

## The hours that we work: the data we need, the data we get

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The number of hours that people work have an impact on their health and well-being (and of those close to them) as well as on productivity levels and labour costs of establishments. Measuring the level and trends in the hours worked in a society, for different groups of workers and for workers individually, is therefore important when monitoring working and life conditions as well as when analysing economic developments. Among the various working time indicators, statistics on **annual hours worked** and its related measure, the **volume of employment**, are becoming increasingly essential to reflect more fully - and therefore to better understand - new developments in work flexibility.

This is because statistics of **annual hours worked** relate to the average hours worked per worker and per year, in the economy or for a group of workers. They incorporate variations in part-time and part-year employment, in annual leave, in paid sick and other types of leave, as well as in flexible daily and weekly working schedules. Conventional measures of employment and weekly hours worked do not. Similarly, statistics on the **volume of employment** relate to the total hours worked by all persons employed in the year. They are the preferred measure of labour input to be used as the denominator in the labour productivity equation, calculated as output per work hour, cf., System of National Accounts (SNA) 1993, *para.15-102*.

$$\begin{aligned}
 \text{Volume of employment in year } j &= \text{annual hours worked in year } j * \\
 &\quad \text{average employment in year } j \\
 &= \sum_i \text{3 annual hours worked by worker } i \text{ in year } j
 \end{aligned}$$

**The ideal measure of annual hours worked and volume of employment would need to cover all hours dedicated to producing the goods and services**

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**accounted for in production statistics<sup>2</sup> in the country during the accounting year.** But such statistics cannot be obtained directly using conventional instruments of data collection. Indeed, it is very difficult to measure time spent producing goods and services accurately covering the relevant employed population and for the whole accounting year. Therefore, they need to be estimated using procedures for which the specifics will vary between countries, depending on the range, type and quality of available data. At least three issues stand out when estimating the annual hours worked and the volume of employment:

- (a) adequately measuring the **hours worked** by the employed population,
- (b) covering the **whole year**, and
- (c) covering the **relevant employed population**.

The following paragraphs will discuss these three issues.

### **Measuring the hours worked**

The length of the working day, week or year, i.e., the hours worked, is the sum of all periods of time spent on activities considered as “work”. It is one of various dimensions that describe how time is spent, together with the *description* of the activities in which time is spent, the *context* in which they are carried out and their *scheduling*, cf *Hoffmann and Mata-Greenwood (2001)*. Note that the hours worked is not a measure of how intensely or efficiently work is done but rather a measure of chronological time spent in work activities.

*“It is a commonplace observation that work expands so as to fill the time available for its completion.”* C. Northcote Parkinson

### **Defining the hours worked**

The conventional starting point to identify the scope of activities to be considered as “work” is the framework used for measuring employment and unemployment, or **labour force framework**, adopted by the 13<sup>th</sup> International Conference of Labour Statisticians (ICLS) in 1983. In this framework “work” relates to any activity which contributes to the production of “economic” goods and services, i.e., goods and services included in the SNA, the latest version of which was adopted in 1993. Within this framework, therefore, **hours worked covers all periods devoted to activities which produce “economic” goods and services.**

“Economic” goods and services are those goods and services which are supplied to other units (for money, for barter or for free). In principle they also include goods produced

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<sup>2</sup>It is assumed here that production statistics adequately cover all productive activities within the SNA production boundary.

for own final use<sup>3</sup>. In practice, however, only agricultural production and processing tends to be included in actual measurement. They exclude all domestic or personal services rendered without pay for one's own household, and that includes cleaning one's own house, preparing meals for household members and caring for one's own children without pay<sup>4</sup>.

Hours worked defined within this framework will have the advantage of being consistent with "employment" and "production" statistics as currently defined, but will have the same drawback as these statistics of reflecting a partial reality. For example, with this framework statistics on "hours worked" generally show that men work longer hours than women. If all productive activities were accounted for, however, the hours worked by women in most countries would exceed the hours worked by men, *UNDP (1995)*. Similarly, the general downward trend in the levels of hours worked in most countries as measured using the labour force framework could be less pronounced or perhaps even reversed if all productive activities were included, depending on the extent to which reductions in hours worked consist of transfers of activities from being done outside the market to being done within the market.

