which might be in the case of, for example, household consumption. If nowcasting techniques are used, it is important to develop predictability analysis of the results to determine their appropriateness in compiling official statistics. However, if nowcasting techniques are not actually used in compilation, they can provide a useful tool for assessing the validity of estimates compiled using more traditional approaches.

12.   Quarterly national accounts and short term indicators

20.51   The QNA are less timely than short term indicators, but they provide a more comprehensive picture of current economic developments organized in an integrated framework for analysing the data. Short term indicators such as price indices, labour market indicators, industrial production indices, and turnover data for retail trade are often available monthly, shortly after the reference period. These short term indicators provide valuable information on specific aspects of current economic developments, and may also be useful source data for compiling QNA. However, these indicators are often not based on national accounts concepts and do not provide a coherent, comprehensive, and consistent picture of the different aspects of the current economic situation. This hampers tracing the causes of current problems and identifying potential future developments. For instance, for a country facing decreasing domestic output growth, it would be helpful to identify causes such as decreasing domestic demand or falling exports and to further trace deeper causes such as income, saving, and investment patterns affecting demand categories, information on which would be available from a comprehensive set of quarterly national accounts.

20.52   In recent times, new non-official sources providing daily or weekly data covering specific aspects of the economy have become available. Examples include estimates of credit and/or debit card spending, road traffic data and monthly VAT collections. These so-called real time indicators are not on a national accounts basis, but can provide a very timely snapshot of particular aspects of economic activity and can be useful in compiling flash estimates.

13. Quarterly national accounts as time series

20.53 The QNA data should be presented in a time-series format. A time series is a collection of observations ordered in time. A time-series format of QNA data is essential for a number of uses, including business and trend cycle analysis, identifying turning points, studying dynamic relationships between economic variables (in particular, leads and lags) and forecasting. The QNA should be compiled and disseminated in quarterly discrete form – i.e., as estimates for each quarter –– and not in cumulative form. Cumulative data do not constitute time series. Observations based on cumulated series cannot be compared, because they measure periods of time with different length.

20.54 For time series recorded in a consistent manner over time, series of period-to-period changes (e.g., GDP quarter on previous quarter growth) or changes from the same period of the previous year (e.g., GDP growth between the third quarter of the current year and the third quarter of the previous year) are generally used to assess short term movements or annual trends from quarterly data. As the quarter to quarter growth rates may be influenced by changing seasonal and calendar effects, seasonally adjusted estimates should be used for assessing movements. On the other hand, growth rates calculated using changes from the same period of the previous years are unlikely to be noticeably impacted by seasonal factors and in this case seasonally adjusted data may not be needed to calculate these growth rates.

20.55 To further highlight the underlying trend-cycle, most standard seasonal adjustment packages also calculate a smoothed trend cycle series, representing an estimate of the combined long term trend and the business-cycle movements in the series. Further information on time series aspects of national accounts can be found in Section D.

C. Regional accounts

1. Introduction

20.56 Regional accounts, also referred to as sub-national accounts, play an important role in the formulation, implementation and evaluation of regional policies. In particular, regional indicators resulting from the regional accounts are used for assessing regional disparities. Regional accounts generally make use of the concepts of the national accounts, though there are issues at a regional level for which additional guidance is needed. Furthermore, the compilation of regional accounts creates additional practical challenges, particularly in regard to the availability of source data. For these reasons they are usually more limited in scope and detail than the national accounts.

20.57 A particular feature of regional accounts is that each region is treated as a different economic territory. In this context, transactions with other regions are recorded as if they are external transactions. External transactions of the region must distinguish between transactions with other regions of the country and transactions with the rest of the world.

20.58 Detailed information on compiling regional accounts can be found in Eurostat's *Manual on Regional Accounts Methods* (2013). This sSection provides an overview of the main issues and preferred methods associated with regional accounting.

2. The regional economic territory

20.59 The economic territory of a country is described in paragraph 5.xx). A regional economy of a country is part of the total economy of that country. The total economy is defined in terms of institutional units and sectors. It consists of all the institutional units which have a centre of predominant economic interest within the economic territory of a country. The economic territory does not coincide exactly with the geographic territory as there may be resident institutional units that undertake production outside the geographic territory. The economic territory of a country can be divided into a so-called "regional territory" and the extra-regional territory. The former consists of that part of the economic territory of a country that can be directly assigned to a region within the geographic territory of a country, including any free zones and bonded warehouses.

20.60 The extra-regional territory is made up of the components of the economic territory of a country which cannot be assigned to a region and consists of:

   a. The national air-space, territorial waters and the continental shelf lying in international waters over which the country enjoys exclusive rights.

b. Territorial exclaves (i.e. geographic territories situated in the rest of the world and used, under international treaties or agreements between states, by general government agencies of the country, e.g. embassies, consulates, military bases, scientific bases etc).

c. Deposits of oil, natural gas etc. in international waters, outside the continental shelf of the country, operated by resident units.

20.61   Because economic activity undertaken in the extra-regional territory cannot generally be allocated to a specific region, the extra-regional territory usually appears as an additional region in the regional accounts. An alternative would be to assign the extra-territorial areas to a particular region or regions on the basis of either geographic or economic attachment.

