

Chapter 19: Population and labour inputs2

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Chapter 19: Population and labour inputs

A. Introduction

- 19.1 Economic activity is essentially human activity and yet the sequence of accounts does not refer to persons except indirectly. The individuals that make up households (the population) are only identified in so far as they engage in consumption expenditure. Employees feature only as the recipient of compensation with no indication about whether there are a few very well paid employees or many very poorly paid (though in fact there are some of each and many in between). The purpose of this chapter is to show how data for population and labour can be used in conjunction with key entries in the sequence of accounts to show how much the average citizen benefits from economic activity by measuring GDP per capita and how much the average worker contributes to output in the form of labour productivity. As well as being of interest in themselves, these figures are interesting in comparison with similar data in different time periods and in different countries.
- 19.2 This chapter considers total population and labour productivity only. Chapter 24 considers different types of households. The extension of productivity to include the impact of capital is covered briefly in chapter 20 and more extensively in other publications such as the OECD manual *Measuring Productivity*.
- 19.3 The SNA requires a definition of population to express GDP and consumption aggregates in per capita terms. In effect, expressing the volume of GDP (or of household final consumption expenditure) in per capita terms “standardizes” the volumes by adjusting for the size of countries based on their populations. Per capita volumes of major aggregates are often used as a measure of the relative standard of living in countries, despite the misgivings of some social analysts about the adequacy of this measure. Even though the per capita volumes of GDP have some shortcomings when used for this purpose, it is clear there is a strong correlation between a country’s per capita volume of GDP and its standard of living.
- 19.4 Labour input variables are required to examine productivity. Changes in productivity over time are an important indicator of the efficiency of economic production. Likewise, differences in the level of productivity in a country compared with similar countries provide a useful indicator of the relative efficiency of the country’s production processes. Productivity can be measured in different ways, with the simplest being labour productivity, typically measured as the volume of GDP per hour worked. More complicated productivity measures, such as multifactor productivity (sometimes called total factor productivity) also require a measure of labour inputs, along with capital inputs, to obtain the overall input measure to divide into the GDP volume to obtain the productivity measure.

1. International standards on labour force statistics

- 19.5 Clearly, if a ratio is to be formed between measures of output and labour input, the concept of labour used must match the coverage of production in the SNA. The relevant standards on the labour force are maintained by the International Labour Organization (ILO). The ILO standards are contained in so-called “Resolutions”, which are adopted by sessions of the International Conference of Labour Statisticians (ICLS). The one most relevant for collecting and compiling the labour force data used in calculating national accounts productivity estimates is the Resolution Concerning Statistics of the Economically Active Population, Employment, Unemployment and Underemployment, adopted by

the Thirteenth International Conference of Labour Statisticians in October 1982. This resolution specifically defines labour force in terms of individuals engaged in activity included in the SNA production boundary. Although the resolution actually refers to the 1968 version of the SNA, it is generally accepted that the clarifications and minor extensions to the production boundary introduced in the 1993 revision of the SNA and the present update are implicitly carried over to the definition of the labour force.

- 19.6 A particularly important point for consistency is that the concept of residence underlying the population and labour force estimates must be the same as that used in the national accounts and that the employment estimates being used to calculate productivity are consistent with those underlying the income and production measures.

2. The structure of the chapter

- 19.7 The topic of population and the derivations of per capita figures for aggregates such as GDP are the subject of section B. Section C starts by describing how the total population can be divided into those in the labour force and those not in the labour force and the adjustments made to population totals to allow for residents working abroad and non-residents working in the national economy. It also describes how various categories of the labour force are defined and discusses some boundary issues.
- 19.8 Section D discusses how simple head counts of employed persons can be improved for use in productivity measures by different means of standardization. The derivation of labour productivity measures is the topic of section E and the chapter closes with a brief discussion of data sources in section F.

B. Population

- 19.9 Annual population estimates derive from less frequent population censuses. Censuses usually count the number of people present on a specified night or the number of people who usually live in a dwelling, even if they are not present when the census is enumerated. However, a census is often conducted only every five or ten years and sometimes less frequently. In years between censuses, updated information on the population of a country is provided by less robust methods. Population is, in principle, an annual average of frequent head counts, each of which relates to a point of time. Thus, population is the annual average number of people present.
- 19.10 *The population of a country is most simply defined as all those persons who are usually resident in the country.* In this definition, the SNA and BPM6 concept of residence is used, that is persons are resident in the country where they have the strongest links thereby establishing a centre of predominant economic interest. Generally, the criterion would be based on their country of residence for one year or more. In most cases, the concept of residence is straightforward, being based on the dwelling a person resides in on a permanent basis, although there are some borderline cases discussed further in chapter 26.
- 19.11 Generally, persons who are resident in a country for one year or more, regardless of their nationality or citizenship, should be included in the population measure. An exception is foreign diplomatic personnel and defence personnel, together with their families, who should be included as part of the population of their home country. The “one-year rule” means that usual residents who are living abroad for less than one year are included in the population but foreign visitors (for example, holidaymakers) who are in the country for less than one year are excluded from the measured population.