Without disregarding the above limitations, determining the set of activities that qualify as "work" in the current labour force framework involves identifying those activities that produce "economic" goods and services. Such activities will include **directly productive** activities but also activities which are **ancillary** to them, even if they are not directly productive, e.g., cleaning the workplace or the work instruments, preparing the materials, thinking and discussing working methods, etc. It will also inevitably include periods of time which are spent in the course of the production process but are clearly **unproductive**, such as waiting time or stand-by time. Such periods of unproductive time are in a sense involuntary because during these periods workers continue to be at the disposal of their employer or clients, in other words, they continue to be "available" to work.

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<sup>3</sup>Among them the "... production of agricultural products and their subsequent storage; the gathering of berries or other uncultivated crops; forestry; wood-cutting and the collection of firewood; hunting and fishing; ... mining salt, cutting peat, the supply of water;... the production of grain by threshing; the production of flour by milling; the curing of skins and the production of leather; the production and preservation of meat and fish productions; the preservation of fruit by drying, bottling, etc.; the production of dairy products such as butter or cheese; the production of beer, wine or spirits; the production of baskets or mates;... weaving cloth; dress making and tailoring; the production of footwear; the production of pottery, utensils or durables; making furniture or furnishings; etc.", cf., *SNA (1993), para. 6.24*.

<sup>4</sup>The reasons given are "... the relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market dis- equilibria - the analysis of inflation, unemployment, etc.", cf., *SNA (1993) para 6.22*.

Included are also **short resting periods**, during which workers are not available to do “other” work, mainly because these are difficult to separate from productive periods of time<sup>5</sup>.

*“Real Work + Appearance to Work = Total Work.” Dilbert<sup>6</sup>*

The current international definition of hours actually worked, adopted by the 10<sup>th</sup> ICLS in 1962, see Box 1 below, follows this rationale. When it was adopted, however, the international definition was intended to be applied in establishment surveys to cover mainly production workers in manufacturing industries and this is reflected in the activities listed. It is possible, however, to broaden the concept of hours worked to cover all workers by extending the content of each of the defining categories:

- S** **Time spent in productive and ancillary activities** can be defined as all time spent in activities which constitute the tasks and duties of the job held, see *Mata-Greenwood (1992)*, encompassing (i) time spent on tasks and duties, regardless of location and payment, e.g., at home, the fields, the barn, the supermarket, etc.; (ii) time spent on tasks and duties, regardless of whether they are carried out within normal or contractual periods, e.g., as overtime; (iii) time spent on professional training (by persons in employment), i.e., training which is authorized by the employer or required by the job; and (iv) travelling time required by the job, e.g., of door-to-door vendors, seafarers and drivers; of agriculture workers when transporting their products; of persons travelling to attend a meeting outside their usual workplace; of doctors on call; etc..

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<sup>5</sup>The first ILO Convention to provide a working definition of hours worked, cf., the Commerce and Offices Convention adopted in 1930, explicitly excluded resting time because during such periods workers are not available for work. However, given that when rest periods are short they are generally difficult to monitor, subsequent Conventions included them in their concept of hours worked.

<sup>6</sup>Adams, Scott. “The Dilbert Principle”, New York, 1996.

### Box 1. International definition of hours actually worked, 10<sup>th</sup> ICLS (1962)

Statistics of hours actually worked should include --

1. hours actually worked during normal periods of work;
2. time worked in addition to hours worked during normal periods of work, and generally paid at higher rates than normal rates (overtime);
3. time spent at the place of work on work such as the preparation of the workplace, repairs and maintenance, preparation and cleaning of tools and the preparation of receipts, time sheets and reports;
4. time spent at the place of work waiting or standing-by 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;
5. time corresponding to short rest periods at the workplace, including tea and coffee breaks.

Statistics of hours actually worked should exclude --

1. hours paid for but not worked, such as paid annual leave, paid public holidays, paid sick leave;
2. meal breaks;
3. time spent on travel from home to work and vice versa.