20.62   The regional territory will be divided into regions in a way that best supports economic analysis, taking into account the availability of data to support the compilation of regional accounts. For countries that have states or provinces, these are typically used as the basis for regional accounts. Other administrative entities, such as departments or regional councils, could also be used. However, the regions do not need to be administrative entities. For example, in the European Union (EU), regional accounts are prepared on the basis of the Nomenclature of Territorial Units for Statistics (NUTS), which divides the territory of the EU for the purpose of the collection, development and harmonisation of EU regional statistics, socio-economic analysis of the regions and framing of EU regional policies.

20.63   In principle, regional accounts could be compiled at any level of disaggregation of an economic territory. In practice, the more detailed the regions, the more difficult it is to compile high quality regional accounts, particularly because source data will often not readily support detailed disaggregation. There may also be issues with data confidentiality.

20.64   As mentioned above, a full system of accounts at the regional level implies treating each region as a different economic territory. Economic transactions of both enterprises and households may cross regional boundaries. For instance, transport services and energy supply can consist of moving goods between two or more regions. Employees can earn their wages or salaries in a region different from their home region and households can spend part of their income outside the resident region. In this context, transactions with other regions are recorded as if they are external transactions. External transactions of the region must distinguish between transactions with other regions of the country and transactions with the rest of the world.

20.65   A particular issue that exists in compiling regional statistics is establishing the appropriate statistical unit. Conceptually, the establishment is the preferred unit, as it should have a local presence that can be allocated to a particular region. However, establishments do not typically have the full range of information required for compiling the full set of institutional sector accounts. Even when it comes to compiling statistics on the production of goods and services, including the inputs needed for this production, it may be problematic to estimate, for example, gross operating surplus which is typically available at the enterprise level only, and not at the establishment level. This can create challenges for compilers, which are summarised where relevant in this section. For a comprehensive discussion on statistical units, see chapters 5 and 6.

20.66   The general principle for regional accounts is that economic activity should be allocated to the region where the institutional unit undertaking the activity is resident. For households, this typically presents less difficulties, as households can generally be allocated unambiguously to a particular region. As with accounts prepared at the national level, the determination of the residence for certain types of persons, such as students and patients, requires particular consideration, and in this regard the guidance for determining residency as explained in chapter 5 should be applied at the regional level for the purpose of regional accounts.

20.67   For other institutional units, the allocation of economic activity may be less straight-forward. Three cases can be distinguished:

a. There are units where their centre of predominant economic interest is in one region and where their activities take place in this region. This includes corporations whose establishments are all located in the region, local and state governments, and many NPISHs.

b. There are multiregional units where their centre of predominant economic interest is in more than one region, but does not necessarily relate to the country as a whole. Many corporations and several NPISHs are in this situation.

c. There are units that are solely national units, which means that their centre of predominant economic interest is not located geographically even in the sense of multiregional locations (although they may undertake activities at particular locations). This is usually the case of central government and may be the case for a small number of corporations (probably public), generally in a monopolistic or quasi-monopolistic situation, such as the national railway corporation or the national electricity corporation.

20.68 Assigning transactions of the units with economic activity in only a single region to a specific region does not raise any conceptual problem. Assigning the transactions of multiregional units between various regions raises more difficulties. When considering deliveries between units of the same enterprise in different regions, it is necessary to apply the recommendation in paragraph 6.xx about intra-enterprise deliveries. Such deliveries are recorded only when the receiving unit assumes responsibility for making the decisions about the level of supply and prices at which their output is delivered to the market. When this is not the case, the receiving unit is regarded as providing only a processing service to the sending unit.

20.69 Further, some of the transactions of multiregional units simply cannot be allocated between the different regions in which they operate. This is the case for most property income and financial transactions. Likewise, interest on the public debt payable by central government cannot be geographically located. This limits the usefulness of balancing items such as saving and net lending at the regional level (other than for households).

20.70 The residence principle implies, for example, that gross value added from transporting goods across several regions will not be partitioned between the regions, but allocated to the region where the production unit is resident. An example for households is that household expenditures in another region will be allocated to the region of residence of the household. Another consequence is that the value added of enterprises with establishments in more than one region will be allocated to the regions where the establishments are located and will not be allocated entirely to the head office or administrative address of the enterprise.

3. Commuting

20.71 Persons can cross national boundaries as non-resident border workers, but it is more common for persons to cross borders between regions as commuters, particularly for smaller regions and regions around metropolitan centres. Commuters can be employees or self-employed. Self-employed persons are recorded as businesses operating from the region where the self-employed person resides. According to the residence principle, commuting employees contribute to gross value added in the country and region in which the establishment where they work is resident. Thus, the regional estimates for labour costs reflect the remuneration of employees at the place of work and not at the dwelling place of the employees. As a result, commuting affects the interpretation of gross value added and GDP per head of the population. Net commuter inflows into regions increase production beyond that possible by the resident active population. Regional GDP per capita appears will be relatively high in regions with net commuter inflows and relatively low in regions with net commuter outflows. It may be useful to compile estimates of regional GDP per person employed.

4. Measuring regional GDP

20.72 Typically, regional gross value added at basic prices is compiled on an industry basis using either the production or income approach. (See chapter 19 for a discussion of these approaches.) If possible, the use of both approaches, compiled independently, is encouraged because it enables the two sets of estimates to be compared against each other to assist in quality assuring the results. Regional GDP is derived from regional gross value added by adding regionalised taxes less subsidies on products.