1. Per capita estimates of volume growth

- 19.12 The growth rate in the volume of GDP is one of the key economic indicators provided by the national accounts. Such growth rates can be compared directly between countries because they are expressed in common units (percentage changes) and are not affected by the currency in which the GDP estimates are expressed. However, part of each country's growth in GDP volumes is attributable to changes in population and so it is useful to "standardize" percentage growth rates by calculating per capita growth rates. For example, if a country's population is increasing more rapidly than its GDP volume growth then the per capita output is falling. On the other hand, a country with a very low growth in GDP volume but with a declining population will be experiencing an increase in per capita output.
- 19.13 Per capita growth rates in real national income per capita or in real actual consumption expenditure generally provide a better measure of the average "welfare" of a country's population than the changes in GDP volumes. GDP is a measure of production within a country but the inflows or outflows of income from or to abroad can have a significant effect on both the level and growth rates in real national income per capita. Similarly, the level and growth rates in GDP volumes can differ significantly from those in the final consumption of households because of the varying shares across countries of capital formation and net exports within GDP.

1. Absolute levels of GDP or GNI per capita

- 19.14 As described in chapter 15, the International Comparison Program (ICP) makes estimates of absolute levels of GDP and GDP per capita across countries in order to try to establish a relative level of prosperity. These estimates involve measures of GDP, purchasing power parities (PPPs) and the same population estimates previously described as being used for volume growth measures.

C. Measuring the labour force

- 19.15 Not all individuals included in the population are engaged in production. Some are too young, some too old and some may simply choose not to work. Others may usually work but be temporarily not working because of illness, lack of employment or being on holiday, for example. A first step in moving from population data to data for employment, is thus to define what is meant by the labour force.
- 19.16 *Labour force consists of those who are actively prepared to make their labour available during any particular reference period for producing goods and services that are included within the production boundary of the SNA.* The economically active population is further divided into those who are employed and those who are unemployed. Thus the population of the country can be subdivided into three categories; employed, unemployed and not in the labour force. A person's status depends on their activity (or lack of it) during a short reference period (usually a week).
- 19.17 Employed persons may be either employees or self-employed persons. *Employment is defined as all persons, both employees and self-employed persons, engaged in some productive activity that falls within the production boundary of the SNA.*

1. Employees

- 19.18 *Employees are persons who, by agreement, work for a resident institutional unit and receive remuneration for their labour.* Their remuneration is recorded in the SNA as compensation of employees. The relationship of employer to employee exists when there is an agreement, which may be formal or informal, between the employer and a person, normally entered into voluntarily by

both parties, whereby the person works for the employer in return for remuneration in cash or in kind.

19.19 Employees include but are not confined to the following categories:

- a. persons (manual and non-manual workers, management personnel, domestic staff, people carrying out remunerated productive activity under employment programs) engaged by an employer under a contract of employment;
- b. civil servants and other government employees whose terms and conditions of employment are laid down by public law;
- c. the armed forces, consisting of those who have enlisted for both long and short engagements and also conscripts (including conscripts working for civil purposes);
- d. ministers of religion, if they are paid directly by general government or a non-profit institution;
- e. owners of corporations and quasi-corporations if they work in these enterprises;
- f. students who have a formal commitment whereby they contribute some of their own labour as an input into an enterprise's process of production in return for remuneration and (or) education services;
- g. disabled workers, provided the formal or informal relationship of employer to employee exists;
- h. persons employed by temporary employment agencies, who are to be included in the industry of the agency which employs them, and not in the industry of the enterprise for which they actually work.

An outworker is a person who agrees to work for a particular enterprise or to supply a certain quantity of goods and services to a particular enterprise by prior arrangement or contract with that enterprise, but whose place of work is not within it. An outworker is treated as an employee if there is an explicit agreement that the outworker is remunerated on the basis of the work done, that is the amount of labour contributed as an input into some process of production.