*ILO (2000)*

**S Unproductive working time spent in the course of work** can be defined as relating to all time spent in activities other than the tasks and duties of the job but during which workers continue to be available to work, regardless of location, duration and payment of this time, and including: (i) time spent waiting for customers in the shop or in the street; (ii) stand-by time for technical or economic reasons; and (iii) on-call time of e.g., doctors and nurses.

**S Short periods of rest** can be defined as all periods of less than a defined period, e.g., one hour, which are spent on activities other than the tasks and duties of the job and during which workers are neither at the disposal of the employer nor available for other work. Such periods may occur as a consequence of natural needs or be authorized by contract or custom.

It would be an advantage to revise the current international definition of hours worked to cover all workers, perhaps along the lines described above, in order to fill an important gap in international standards.

## Estimates of hours worked

When statistics on hours worked (for any reference period) are not available or are not considered of as good quality as other working time measures which may be available, e.g., hours paid for, usual hours or normal hours, the latter may be used as a basis for estimates of the target measure.

For example, statistics on **hours paid for** relate to all periods of time, whether worked or not worked, for which paid workers have been paid (generally by the employer) during a specified reference period. It covers only paid employees and includes periods of time during which the worker has the right not to work and for which payment is received: vacations, holidays and certain absences, such as sickness, maternity leave, military training, etc. On the other hand, it excludes all periods of time worked which are not paid. Such a measure would need to be adjusted as follows to arrive at hours worked for paid employees:

	<b>hours paid for</b> (during reference period)
-	paid absences (including vacations and holidays)(during period)
+	unpaid overtime and other unpaid time worked (during period)
=	<b>hours worked</b> (during period) by paid employees

Statistics on the **normal hours of work** usually only cover (a subset of) persons in paid employment and relate to the daily or weekly hours that they are expected to be at the disposal of their employer according to legislation, collective agreements or working contracts. The international definition of normal hours of work adopted by the 10<sup>th</sup> ICLS in 1962, cf. Box 2 below, defines it in terms of **legal** and **contractual** hours of work. These two measures are highly correlated but are not equivalent. They are both valid for workers in paid employment, but they are established by different bodies (legal documents, working contracts) and it is possible for establishments to offer shorter or longer working schedules to their workers than the hours stipulated in legal documents. When this is the measure available, to arrive at estimates of hours worked of all workers, adjustments would need to be made to include paid and unpaid overtime, exclude (paid and unpaid) absence from work and include an estimate of the hours worked by the population not covered by the measure of normal hours, i.e., the self-employed, part-time workers, etc.

	<b>normal hours</b> (during day or week)
+	actual overtime worked (during day or week)
-	actual absence from work (during day or week)
+	hours worked by omitted population (during day or week)
=	<b>hours worked</b> (during day or week)

### Box 2. International definition of normal hours of work, 10<sup>th</sup> ICLS (1962)

Normal hours of work are the hours of work fixed by or in pursuance of laws or regulations, collective agreements or arbitral awards. Where not fixed by or in pursuance of laws or regulations, collective agreements or arbitral awards, normal hours of work should be taken as meaning the number of hours per day or week in excess of which any time worked is remunerated at overtime rates or forms and exception to the rules or customs of the establishment relating to the classes of workers concerned.

ILO (2000)

Statistics on the **usual weekly hours of work** generally relate to the weekly schedule most commonly worked by persons in employment during the season, month or another long period<sup>7</sup>, i.e., the modal value of the weekly hours worked, whether workers possess a working contract or not, cf., *Mata-Greenwood (1992)*. Usual hours of work are not equivalent to the average weekly hours worked over a long period, which is affected by the weeks of unemployment or inactivity within the long period. As compared to the normal hours of work (for workers covered by this measure), the usual hours of work includes overtime which occurs regularly and exclude regular absences from work:

	<b>usual hours of work</b> per week
+	usual overtime (per week)
-	usual absence from work (per week)
=	<b>normal hours of work</b> during a week