20.73 Conceptually, regional GDP could also be compiled using the expenditure approach. However, this approach requires information on imports and exports, which at the regional level involves transactions in goods and services between regions. Collecting this information is typically difficult in practice. However, producing regional estimates of other components of the expenditure approach, such as final consumption and gross fixed capital formation expenditures, can be very useful for analytical and policy purposes.

5. Regional accounts by institutional sector

20.74 For a range of reasons, including the difficulties of allocating property income and financial flows of multiregional and national units across regions, in most cases regional accounts are limited to recording production activities and more complete accounts for institutional sectors composed of regional units, such as households, and state and local governments.

20.75 There are no conceptual constraints to compiling a complete set of regional accounts for households and state and local governments, namely: the production account with gross value added as balancing item; the generation of earned income account with gross/net operating surplus and mixed income as balancing items; the allocation of earned income account with the balance of earned income as a balancing item; the income transfers other than social transfers in kind account with gross/net disposable income as balancing item; the use of income account with saving as balancing item; and the capital account with net lending or net borrowing as balancing item.

20.76 Regional household income accounts, in particular, can be important in understanding the economic well-being of regions and can play an important role in regional policy development. Therefore, countries that compile regional accounts are strongly encouraged to compile household income accounts. This would include highly relevant regional estimates of household final consumption in the use of income account.

20.77 For countries that aspire to compile regional accounts for other sectors, a reasonable solution would be to introduce a kind of national "quasi-region", not allocated as such between the regions and being treated as an extra region. This national "quasi-region" may include the head offices of enterprises that have establishments located in, and assigned to, the regions, as well as national units.

6. Methods of regionalization

20.78 There are essentially two general methods for estimating regional aggregates – the "bottom-up" and "top-down" methods.

20.79 The bottom-up or ascending method of estimating a regional aggregate involves collecting data at the local establishment level or the residence of households and aggregating these values to get a regional total. The method is called "bottom-up" because the elements for compiling the aggregate are directly collected at the regional level. This method can be used for enterprises that operate in only one region, or for establishments and households if full information is available.

20.80 A pseudo bottom-up method can be followed where data for establishments or the residence of households are not available. Data for establishments can be estimated from enterprise data allocated using regional indicators. The estimates can then be aggregated to obtain regional totals just as in a purely bottom-up method. This method can be used especially for multiregional enterprises.

20.81 A technique that sits in-between a pure bottom-up approach and a pseudo bottom-up approach can be used when partial information is available for establishments. For example, information on ~~renumeration~~remuneration of employees may be available at the establishment level, but not information on gross operating surplus. In this case, the information on ~~renumeration~~remuneration of employees would be used directly in a bottom-up approach, and estimates of gross operating surplus at the enterprise level could be allocated to establishments in proportion to ~~renumeration~~remuneration of employers.

20.82 In the top-down method a national figure from the national accounts is distributed using regional indicators which are as close as possible to the variable to be estimated. For example, remuneration of employees might be allocated to regions using the regional distribution of the total number of full time equivalents of employees, multiplied by the average annual earnings per employee from a different statistical source. This results in the regional distribution of total earnings of employees, which can be used as a regional indicator for the allocation of remuneration of employees to regions. However, indicators that allocate activity to where it takes place, rather than the region where production occurs, ~~basis,~~ such as allocating the gross value added of rail passenger transport to regions according to the number of passengers transported in a region, should be avoided if possible.

20.83 In terms of quality and precision, the bottom-up approach is preferred, especially when the source data are available and of an acceptable quality. However, in practice, regional accounts are likely to be compiled using a mixture of bottom-up and top-down approaches depending on the availability of source data.

7. Volume and price estimates

20.84 In measuring price and volume changes, the principles applied for the national economy also apply to regions. However, there may be problems with regional data which make applying these principles to regions difficult. These include:

    a. information on regional price changes is often not available.

    b. if regional value added in current prices is directly estimated and not by deducting intermediate consumption from output, then double deflation of regional value added is not possible.

    c. in the absence of regional supply and use tables, price and volume changes cannot be measured and assessed in such a framework.

20.85 A commonly used approach is therefore to deflate regional value added by industry on the basis of national price changes by industry. This is carried out at the most detailed level at which gross value added at current prices is available. Differences between national and regional price changes due to differences in economic structure by industry are taken into account. However, this solution is still vulnerable to major differences between national and regional price changes. Examples of such differences are:

    a. Differences in cost structure, technological intensity and composition of outputs within one industry between producers in different regions. There can be large variations in price changes amongst regions for a single industry.

    b. Regional differences in the price changes of major inputs, <u>for example,</u> ~~e.g.~~ changes in the price of labour, land and renting office space. However, the existence, for example, of national wage agreements with no regional differentiation implies that regional differences in changes in wage rates are likely small.

8. Regional input-output statistics

20.86 Regional input-output statistics comprise regional supply and use tables and the input-output tables based on them. The data in the tables improve the precision and add depth to regional accounts data. They describe the structure of production in the regions, relationships between economic activities and the dependence of regions on the product flows in other regions and abroad.