19.20 Persons temporarily not at work are also considered as employees provided they have a formal job attachment. This formal attachment should be determined according to one or more of the following criteria:

- a. the continued receipt of wage or salary;
- b. an assurance of return to work following the end of the contingency, or an agreement as to the date of return;
- c. the elapsed duration of absence from the job which, wherever relevant, may be that duration for which workers can receive compensation benefits without obligations to accept other jobs.

Persons included in the above classification are those temporarily not at work because of illness or injury, holiday or vacation, strike or lock-out, educational or training leave, maternity or parental leave, reduction in economic activity, temporary disorganization or suspension of work due to such reasons as bad weather, mechanical or electrical breakdown, or shortage of raw materials or fuels, or other temporary absence with or without leave.

1. Self-employed persons

19.21 *Self-employed persons are persons who are the sole or joint owners of the unincorporated enterprises in which they work, excluding those unincorporated enterprises that are classified as quasi-corporations.* Self-employed persons are classified here if they are not in paid employment that constitutes their principal activity; in that latter case, they are classified as employees. They

may be temporarily not at work during the reference period for any specific reason. The compensation for self-employment is included in mixed income because it is not possible to separate the return to labour from the return to any capital used in the unincorporated enterprise.

19.22 Self-employed persons also include the following categories:

- a. contributing family workers working in unincorporated enterprises;
- b. outworkers whose income is a function of the value of the outputs from some process of production for which they are responsible, however much or little work was put in;
- c. workers engaged in production undertaken entirely for their own final consumption or own capital formation, either individually or collectively.

19.23 In ILO statistics, self-employed persons include those working in enterprises that are legally unincorporated even if there is sufficient information available for them to be treated as quasi-corporations in the SNA. In the SNA the remuneration of these people is included in compensation of employees rather than in mixed income. Among others, this may include members of producers' cooperatives.

2. Unemployment

19.24 To complete the picture of the labour force, it is necessary to mention unemployment because the labour force is defined as employed persons (that is, employees plus self-employed persons) plus those who are unemployed. To be classified as unemployed, a person must be not in employment but available for work and actively seeking work. The concept of unemployed persons is not required in the national accounts because the unemployed do not contribute to production but is necessary to make the conceptual transition from population to the labour force.

3. Boundary problems

Jobs and employees

19.25 Individuals may have more than one source of income from employment because they work for more than one employer or, in addition to working for one or more employers, they work on their own account as self-employed. The agreement between an employee and the employer defines a job and each self-employed person has a job. The number of jobs in the economy thus exceeds the number of persons employed to the extent that some employees have more than one job. An individual with more than one job may do these successively as when the person works for part of the week in one job and the rest of the week in another or in parallel as when the person has an evening job as well as a daytime job.

19.26 An employer may not be aware of, and in any case is not asked to provide information on, secondary jobs undertaken by his employees. When an employer supplies information on the number of employees, he actually provides information on the number of jobs he provides. The distinction between number of jobs and number of employees is one issue that has to be carefully addressed in productivity statistics.

Residence

19.27 Population numbers are dependent on the residence of individuals but employees do not have to be resident in the economy where they work. The results of the activity of producer units can be compared with employment only if the latter includes both the residents and the non-residents who work for resident producer units. Employment therefore includes the following categories where there might be a question about whether they are considered resident or not:

- a. non-resident frontier workers, that is, persons who cross the border each day to work in the economic territory;
- b. non-resident seasonal workers, that is, persons who move into the economic territory and stay there for less than one year in order to work in industries which periodically require additional labour;
- c. members of the country's armed forces stationed in the rest of the world;
- d. nationals who are on the staff of national scientific bases established outside the geographic territory of the country;
- e. nationals who are on the staff of diplomatic missions abroad;
- f. members of the crews of fishing boats, other ships, aircraft and floating platforms operated by resident units;
- g. local employees of general government bodies situated outside the economic territory.

19.28 On the other hand, the following are excluded from employment:

- a. residents who are frontier workers or seasonal workers, that is, who work in another economic territory;
- b. nationals who are members of the crews of fishing boats, other ships, aircraft and floating platforms operated by non-resident units;
- c. local employees of foreign government agencies located on the geographic territory of the country;
- d. the personnel of international civilian organizations located within the geographic territory of the country (including local employees directly recruited);
- e. members of the armed forces working with international military organizations located on the geographic territory of the country;
- f. nationals working in foreign scientific bases established in the economic territory.