When this is the measure available, data need to be adjusted to include all overtime worked beyond usual overtime and exclude all absence from work taken beyond usual absence from work during the reference week:

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<sup>7</sup>The relevant "long period" may depend upon the stability of working schedules. For sales- and agricultural jobs, whose working schedules are different during the high and low commercial or agricultural seasons, the relevant reference period could be the current season. For most office-based clerical jobs the reference period may be irrelevant because their working schedules tend to be stable. Among temporary and casual workers, the relevant "long period" can be the current working period or season, provided all (shorter) periods when they have not been in employment are disregarded. The "long period" may also be set as a function of the frequency with which data are collected (e.g. monthly household surveys may use one month as a long period).

## The impact of data sources

There is an important gap between what **needs** to be measured (i.e., what users of statistics would like to measure) and what **can** be measured, as well as between what **can**

	<b>usual hours of work</b> (per week)
+	overtime worked beyond usual overtime (during reference week)
-	absence from work beyond usual absence (during reference week)
=	<b>hours worked</b> (during reference week)

be measured and what **is** actually being measured. Both gaps stem from imperfect measurement instruments, as the measurements depend either on incomplete and imprecise registrations kept for purposes other than the production of statistics or on unreliable responses of individuals to standard questions.

The first type of gap results mainly from the difficulty of fully identifying all periods spent on “economic” activities and distinguishing them unequivocally from periods spent on other types of activities. Little can be done to reduce the first type of gap, therefore.

In contrast, the second type of gap arises mainly because the methodology used does not (a) observe hours worked on a continuous basis for all workers in a country, and (b) rigorously apply the statistical notion of hours worked in such a way that the reported values of hours worked are detached as much as possible from the administrative notion of working time, see Box 3. This type of gap can and should be reduced, as will be discussed in the next paragraphs.

For example, data on hours worked obtained from **establishment-based surveys** (ESs) depend on the type of registrations kept by establishments for monitoring attendance and for payment purposes. They reflect the establishments’ information needs as determined by supervisory objectives and payment practices. These registrations may differ between establishments with respect to the contents of working time, worker coverage and degrees of detail, rendering aggregate figures highly heterogeneous. In general, the procedures followed by establishments for recording working time are not well documented nor controlled. Thus:

- (1) The **content** of reported hours worked tends to reflect the administrative need for information about hours worked which tends to relate to the hours which are paid or to contractual hours of work. It is very possible that some inactivity periods are included in reported hours worked and that some periods spent on economic activities, e.g. unpaid overtime work and work done at home, are excluded, in line with the establishments’ payment practices.

### Box 3. Administrative versus statistical measures of hours worked

There is an essential difference between hours worked defined for administrative purposes and hours worked defined for statistical purposes (to correspond to the actual production of economic goods and services).

In the first case, hours worked will cover all periods of time for which an agreement has been reached between the parties concerned (i.e. the individuals, workers' organisations, employers, employers' organisations, government), regardless of whether they are spent working or not. One agreement may consider the following activities as work (and pay them): time spent changing clothes, commuting time, lunch time, etc. And yet another agreement may exclude all of these periods from work and not pay for them. The content of hours worked defined in one agreement will be specific to the group of workers mentioned in it and not necessarily be comparable to that defined in another agreement for another group of workers. Data relating to hours worked so defined which is aggregated to produce a national measure will be heterogeneous in content, and therefore misleading.

In contrast, hours worked defined purely for statistical purposes will reflect the time spent on a standard set of activities, some of which may be excluded from working time legislation and vice versa. It is applied uniformly to all workers and will be comparable between different groups of workers, and can be aggregated to produce a national figure.

- (2) The **degree of detail** provided by establishment records will vary as recorded absences may only relate to full-day absences, but working time reported to statistical questionnaires is often presented in time units of one hour<sup>8</sup>.
- (3) Statistics obtain from ESs often have a limited worker and industry **coverage**, excluding most managerial and peripheral staff, part-time workers and workers in small establishments.
- (4) On the other hand, for the concept and workers covered, ES statistics may be more precise than those based on household surveys as they are based on existing written records, and thus should also be able to provide consistent data for longer **reference periods**.