20.87 Regional input-output statistics form an integral part of regional accounts. Product flows described according to a consistent and logical framework add to the content of regional accounts data and enhance their quality. Supply and use tables describe the supply of products generated by production and imports in a region and the use of these products in the production of other goods (intermediate consumption), consumption as final products, capital formation and exports. The symmetrical input-output tables which are derived from supply and use tables describe interdependencies between economic activities. Analytical tables derived from them can be used to study the importance of the production and final use of economic activities to regional economy and employment.

20.88 Notwithstanding the benefits of compiling regional input-output statistics, they are data intensive and ideally require data for all components, including regional trade in goods and services. Generally, the full range of data is not available, so estimates of missing components are often derived using models. Due to the extent of modelling that may be required, regional input-output tables are often produced by organizations like universities or economic research institutes. Nonetheless, given the usefulness of regional input-output statistics, national statistical offices that produce regional accounts should investigate the possibility of producing regional input-output statistics. If, however, it is determined that they cannot be produced to the quality necessary for official statistics, the national statistical office should support other institutions that may be prepared to produce these statistics, or alternatively produce the statistics as experimental statistics with adequate metadata on the quality of results. Further information on supply and use tables can be found in chapter 15 and on input-output tables in chapter 36.

D. Time series aspects of national accounting

1. Introduction

20.89 Every nation's economy fluctuates between periods of expansion and contraction. These fluctuations, which are known as the "business cycle", are caused by changes in levels of employment, productivity, and the total demand for and supply of the nation's goods and services. In the short run, these changes lead to periods of expansion and contraction, often referred to as a "recession". But in the long run, in an economy with underlying growth in potential output, the peaks will be higher each time.

20.90 Conceptually, the typical business cycle has four phases, which progress as follows:

    a. Expansion: when the volume of GDP is increasing, and unemployment is typically decreasing.

    b. Peak: the turning point in the business cycle at which output stops increasing.

    c. Recession: when the volume of GDP is decreasing, and unemployment is increasing.

    d. Trough: the turning point at which a recession ends and the volume of GDP starts increasing.

20.91 A major strength of the national accounts is to offer long and consistent time series, which are a necessary ingredient for monitoring the business cycle and for economic modelling and forecasting. National accounts data should be comparable over time to provide accurate measurements of short and long term economic changes. This presents two particular challenges for compilers.

20.92 First, high quality data sources are often available less frequently than the frequency with which the accounts are compiled. To overcome this, national accountants use data sources that are timelier, but are of lower quality. To ensure that the best use is made of source data, the higher quality data sources are introduced when they become available, and the lesser quality but more frequent data sources are integrated through a process known as extrapolation and interpolation. Underpinning this approach are benchmarking techniques, which are discussed below in sub-section 2.

20.93 The second challenge occurs when new concepts, methodologies etc. are introduced into the national accounts. In theory, the impact of these changes should be carried as far back as possible to avoid breaks in the series. In practice, this task is complex because the data to compile back periods under new principles may not be available or new classifications may simply not be applicable to previous periods. Consequently, it may not be possible to re-calculate back series following the same methodology used for current periods and backcasting is required. Backcasting is discussed in sub-section 3.

20.94 Both benchmarking and backcasting lead to revisions in national accounts series, which need to be carefully managed and explained to users. The issue of revisions is touched upon is sub-section 4.

2. Benchmarking

20.95 Benchmarking deals with the problem of combining a series of high-frequency data (e.g., quarterly data) with a series of low-frequency data (e.g., annual data) for the same variable into a consistent time series. The two series may show different levels and movements, and need to be made temporally consistent. Because low-frequency data are usually more comprehensive and accurate than high-frequency ones, the high-frequency series is benchmarked to the low-frequency one. Benchmarking is also relevant to link the data between two comprehensive revision periods, where the national accounts are comprehensively revised say every five years.

20.96 Benchmarking methods should be used to derive more frequent series that (i) are temporally consistent with the less-frequent benchmarks, (ii) preserve as much as possible the movements in the indicators, and (iii) provide accurate extrapolations for periods going forward.

20.97 The pro rata method, which is a simple method of benchmarking, should be avoided. The pro rata method distributes the temporal discrepancies—the differences between the estimates derived from the more-frequent series and those derived from the less-frequent data—in proportion to the value of the indicator. The pro rata approach produces unacceptable discontinuities from one benchmark to the next (the so-called step problem) and therefore does not preserve the movements in the indicator from the last period before the benchmark to the period following the benchmark. Techniques that introduce such breaks in the time series seriously hamper the usefulness of the time series by distorting economic developments and possible turning points. They also ~~thwart~~ hinder forecasting and constitute a serious impediment for

seasonal adjustment and trend analysis.

20.98   To avoid the "step problem", proportional benchmarking methods with movement preservation of indicators should be used to derive more frequent series. The preferred solution is the proportional Denton method. The proportional Denton method preserves the movements in the more frequent series as much as possible subject to the restrictions provided by the benchmarking data. As an alternative to the Denton method, the proportional Cholette–Dagum method and its variants can also be used. These benchmarking techniques are explained in detail in Chapter 6 of the IMF's *Quarterly National Accounts Manual* (2017). As explained in the Manual, even though the chapter is focused on the quarterly-to-annual benchmarking, the principles and methods outlined apply to benchmarking of any other high-frequency to low-frequency data. Eurostat's *ESS guidelines on temporal disaggregation, benchmarking and reconciliation* (2018) also provide further information on this topic.