19.29 The following adjustments are required to make the transition from the SNA concepts to the concepts generally used in labour force statistics (employment on a national basis):

- a. the conscripted forces are generally not included in the labour force statistics, but included in the SNA under general government services;
- b. residents working for non-resident producer units are included in labour force statistics but not included in employment as defined in the SNA;
- c. non-residents working with resident producer units are not included in labour force statistics but are included in employment as defined in the SNA;
- d. resident workers living permanently in an institution are generally not included in labour force statistics but are included in SNA employment;
- e. resident workers under the age limit defined for measurement of the labour force are included in SNA employment.

4. The non-observed economy

19.30 National accountants are particularly concerned about ensuring that the whole of economic activity within the SNA production boundary is measured comprehensively. This is often referred to as the "exhaustiveness" of the coverage of the national accounts. In practice, it means ensuring that the

value of production activities that are illegal or hidden (that is, the “underground economy” or the “hidden economy”) as well as those that are simply described as informal is included in the accounts. In principle, for the SNA, the remuneration of all these workers should be included in either compensation of employees or mixed income and therefore, when looking at comparisons between labour statistics and output, it is important the persons concerned should be included in labour statistics also.

19.31 The extent of such activities will differ from one country to another depending on their institutional arrangements. For example, all businesses may have to register in one country while, in another, businesses that have less than a prescribed annual turnover may not have to register. In some countries, certain types of unincorporated enterprises may be required to register before they are allowed to operate while others do not. In addition, the criteria used to determine which unincorporated enterprises have to register will also differ across countries. For all these reasons,, the estimates for the non-observed economy will contribute different shares of GDP from one country to another depending on the registration arrangements in place and the compliance with them.

5. Labour in NPISHs

19.32 The output of NPISHs is supplied free or at prices that are not economically significant so it is generally valued by the costs of production. One of these costs is compensation of employees. It is important that these employees be recorded in the employment measures used in deriving productivity changes. However, NPISHs often have volunteer workers so the treatment of these deserves special attention. It is another area where there is a difference between ILO and SNA practices that causes an inconsistency between the numbers treated as being remunerated and those regarded as being economically active.

6. Volunteer labour

19.33 A distinction can be made between those who have an agreement to provide labour services for token remuneration or only income in kind, those for whom there is explicitly no remuneration and those where there is apparently no remuneration but the workers benefit directly from the output to which they contribute. In ILO statistics, all three types of worker are included in the economically active population.

19.34 In the SNA, the remuneration of those working for token remuneration or only income in kind is measured by these rates. No imputation for an additional element of remuneration is included. For example, if doctors or teachers work for only food and lodging, there is no salary imputed to them. Such instances may arise in religious institutions or in the wake of natural disasters. If the unit employing these staff is responsible for whatever little remuneration is received, they are included in employment.

19.35 If staff are purely volunteer, with no remuneration at all, not even in kind, then these individuals are not regarded as being employed in SNA terms and there is no entry for compensation of employees (or mixed income) for them.

19.36 If family members contribute to the output of an unincorporated enterprise, the estimate of mixed income is supposed to include an element of remuneration for them and thus they are treated as being in the economically active population from an SNA point of view. In ILO statistics such workers will be treated as self-employed unless they are under age.

19.37 By convention, no labour services are attributed to the services provided by owner-occupied dwellings. In contrast, if a group of individuals agrees to construct a building or structure, for example a school or a well, these individuals are regarded as being in the labour force and receive mixed income for their efforts. Because it is difficult to value such projects, unless a direct

comparison can be made with a similar building, the value of construction should be based on the costs incurred. Labour is a significant input into construction projects, so its value must be included as part of the total costs using wage rates paid for similar kinds of work on local labour markets (see paragraphs 6.127 and 7.30). This income is then used to acquire the result of their efforts which may subsequently be handed over to a third party for maintenance. The latter process is recorded as a capital transfer in kind.

D. Standardized measures of labour inputs

19.38 A crude estimate of the labour inputs required for productivity measures is provided by the numbers of persons employed. Using this as a starting point, the labour input measures can then be adjusted to provide various degrees of sophistication, with measures such as full-time equivalents being preferred to the simple numbers employed, with hours worked being a step better, and with quality-adjusted labour inputs being the most advanced measure.

1. Employment measured on a full-time equivalent basis

19.39 Full-time equivalent employment is the number of full-time equivalent jobs, defined as total hours actually worked by all employed persons divided by the average number of hours actually worked in full-time jobs.