Statistics on hours worked obtained from **household-based surveys**, including specialized Labour Force Surveys (LFSs), rely on the information provided by individuals responding to a standard (set of) question(s). Because the information collected is only

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<sup>8</sup>A common practice is to multiply the number of days of presence during the reference period by a standard number of hours, e.g. 8 hours. If the number of part-time workers is important, a separate calculation may be done for them. Another possibility is to multiply the number of persons by a standard number of hours for the reference period, e.g. 8 hours if the reference period is one day, 40 if it is one week, and subtract the total days of recorded absence of all workers, itself multiplied by the standard number of hours.

limited by the capacity and willingness of respondents to provide it and not by the content of existing written records, these surveys have much more control over the type and range of data collected than ESs. On the other hand, the information is subject to response errors of various kinds, see Box 4. Thus,

- (1) It is possible to better control the **content** of the hours worked measure, making it independent of respondents' own perception and understanding of what "work" is, by requesting information separately on each of the components of working time, e.g., breaks, overtime, absence from work, work at home, etc., or better still, by requesting information on the type of activities carried out during the reference period, using a time use survey approach, cf., discussion below, and therefore: (i) detach it from the administrative notion of working time, especially for employees, (ii) help respondents remember unusual absences or overtime periods, and (iii) simplify the reporting for workers who perform atypical types of jobs and who work close to their home, for whom the distinctions between work and other activities may be blurred. In practice, however, to keep overall survey costs low and questionnaires short, hours worked is usually obtained with a direct question of the type "How many hours did you work last week?", which relies heavily on respondents' perceptions of which periods are to be included or not, as well as on the memory of the number and duration of these periods. As a consequence, reported hours worked will tend to be influenced by the administrative notion of hours worked. This feature, together with the fact that most LFSs use proxy respondents, to some extent causes response errors to be an important source of distortion in the data on hours worked obtained from LFSs. In *OECD (1998)* it has been suggested that data on hours worked as conventionally measured tends to underestimate both part-week absence from work and overtime when compared with data from administrative sources.
- (2) The **degree of detail** provided can be variable as part-day absences, and even part-week absences, tend to be ignored to different degrees.
- (3) LFSs can **cover** the whole resident population in a country but they may exclude difficult to reach areas and persons living in collective households, e.g., in hospitals, prisons, military compounds and hotels, where many persons work. They also exclude non-residents who work in the country and include residents who work abroad.
- (4) To reduce recall errors and the problems for respondents to make estimates for complex patterns of activities, the **reference period** is generally short. Therefore, to estimate annual hours adequately from this source the data

collection exercise needs to be repeated frequently through the year, a requirement that not many countries are able to satisfy<sup>9</sup>. Furthermore, monthly and quarterly surveys which choose a reference period without any holidays will overestimate the hours worked for the month or quarter concerned, unless special adjustments are made on the basis of information from other sources.

#### Box 4. Types of response errors in LFSs

- S** respondents may forget certain events which are unusual or of short duration, such as occasional overtime or short absences, and may report rather the normal hours of work (*recall errors*);
- S** respondents who provide information for other members in the household may be ignorant of their activities, especially those which are infrequent (*proxy response errors*);
- S** respondents may not know exactly what activities are to be included in work and may include some periods of time spent in activities which are not to be considered as work, e.g., because they are considered as work in their workplace or because they are paid, and may omit to report time spent in activities which are to be considered as work, e.g., because they are not paid.
- S** respondents may purposely provide incorrect information, e.g., about activities which are compromising or socially unacceptable, or may fail to report unauthorized absences and overstate overtime.