20.99   Benchmarking should be an integral part of the national accounts compilation process and should be conducted at the most detailed compilation level. In practice, this may imply benchmarking different series in stages, where data for some series—which have already been benchmarked—are used to estimate other series, followed by a second or third round of benchmarking. The actual arrangements will vary depending on the particularities of each case.

20.100   To avoid introducing distortions in the series, incorporation of new benchmarking data will generally require revision of previously published higher frequency series for several years. As noted above, benchmarking methods with movement preservation (like the Denton method and the Cholette–Dagum method) minimize the impact of revisions on the historical movements of the higher frequency series.

3.   Backcasting

20.101   The term "backcasting" (or "back-calculation") relates to all the steps undertaken to reconstruct backward data using current measurement standards. The objective is to provide the user with long and consistent time series that maintains the economic history of a country. In the national accounts, a backcasting exercise is typically required at the time of a major revision for introducing methodological changes, new accounting standards, new concepts, new classifications, new benchmark years or base years, or new data sources. These revisions may lead to breaks in the time series when they cannot be applied for the entire length of the national accounts. These breaks can hamper the comparability between observations in the pre- and post-revision periods.

20.102   There are two general backcasting approaches: (i) the micro approach and (ii) the macro approach. The micro approach aims at recompiling the historical estimates starting from the source data at the elementary level of detail. The micro approach guarantees the most accurate results as the micro data are processed and aggregated using the new concepts, definitions, classifications etc. However, the necessary source data may not exist, or it may not be feasible to rerun the entire compilation process with available resources and time constraints.

20.103   In contrast to the micro approach, the macro approach aims at backcasting at more aggregate levels. The macro approach comprises statistical techniques and estimation methods that make a greater use of assumptions about how new concepts principles etc. apply to the past. These methods can make use of previously published series, indicator series or intermediate series calculated in the various steps of the national accounts compilation process. As results may differ according to the aggregation level of the data; compilers should choose the preferred detail level considering the complexity of the backcasting exercise and the quality of the recalculations. Ideally, backcasting methods should be applied at the most detailed level of the national accounts compilation.

20.104   In practice, countries should adopt a mix of backcasting methods that best suit their specific circumstances and needs of the particular backcasting exercise.

20.105   Splicing (or linking) is the simplest and most common macro backcasting method. Splicing can be used to link the new series with the old published national accounts series. The only requirement is to have an overlap between the old and new series for at least one period. The old and new series should measure as much as possible the same concept. Back data are obtained by multiplying the values of the old series by the ratio between new and old levels in the overlap period. In the case of quarterly series, the overlap period can be either the first quarter or the first year in the new series. In the former case, the new series will show the same quarter-to-quarter rates of change of the old series in the backward period. With annual splicing, the adjustment ratio is taken from the whole year; in this case, the spliced series will preserve the old annual rate for the overlap year.

20.106   The assumption underlying basic splicing is that the impact of the changes in the overlap period remains the same in the backcasting period. If this assumption is unlikely to hold true, alternative methods, as discussed below, should be used.

20.107   Quarterly splicing is the preferred approach as it provides the smoothest transition between the old and new series. However, compilers should be aware that quarterly splicing may introduce a break in the seasonal pattern if the new series presents seasonal effects that are different from those in the old series. Annual splicing could be preferable when there is a need to preserve the annual movements in the overlap period.

20.108   Another splicing possibility is to link gradually the old series to the new series. This approach aims at interpolating the new level of the series with a particular point in time of the backcasting period (one year or one quarter). The rates of change in the in-between periods will change accordingly. This method can be appropriate when a particular level in the old series should be preserved. This situation could arise when it is required to maintain levels of national accounts variables that had been estimated from previous benchmark revisions.

20.109   More sophisticated backcasting methods may be required when the assumptions underlying basic splicing techniques do not hold. For example, a more elaborated backcasting solution should be devised when there is an update of classifications. In such cases, assuming that the new series present the same movements of the old series may lead to incorrect results. New classifications may bring out items that did not exist before, or may change the way previous items were aggregated in top-level groups. Furthermore, an additional constraint for pure classification changes is that the total should not change. Bridge tables between old and new classifications should be created to help reconstruct old indicators according to a new classification. One way to reconstruct short term dynamics of new items in past periods is to estimate regression models between national accounts series and proxy indicators for those items. This approach should be used with caution as these methods rely on behavioural relationships between national accounts variables and related information that may not hold for the entire time period.

20.110   Another case where the assumptions underlying basic splicing may not hold is when conceptual changes are introduced. Basic splicing may lead to estimates being created for certain items for historical periods when the items simply did not exist, for example, those relating to new technologies. In these cases, it may be necessary to set a particular historical period's value at zero, and to use interpolation techniques to estimate values for subsequent periods until actual data are available.

20.111   A backcasting exercise should be conducted in a coordinated manner for both annual and quarterly accounts. The benchmarking methods described above can be used to realign quarterly data to annual benchmarks that are back-calculated independently.