19.40 The definition does not necessarily describe how the concept is estimated. The method sometimes used, of simply counting all part-time jobs as half a full-time job, is the crudest possible way of making an estimate. Since the length of a full-time job has changed through time and differs between industries, more sophisticated methods which establish the average proportion and average working time of less than full-week full-time jobs in each job group separately are preferable.

19.41 The SNA does not recommend full-time equivalent employment as the preferred measure of labour inputs. However, if the data are good enough to permit an estimation of total hours actually worked, full-time equivalent employment should also appear in association with the national accounts. One reason is that this facilitates international comparisons with countries which can only estimate full-time equivalent employment. However, with the move by the ILO to recommend recording total hours actually worked as the preferred measure of labour input, the use of full-time equivalents should gradually be phased out.

19.42 As just noted, the number of full-time equivalent employees is based on the number of hours worked, on average, in a full-time job. If the number of hours in a full-time job falls because of an increase in annual leave allowances or public holidays, say, there may be little or no change in full-time equivalents even though the total number of hours actually worked has declined. A similar effect may be caused by an increasing incidence of sick leave. The estimate of the number of hours in a full-time job is therefore adjusted for the average amount of sick leave taken in the reference period as well as for leave taken.

1. Hours worked

19.43 Even with such adjustments made to full-time equivalent numbers, the preference is for total hours worked to be used instead in productivity estimates.

19.44 In practice, total hours actually worked and annual (full-time) hours actually worked may have to be estimated. In many countries, especially for monthly paid employee jobs, only normal hours or hours usually worked, any paid overtime, plus annual and holiday leave entitlements can be ascertained, and it may be impossible to estimate the subtraction to be made for average illness leave

from either total hours actually worked or annual (full-time) hours actually worked. This error will not affect full-time equivalent employment if sickness rates in part-time jobs are the same as in full-time jobs, so can be tolerated if it is unavoidable.

- 19.45 If the reference weeks used in the surveys that provide the data are not fully representative, the best available information on variations throughout the year should be used in estimating data for the year as a whole.

Defining hours worked

- 19.46 Total hours actually worked are those hours of labour that have contributed to production and can be defined with reference to the production boundary of the SNA. The ILO “Resolution on the Measurement of Working Time”, adopted by the Eighteenth International Conference of Labour Statisticians, defines hours actually worked as the time persons spend in the performance of activities that contribute to the production of goods and services during a specified reference period. The resolution specifies hours worked as follows:

- (1) *Hours actually worked* occur in all types of jobs under varying work and compensation arrangements paid or unpaid, that can be performed at all types of location.
- (2) *Hours actually worked* are not linked to administrative or legal concepts and therefore apply to all working persons and may occur within normal or contractual hours or as overtime.
- (3) For operational purposes, *hours actually worked* **include** hours spent directly and in relation to productive activity; time spent in between productive activity; and short resting time.
 - (a) “Direct and related hours” spent carrying out the tasks and duties of the job including to maintain, facilitate or enhance productive activity, that should comprise activities such as:
 - (i) To clean, care for, maintain, repair, prepare, design or administer instruments, processes, procedures or the work location itself, changing time to put on work clothes, decontaminate or wash up;
 - (ii) To purchase raw or basic materials or resale goods, to transport persons or products to/from the market, source or home, door-to-door vending and itinerant activities;
 - (iii) Awaiting as part of working time arrangements and/or explicitly paid for, for example, business or customers, patients or persons in one’s charge;
 - (iv) On-call duty whether specified as paid or unpaid, occurs at the work location (as in health and other essential services) or away from it (for example from home) if persons’ activities or movements are restricted and as from the time when they are called back to duty;
 - (v) Travel between workplaces such as to reach field projects, fishing areas, assignments, conferences or to meet clients, patients, or persons in one’s care, excluding personal repose during long trips;
 - (vi) Training or skills enhancement for jobs in the economic unit, in or away from the work location (in paid employment this applies to training that may be given by the employer or provided indirectly).