Data on hours worked obtained from **Time Use Surveys** (TUSs) also rely on information provided by individuals to two standardized forms: (i) a demographic questionnaire which obtains personal and labour force information using a similar structure and content as LFS questionnaires, and (ii) a time diary which collects information on all activities carried out during one or a few days in chronological sequence throughout each 24-hours period. Because these surveys obtain information on the time spent on **all** activities, working activities are a set among many for which the respondent has to provide information. The decision as to whether one activity or the other is considered work may be made at the processing stage, depending on the coding scheme used for activities as well as instructions to respondents about how to record their activities, but not necessarily on the respondent's perception of what is work. As a consequence,

- (1) TUSs exert the greatest control over the **content** of the hours worked measure and there is evidence that data on hours worked are of higher quality than in LFSs, cf., *Niemi (1983)*, particularly for self-employed workers, who are not paid for hours worked and who may often interchange personal

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<sup>9</sup>Of 72 countries covered in an ILO methodological study, only 12 carry out monthly surveys and 18 quarterly or three-times-a-year surveys (ILO, 1990).

activities with work activities. The quality of the information would be improved further if the description of work activities were not treated as a “black box”, as is currently common in TUSs, but were obtained with as much detail as are other types of activities. Because work is generally treated as a black box, the measurement of hours worked in TUSs still relies on respondents’ perceptions of what “work” is.

- (2) The **degree of resolution** used is as homogeneous and refined as possible.
- (3) The worker **coverage** has the same potentials and limitations as LFSs.
- (4) TUSs are generally conducted as a continuous surveys covering one year, but are not carried out every year and are based on smaller samples than the LFS.

### **Covering the whole year**

Generally, measurement instruments are not able to provide information on hours worked of the whole population for the whole year. Either they are not able to accurately measure hours worked for long reference periods, or they cover neither the whole working population nor the concept targeted. As a consequence, methodologies have been developed to impute values to the missing pieces. Most national methodologies use different combinations of two approaches, depending mainly on the range, type and quality of the data available.

### **Methodology of components**

The first type of methodology uses a **component** or **accounting** approach which estimates the components of variation in the hours worked, e.g., vacation time, sick leave, holidays, maternity leave, overtime, etc., from a significant and well-defined norm, e.g., normal or usual hours. It provides good estimates when normal hours are applicable to an important share of the working population, i.e., when most workers are regular employees in the formal sector. This method is generally used when statistics based on ESs and administrative records exist and are considered more reliable, for the degree of detail required, than statistics from LFSs.

This methodology generally calculates the annual hours worked separately for particular groups of workers, insofar as statistics are available for these groups and they can be clearly distinguished. Such groups can be, e.g., public sector employees, full-time employees in agriculture, in manufacturing, part-time workers, self-employed workers, informal sector workers, black market and undeclared workers, etc. For each group the normal hours of work (for that group and reference period) are multiplied by the average number of reference periods during the year. The number of contractual days of absences,

such as holidays and of vacations actually taken, converted to standard hours, are then subtracted as well as other information on absence from work. Generally, available statistics on absence from work do not refer to all industries or types of absences but only to, e.g., sickness and maternity leave (from social security records), strikes and bad weather (from labour inspectorates reports), etc.. Such statistics are generally in terms of days, so they also need to be converted to standard hours. In principle, corrections are also needed for periods of unemployment during the year. Finally, hours of (generally paid) overtime worked are added. Once the annual hours worked are obtained for each and all of the groups of workers, a weighted average can be calculated on the basis of the relative number of workers in each particular group:

$$E [ nh_i * d/7 - h_i - ab_i + ov_i ] e_i/e$$

where	$nh_i$	=	normal hours of work per week + per worker in group i
	$d$	=	days in the year
	$h_i$	=	annual days of vacations and holidays per worker in group i (converted to hours)
	$ab_i$	=	hours of absence from work per worker in group i
	$ov_i$	=	hours of overtime worked in the year per worker in group i
	$e_i$	=	employment in group i
	$e$	=	total employment

Sometimes the required information does not exist for particular groups of workers, e.g., part-time workers, self-employed workers, etc. For these workers, annual hours worked can be estimated as a ratio of the annual hours of full-time employees, using information generally available from LFSs:

$$\frac{\text{weekly hours worked by e.g., self-employed workers}}{\text{weekly hours worked of full-time employees}} * \frac{\text{annual hours worked of full-time employees}}{\text{annual hours worked of full-time employees}}$$

This formula assumes that the groups of workers for which no information is available have the same leave and overtime behaviour as employees. If external information exists on the different components of leave and overtime for them, then these can be used to refine the estimation procedure.