20.112   One problem of consistency that may arise from the application of backcasting techniques at all levels of compilation is the lack of additivity between components and aggregates. Backcasting at detailed level has the advantage of preserving the original information for each series. However, it will show discrepancies between components and aggregates. This problem can be solved if backcasting is applied at the component level only, while the aggregate is derived as the sum of the reconstructed components. A disadvantage of this approach is that the aggregate rates of change will differ from the original ones, which may lead to confusion and criticisms from the user. The choice will also depend on the types of revision introduced. If there is a change in classifications, components that are not affected by the classification change, such as a higher level aggregate, should be preserved. However, when new methods are introduced, the aggregate levels should not be preserved.

20.113   Generally speaking, compilers should implement a backcasting solution that preserves as much as possible the consistency property of national accounts and, at the same time, minimizes the changes in the economic history of a country. The new backcast results must present a ~~a~~ plausible picture of the macro-economy over the entire time series. There should be a thorough evaluation of the backcast results, including verification of the individual series and balancing items, and analysis of the revisions to both levels and growth rates of key variables.

20.114   Backcasting is explained in more detail in Chapter 5 of the IMF's *Quarterly National Accounts Manual* (2017)

4.   Revisions

20.115   In order to maintain high-quality, consistent time series, revisions are an essential part of good national

accounts compilation practice. They ensure that users are provided with data that are as timely and accurate as possible. Revisions are necessary to incorporate improvements in source data and methods, and the introduction of new international standards and classifications.

20.116 Resource constraints, in combination with user needs, cause tension between the timeliness of published data on the one hand, and reliability, accuracy, and comprehensiveness on the other. To reduce this tension, as discussed above, initial estimates are typically compiled on a timely basis, with later, revised estimates produced when more and better source data become available. Good management of the process of revisions requires the existence of a well-established and transparent revision policy.

20.117 It is important to emphasize that revisions are conducted for the benefit of users: namely, to provide users with data that are as timely and accurate as possible. Revisions allow new and more accurate information to be incorporated, thus improving the accuracy of the estimates, without introducing breaks in the time series. Although repeated revisions may be perceived as reflecting negatively on the trustworthiness of official statistics, delaying the incorporation of new data in the published estimates may increase the magnitude of later revisions (in particular, if these go in the same direction). Furthermore, not passing on known revisions reduces the actual trustworthiness of data even more, because the data do not reflect the best available information, and the public may know this or find this out (for instance, the public may wonder why a revision in the monthly production index is not reflected in the QNA).

20.118 Every so often (such as every five years), compilers of national accounts statistics, particularly compilers of QNA, should undertake a systematic analysis of the revisions that have been made to key national accounts series, such as GDP. Structural differences between initial and subsequent estimates, such as when initial estimates persistently overstate or understate later estimates, could indicate bias in the initial data sources or methods, which could be adjusted to improve the quality of the initial estimates. Significant volatility in revisions, but without a persistent pattern, could indicate that the initial data sources or methods are not of sufficient quality, and improvements to them or the use of better-quality alternatives should be investigated.

20.119 More information on developing a revisions policy and communicating revisions to users can be found in chapter 21.

E.   High inflation

20.120 Establishing meaningful national accounts in a country where high inflation prevails is indeed a challenge for national accounting. This challenge does not arise because those conditions create totally new national accounting problems. In fact, the same problems also exist conceptually in the very common situation of creeping inflation, with low rates of changes in the general level of prices. However, high rates of inflation exacerbate the problems. A method of measurement which gives acceptable approximate measures in more or less normal conditions may no longer be acceptable with significant inflation.

20.121 Basically, under high inflation the three classic roles of the currency are disrupted. The disruption in the currency's role as instrument of payment is minor; most transactions continue to be cleared in the national currency even though - sometimes legally, more often illegally - foreign currencies may be used for some domestic payments. The main difficulties are encountered in the currency's role of reserve of value. This aspect is well-known. When the annual rate of inflation is 50 per cent, for example, it is not advisable to keep any saving in the form of monetary assets, unless a mechanism of compensation against inflation is established explicitly through indexation or implicitly through high market rates of interest. Perhaps less obvious is the crisis of the currency's role as unit of account even for short periods of time. This aspect is, of course, connected with the previous one. Even within a period of one year, the value (i.e., the purchasing power) of the currency diminishes sharply when inflation is high, with the result that the sum of the values of transactions which take place at different times of the year is not at all easy to interpret. If all transactions were evenly distributed and inflation regular during the year, it could be said that the unit of account is the mid-year value of the currency. However, this condition is not fulfilled in practice. This means that under high inflation flows as conventionally measured give a distorted picture of the economic structure.

20.122 On certain aspects the SNA provides rules which, rigorously applied, are capable of providing correct measures. For example, rules related to time of recording transactions are essential: transactions have to be recorded at the same point in time in the various accounts in question for both transactors. Differences in the time of recording by transactors have much more serious distorting effects when inflation is high.

20.123 A particular and very important aspect concerns transactions and balancing items that are measured by

the difference between flows. This is the case, for example, for distribution margins measured as the difference between sales and the purchase value of the goods which are sold (the method followed in practice being very often: sales less purchases plus changes in inventories). The correct measurement of distribution margins at any point in time supposes that the purchase value of the goods sold is the price prevailing at the time the goods are sold, not at the time the purchase was actually made. In other words it means that changes in inventories have to reflect adequately the difference in value between entries to and withdrawals from inventories valued at prices at the time of entry and withdrawal, respectively (see chapter 7).