- (b) “In between time” when persons cannot work but continue to be available for work, that is unavoidable or inherent to the nature or process of the job, involving temporary technical, material or economic stand-by (due to work or machinery breakdown, accident, lack of supplies, power or Internet access, etc.).
 - (c) “Resting time” for short periods of rest, relief or refreshment, including tea, coffee or prayer breaks, generally authorized by custom or contract according to established practice and/or national circumstances.
- (4) *Hours actually worked* **exclude:**
- (a) Time not worked, irrespective of payment; they include annual leave, public holidays, sick leave, parental (maternity and paternity) leave, other absence leave for personal or family reasons or civic duty; these hours are part of *Absence from work*;
 - (b) Commuting time between work and home when no productive activity is performed, even if paid by the employer;
 - (c) Time spent in educational activity not intended for jobs in the economic unit, even though the employer may authorize, pay or provide (for) it;
 - (d) Longer breaks distinguished from short resting time when no productive activity is performed, such as meal breaks, even if paid by the employer.
- (5) Statistics of *hours worked* should include:
- (a) Hours actually worked during normal periods of work and directly contributing to production;
 - (b) Paid time spent on training;
 - (c) Time worked in addition to hours worked during normal periods of work, and generally paid at higher rates than normal rate (overtime). Note that overtime hours worked should be included even if they are unpaid;
 - (d) Time spent working on tasks such as the preparation of the workplace, repairs and maintenance, preparation and cleaning of tools, and the preparation of receipts, time sheets and reports;
 - (e) Time spent waiting or standing-by during short-term disruptions during the workday for such reasons as lack of supply of work, breakdown of machinery, or accidents, or time spent at the place of work during which no work is done but for which payment is made under a guaranteed employment contract;
 - (f) Time corresponding to short periods of rest during the workday, including tea and coffee breaks;
 - (g) On-call work arrangements provided that the person is being paid more than half their normal wage rate for being on call;
 - (h) Hours worked by defence force personnel, including conscripts, should be included even if they are outside the scope of a country’s labour force survey.
- (6) Statistics of *hours actually worked* should **exclude:**

- (a) Hours paid for but not worked, such as paid annual leave, paid public holidays, paid sick leave, parental leave, strikes, “short leave” (for medical visits etc.), bad weather shut downs.
 - (b) Meal breaks.
 - (c) Time spent on travel from home to work and vice versa although any work undertaken while commuting (for example, while on a train) should be included.
- (7) Residents working for non-resident producers.
- 19.47 The number of total hours actually worked is the aggregate number of hours actually worked by all persons in all jobs during a specified reference period.
- 19.48 The truism, for employee jobs, that hours worked equal hours paid less hours paid but not worked, plus hours worked but not paid, is a useful one, since many establishment surveys record hours paid, not hours worked, so that hours worked have to be estimated for each job group, using whatever information is available about paid leave, etc.

2. Quality-adjusted labour input

- 19.49 Using total hours actually worked as the input measure for calculating labour productivity changes over time implicitly assumes that each hour worked is of the same quality (that is, there are no differences in the qualifications and skill levels of the labour employed). In other words, each hour worked by a highly skilled person, such as a brain surgeon, is assumed to produce the same quantity and quality of output as each hour worked by an unskilled worker. It is possible to produce a quality adjusted measure of the labour inputs that takes account of changes in the mix of workers over time by weighting together indicators of quality for different grades of workers.
- 19.50 The quality indicators used can relate to variables such as academic qualifications, trade qualifications, experience (typically based on age of the worker), industry of employment and so on. The various indicators are weighted together using average wages for a worker falling into each category. The theory behind this approach is that workers are hired only until their marginal price (that is, their wages, including on-costs) is less than the marginal revenue expected to result from their production. The index formula used can be a fixed-weight (Laspeyres) formula or a more sophisticated formula such as the Tornqvist, which takes account of changing weights by using weights from each of the periods in the analysis.
- 19.51 Calculating a quality-adjusted labour input measure using this approach is very data intensive and only those countries that have highly-developed statistical systems are likely to have the detailed data required.

3. Employee labour input at constant compensation

- 19.52 Total hours actually worked and full-time equivalent employment are both physical measures of labour input. Output too can usually be measured in physical terms, such as tonnes or cubic meters, but this is not done in the national accounts, because the basic value per tonne or cubic meter varies so much between products that these physical measures lack general economic significance. But compensation per hour or per full-time year of work varies enormously too, so that the physical measures of labour input also lack general economic significance. Their usefulness thus rests either upon the assumption that the mix of different kinds of labour is much the same in the different countries or at the different times examined, or upon their application in a social or political context, where interest centres upon personal welfare rather than upon the economics of production and income generation.

- 19.53 When output is measured both at current prices and in volume terms, it is natural to do the same with labour inputs as well as with intermediate inputs. However, mixed income, which is the value added arising in an unincorporated enterprise, cannot be unambiguously divided between the return to labour and the returns to capital and entrepreneurship. For this reason, only the value of employee labour input (and not self-employed labour input) forms part of the SNA.
- 19.54 The measurement of employee labour inputs at current prices and in volume terms is symmetrical with the measurement of output and subject to the following caveats.
- Market prices and market compensation are assumed to measure the relative economic importance of different goods, services and jobs; the advantages and disadvantages of this assumption are the same for inputs as for outputs;
 - Though the constant price and constant compensation concepts are defined as revaluations of quantities at base period prices or compensation levels, they can be estimated in practice as the sum, over all groups, of values at current price or compensation levels, each divided by an appropriate wage index;
 - These group indices are estimates, calculated for a representative sample of jobs or of goods or services, with weights reflecting the relative importance of each of the sub-groups represented by a selected and specified job, or by a selected and specified good or service. In other words, a compensation index is constructed like a price index.
- 19.55 While the value of employee labour input at constant compensation can be estimated by deflating current values, as mentioned above, the data may also permit the direct approach of multiplying the current number of jobs in each job group by the base-period average annual compensation for jobs in that job group.

E. Estimating labour productivity

1. Labour productivity and MFP

- 19.56 Volumes of output per hour worked (or per person employed) are described as measures of labour productivity. However, this is a somewhat unsophisticated measure because changes in this measure can reflect a number of factors other than just the number of hours of labour employed. In particular, increases in the amount of capital used can affect this ratio as can changes in the composition of the labour force over time.
- 19.57 Measures of capital productivity, calculated as the ratio of the volume of output per unit of capital stock suffer from similar drawbacks since they do not capture the effects of the amount of labour employed and the efficiency and composition of the capital inputs.
- 19.58 A measure that takes account of the contributions of both labour and capital to output is multifactor productivity (MFP), which is sometimes referred to as total factor productivity (TFP). The advantage of using MFP as the measure of productivity is that it includes the effects of changes in both labour and capital, whether they are due to improved skills, more efficient capital, a change in composition of either labour or capital, and variations in the utilization of capital.
- 19.59 The productivity model can be extended to include other factors such as the energy and materials used in production. However, the source data required are very detailed; they are broadly consistent with producing productivity estimates at the most detailed level of the input-output tables, so few countries produce such estimates.

1. Employment estimates for productivity estimation

- 19.60 As explained in section D, neither the number of employees, nor even full-time equivalent employees are ideal measures for use in productivity studies. Total hours actually worked is preferred by many because it is a reasonable compromise between these cruder measures and data-intensive measures that adjust for differences in the qualifications, skill levels and composition of labour.
- 19.61 Whichever labour measure is used in calculating productivity, it is very important to ensure that the coverage of the labour data is consistent with that of the national accounts. In other words, the labour inputs must be estimated within the same production boundary and using the same criteria for residence that are used in the national accounts. Typically, the topics that cause most difficulty are residence (particularly with border workers), defence force and diplomatic personnel (who are commonly excluded from the labour force surveys often used to provide the basic data), and obtaining details of unpaid hours (for example, unpaid overtime) or of some self employment (for example, contributing family workers).
- 19.62 Increasingly, analysts are interested in measuring productivity on an industry basis as well as for the economy as a whole. Calculating industry employment and working time by industry adds an additional degree of difficulty to the estimation process. In particular, the national accounting data come from surveys of businesses while the employment estimates are generally obtained using household surveys. It is often difficult to correctly match the industry data from these separate sources. Similar difficulties potentially affect regional estimates, with the concept of residence having to be applied at a regional level rather than at the country level.
- 19.63 Labour productivity, including industry productivity, and multifactor productivity (MFP) are all valid measures of an economy's performance. From a practical viewpoint, it is important to ensure that the employment and working time data underlying these sets of estimates are consistent when calculating the productivity estimates.

2. Data consistency

- 19.64 Examining the relative productivity performance of different industries is of interest to many analysts. In practice, the labour input estimates by industry can be estimated either "bottom up" or "top down". In the former case, the totals for the economy as a whole will be completely consistent with the industry estimates because they are summed to derive the total labour estimates. However, in the case of a top-down approach, a range of different data sources may be used to obtain the disaggregation by industry. In such cases, it is important to ensure that the sum of the industry estimates is consistent with the national totals.
- 19.65 Classifying employment by industry is not always straightforward. The main issue is to ensure that the employment estimates for each industry are as consistent as possible with the national accounts values and volumes so that the productivity estimates are reliable. One particular problem that arises with the industry estimates of employment relates to the industry to which employment agencies are classified (Industry class 7491 "Labour recruitment and provision of personnel"). Maintaining consistency with the industry output in the national accounts means that employment should be classified to the industry of the business that legally employs the workers. In practice, this will be the business that pays the employee's wages and any associated social contributions etc., which will usually be the employment agency and so the employees will be classified to "Labour recruitment and provision of personnel". The output of this industry includes the revenue derived from the activity of hiring out staff to those businesses that need the staff; generally, those businesses will be in industries other than "Labour recruitment and provision of personnel". The businesses using these staff pay the employment agency for the staff that have been supplied and then the employment agency pays the staff so the payments by the "using" businesses will be recorded as part of intermediate input for the using industry.