20.124 The measurement of value added is a very important case in point when the process of production extends over a long period of time (under high inflation "long" is usually much shorter than when inflation is low) and there is a significant lag between intermediate consumption and the recording of output. (In agriculture, for example, harvesting may even take place in a different calendar year.) In principle, the SNA provides the solution for correct measurement. It relies upon careful recording of work-in-progress. In effect, if intermediate consumption takes place mainly, for example, in the first part of the year and output (harvests or, in other cases, deliveries taken as a measure of output) is recorded mostly in the second part of the year, under high inflation value added will be overestimated. Since ~~renumeration~~remuneration of employees is recorded when due or paid, the figure for operating surplus is heavily distorted. Of course, for agriculture if harvests occur mainly in the first half of the year and intermediate consumption in the second, the distortion is inverted.

20.125 The solution in such cases, in principle, is to record output progressively as work-in-progress. Then at the end of the process of production, the previously recorded work-in-progress is withdrawn from inventories after due revaluation, while from the other side the output of finished products is entered in inventories at the prices prevailing at this time. This solution shows that, basically, the right rule of recording output and inventories is the perpetual inventory method, careful attention being paid to the recording of work-in-progress. This is true for business accounts and national accounts as well. Departures from this ideal treatment cause more significant biases when inflation is high. In practice, the right solution may be difficult to apply, especially if business accounts do not provide adequate data. However, it should be approximated as far as possible, in order to minimize distortions.

20.126 Applying the SNA's solutions referred to in the previous paragraphs is a means of trying to get correct measures as far as it is feasible. However, they do not solve the difficulty related to the loss of meaning of the unit of account under high inflation. Rigorously, a unit of the currency at the beginning of the year is not additive with a unit of the currency in the last months of the same year. Strictly speaking, this holds every time the purchasing power of the currency changes, even when the rate of inflation is low. However, under normal conditions (low inflation) it is assumed that over a short period of time (one year) the loss of significance of the currency as a unit of account is limited. For longer periods, this assumption is not acceptable, and comparisons are made either in volume terms (for goods and services) or in real terms (constant purchasing power of the currency). A short period of hyper-inflation involves the same measurement problems as a much longer period of low inflation.

20.127 As explained above, because transactions are not evenly distributed and inflation is not regular during the year, it may not be assumed that the implicit unit of account is the mid-year currency. Consequently, the economic relations are distorted. Phenomena occurring mainly in the first part of the year have their shares understated; conversely, those occurring mainly in the last part of the year have their shares overstated.

20.128 In order to avoid such distortions, it would be possible to use the currency at a certain point or during a short period of time (one month, for example) as the unit of account. All transactions would then be revalued at the (constant purchasing power of the) currency at the chosen point or period by applying to current values an indicator of the change in the general price level. Applying such a procedure systematically might, of course, be burdensome, but it might be appropriate to implement it for certain flows or certain aggregates only, possibly using simplified methods of calculation.

20.129 Because of the difficulties in interpreting national accounts in current values, one could conclude that it is useless to establish these accounts. However, they remain necessary for use in conjunction with monetary and financial variables. Further, under such circumstances more emphasis should be given to accounts covering shorter time periods. As monthly accounts are often not feasible, except for some items, quarterly accounts covering more than just GDP and its uses would be of great value for analysis. The use of the currency as a unit of account on a quarterly basis, while subject to the general criticism in principle, provides results which are easier to interpret than annual data, at least if hyper-inflation is avoided. In addition, quarterly accounts might provide a short-cut method for determining annual

accounts, using the average value of the currency in a given quarter as the unit of account.

20.130   Volume estimates, which play an important role in national accounting in general, are given even more emphasis for flows of goods and services and the production account when inflation is high. As far as possible it is probably appropriate to attempt to estimate volume increases directly rather than rely on deflation methods applied to current prices. In effect, the degree of approximation in the measurement of price changes may well be of the order of magnitude of the volume changes. The danger is increased when the base period for price increases is very out of date.

20.131   In general, frequent rebasing of national accounts in volume terms is advisable when changes in relative prices are important. In this regard, annual chain linking is encouraged. If this is not possible, the choice of the base year, which is always a delicate one, may be especially complex under high inflation due to the fact that price adjustments are irregularly timed. Studying how relative prices move in the short-, medium- and long-term in periods of high inflation, as compared with other periods, is of particular importance.

20.132   To assess the effects of inflation it is not sufficient to measure only flows in the current accounts and in the capital and financial accounts of the sequence of economic accounts. This is so because inflation may redistribute wealth and because changes in real wealth due to inflation may amplify or counterbalance changes in these flows. The revaluation account, which shows real holding gains and losses incurred by institutional sectors and the rest of the world according to the types of assets and liabilities they hold, is of special importance in this context.