19.66 Ideally, for productivity purposes both the output attributable to these staff and the hours they work would be recorded in the industry in which they are actually working rather than “Labour recruitment and provision of personnel”. However, in practice, it is unlikely that the data can be collected to enable the output and hours worked to be classified this way. It may be useful for some purposes for the staff hired out by employment agencies to be allocated to the industries that actually use the staff. However, any such allocation should be presented in a supplementary table and not in the main accounts.

3. International comparisons

19.67 Productivity growth is often expressed in percentage terms and comparisons across countries made in terms of these percentages. Assuming similar methods have been used to compile the estimates for the countries being compared, this sort of comparison is interesting and much simpler than the alternative. Measuring the relative levels of production (for example, the volume of GDP or of GDP per capita) or productivity between countries is more complicated because it is necessary to convert the national accounts data to a common currency. The means of doing so is to calculate purchasing power parities (PPPs), which measure the rate of currency conversion rate that would be required to equalize the prices of a common basket of goods and services between the countries concerned. In practice, PPPs adjust for differences in price levels between countries as well as differences in exchange rates (see Section E of Chapter 15).

19.68 Analyzing productivity below the level of GDP, such as by industry, is problematical. PPPs are calculated using the expenditure-based estimates of GDP so there are no PPPs for the individual industries that contribute to GDP. Therefore, it is necessary to make an assumption that the PPP for a single aggregate such as GDP is applicable to all industries. Examining the differences in the PPPs for the various expenditure components shows they can vary significantly so this is unlikely to be a very good assumption. As a result, it is difficult to make robust international comparisons of productivity at disaggregated levels.

F. A note on source data

19.69 Broadly speaking, there are three types of data sources for employment data:

- a. household surveys, such as a labour force survey;
- b. business surveys;
- c. administrative data (for example, employment associated with a payroll tax).

Population data may also be available infrequently.

19.70 The employment estimates from a household survey typically count the number of people who have jobs and, perhaps, the number of hours they work. If the labour input measure being used is the number of jobs in the country then the household survey will provide an under-estimate to the extent that some people work in more than one job, unless the survey collects information on multiple jobholding. On the other hand, if the household survey collects details relating to the hours worked in all the jobs in which each person is employed then it should provide a good estimate of employment for the economy as whole.

19.71 Business surveys tend to have some shortcomings when being used as a source of employment data. In the first place, it is difficult to ensure that the survey frame on which they are based is completely up to date because of the lags inherent in the sources used to update the frame (for example,

registration of new businesses with the appropriate authorities). Secondly, it is often difficult to collect data for self-employed persons, particularly if they are operating an unincorporated business. Even if the lags in updating the survey frame are consistent, their impact on the employment estimates will vary with the peaks and troughs in the business cycle.

- 19.72 Generally speaking, administrative data do not provide a useful source of employment data for the national accounts. Even if they have reasonably full coverage (for example, business tax data) the data are often not available until well after the reference year and will generally only provide a one-off snapshot of employment in that year rather than the average for the year. A source such as payroll tax data is often affected by having exemptions for smaller businesses, which affects the completeness of the data. In such cases, the coverage of businesses is likely to vary by industry because of the concentration of smaller businesses in industries like agriculture, dwelling construction and retailing. In addition, these industries are likely to have a higher proportion of unincorporated businesses than the average.
- 19.73 The problems connected with handling border workers in the national accounts have been described in the section on residence. As far as data sources are concerned, household surveys are likely to include employed persons in the country in which they are surveyed (that is, their country of residence) unless the survey contains specific questions to identify and exclude such workers.
- 19.74 Employed persons who have more than one job during a reference week can only be classified by industry and by status in employment through the application of some essentially arbitrary criterion as to which of their jobs is the most important one. On the practical plane, while household surveys can provide data about either or both of employed persons and jobs, establishment surveys only provide data about jobs.