20.133   Calculating these gains and losses supposes, of course, that a country has previously established sector balance sheets. Establishing sector balance sheets for financial assets and liabilities is of prime importance because the dramatic changes in the purchasing power of the currency when inflation is high undermine its role as a reserve of value. The face value of monetary assets covers a vanishing real value of these assets. For interest-bearing monetary assets and liabilities (non-interest bearing monetary assets may hardly exist when inflation is high, except at the minimum level necessary for current payments), the decrease in their real value is generally compensated, at least in part, by explicit indexation or inclusion of an element compensating for inflation in the rate of interest. This means that nominal interest, under these circumstances, can include a component which may be viewed as an anticipated reimbursement/refund of the real value of the principal of the financial liability/asset. The higher the rate of inflation, the quicker is this process of reimbursement/refund.

20.134   The element of compensation for inflation should not be considered as a return to capital by the lender and a current cost by the borrower. The SNA treats these components of explicit or implicit indexation as interest received and paid in the current accounts, and this treatment does not create great difficulties when inflation is low. However, the measurement of these components is essential when inflation is high if one wants to interpret correctly figures such as government disposable income or saving (or government deficit) and the corresponding figures for creditor sectors, etc. For this reason, for countries experiencing high inflation, it is recommended to show real holding gains and losses on monetary ~~assts~~ assets as memorandum items to the current accounts, in particular the earned income account. Countries with high inflation would benefit greatly from following this procedure and, in addition, giving great emphasis to a careful scrutiny of holding gains and losses in the revaluation account.

20.135   Going one step further, countries experiencing significant inflation may want to adjust nominal interest in order to get more meaningful measures of earned incomes, disposable income and saving of the various institutional sectors and possibly the total economy. Two main approaches may be followed:

   a.   Deduct from nominal interest the amount which has been or would have been necessary in order to keep the purchasing power of the capital intact (the capital being the principal of the financial asset/liability to which the interest refers); or

   b.   Deduct from nominal interest the component of protection against inflation of the principal of the asset which is actually included in nominal interest.

20.136   The first approach is usually referred to as the calculation of "real interest". Real interest is the excess of nominal interest on monetary assets over the amount which has been or would have been necessary in order to fully protect the creditor against inflation. The latter amount is calculated using an index representative of the change in the general purchasing power of the currency. When nominal interest is higher than the amount necessary to keep capital intact, real interest is positive. When nominal interest is lower than the amount necessary to keep capital intact, real interest is negative.

20.137 Real interest is derived from nominal interest by taking account of real holding gains/losses on the underlying assets/liabilities. For this reason, however, real interest may not be introduced in the sequence of economic accounts since it is a basic principle of the SNA that holding gains or losses should not be recorded in the current accounts of the sequence of economic accounts, but only in the revaluation account. This is true for nominal holding gains/losses (and a fortiori real holding gains/losses) on all types of assets/liabilities. Thus real interest as well as other adjustments of current incomes for real holding gains/losses may only be introduced as supplementary items, either or not in extended tables.

20.138 In the second approach, the component of protection of the principal of the asset against inflation which is actually included in nominal interest is deducted. Clearly the component of protection against inflation cannot, by definition, be greater than nominal interest itself; it can only be lower than or equal to nominal interest (leaving aside the service charge issue). In order to avoid any confusion with real interest from one side, and interest as currently defined in the sequence of economic accounts from the other side, let us call the excess of nominal interest over the component of protection against inflation of the principal of the asset actually included in nominal interest "interest prime". By definition, "interest prime" may be positive or zero, but never negative.

20.139 Real interest and interest prime serve different purposes. Interest prime takes into account the actual influence of inflation on nominal interest, by deducting from the latter the actual component of protection against inflation of the principal of the asset which it includes. Real interest takes into account the impact of inflation on the purchasing power of the underlying assets, by deducting from the nominal interest the amount which has been or would have been necessary in order to keep the purchasing power of the asset intact.

20.140 Reflecting their different purposes, real interest and interest prime have different roles and places in the SNA. Real interest is a very useful analytical tool; as already stated above, it may be calculated as a supplementary item, something which is recommended for countries experiencing high inflation. Although it does not go so far as real interest, interest prime allows for a possible adjustment of nominal interest in the SNA sequence of economic accounts itself in the context of significant inflation. In the case of other property income, such as dividends, the protection against inflation of the value of the underlying asset is sought through the change in the market prices of the underlying assets, such as shares, recorded in the revaluation account. This element is not included in dividends in current terms. Thus, in terms of economic significance, the meaning of "interest prime" resembles the meaning of dividends. Both "interest prime" and dividends may then be adjusted for real holding gains/losses, outside the sequence of economic accounts, in order to get real interest or real dividends (not to be confused with interest in real terms or dividends in real terms). In terms of economic significance, the sum of dividends and holding gains/losses on shares can be interpreted as parallel to nominal interest. This shows that "interest prime" actually provides a concept whose definition is closer to the definition and measure of other property income than nominal interest.

20.141 Real interest and interest prime only coincide when the component of protection against inflation actually included in nominal interest is strictly equal to the amount necessary in order to give the creditor full protection against inflation. In other cases, real holding gains or losses are still experienced by debtors and creditors. They may be combined with interest prime, outside the sequence of economic accounts, in order to derive real interest.

20.142 For further information on accounting for high inflation, see OECD *Inflation Accounting: A Manual on National Accounting Under Conditions of High Inflation* (2003)