### **Averaging methodology**

The second type of methodology uses an **direct or averaging** approach and assumes that the periods covered by direct measurement are more or less representative of

all other periods. This methodology is generally used when LFS data are frequent and of good quality, or where this is the only source available. In principle it requires continuous data on weekly hours worked but generally it is obtained from monthly or quarterly labour force survey data. Given the way data are obtained in LFSs, this procedure will provide good estimates when variations from the norm, due to overtime and absence, are not important.

Annual hours worked are obtained by extrapolating the monthly or quarterly data (which may relate to a subset of weeks in that period) to cover the whole month or quarter. This extrapolation generally incorporates any public holidays in the period. Resulting monthly or quarterly estimates may then be added up to obtain total annual hours worked which are then divided by the average number of workers during the year.

If variations from the norm are considered important, and if external information, stemming from administrative or establishment-based sources exist and are of good quality, the data may then be further adjusted for absences due to strike activity, sickness, vacation, etc.:

$$E_j = \frac{\sum_i wdw_j h_{ij} + wdm_j \sum_i h_{ij} - a \sum_i emp_j}{12 \text{ (or 3)}}$$

where

- $wdm_j$  = working days in month or quarter j
- $wdw_j$  = working days in reference week in month or quarter j
- $h_{ij}$  = hours worked by worker i during reference week in month or quarter j
- $emp_j$  = employed population in reference week in month or quarter j
- $a$  = correction for absence from work due to strike, sickness, vacation, etc. per worker in the year

### Estimating hours worked for the relevant population

In order to be useful as the denominator of the labour productivity equation, hours worked needs to relate to the hours worked by persons who produced the goods and services accounted for in production statistics. These are persons who worked in enterprises which are found in a country, regardless of whether they reside in that country or not. More precisely, they correspond to the domestic concept of employment, which relates to the population who works in units whose “centre of economic interest” is within the economic territory of a country, cf., *SNA (1993)*. Roughly, it will include all persons, whether resident of the country or not, who work in economic units found in the country, but will exclude residents who work in economic units found in other countries; it will include non-resident persons working in national embassies, ships, military bases, scientific stations, etc., located in another country, but will exclude all resident persons working in international

organisations, foreign embassies, ships, military bases, scientific stations, etc., located in the country.

Therefore, to estimate the hours worked for the domestic population necessary to calculate the volume of employment for use as the denominator in the productivity equation, in principle entails making the adjustments necessary to ensure that the corresponding population is applied, depending on the sources used for the estimates of hours worked. This implies obtaining information on residents who work abroad, and of non-residents who work in the country; and completing the coverage of residents working in the country, e.g, those residing in collective dwellings, persons working outside the formal economy, etc., depending on the characteristics of the data available in the country.

The following illustrates the type of adjustments that are needed to arrive at the domestic employment concept when the base data stem from LFSs:

	<b>Employment as measured in LFSs</b>
+	resident foreigners not included in the scope of the survey, e.g., temporary workers, etc.
+	workers in territories excluded from the scope of LFS, including workers in national embassies, military camps, ships, aircraft, etc., abroad
+	armed forces and conscripts
+	other workers in collective dwellings
+	non-residents who work in the country
-	residents who work abroad, including those in foreign embassies, military camps, ships, etc..
=	<b>Domestic concept of employment</b>

The resulting figure is then multiplied by the annual hours worked per worker to obtain the **volume of employment**.

## Summary

This paper deals with three issues involved in the measurement of annual hours worked and its related concept, the volume of employment.

The first relates to measuring the hours worked: (a) what are the activities considered as “work” and the effect of disregarding the important contribution of non-market productive activities on the meaning and usefulness of the resulting data; (b) the adjustments needed when data on hours worked are not available; (c) the impact of measurement methodologies on the range, type and quality of resulting figures, in particular with respect to their capacity to detach themselves from the administrative notion of hours worked and with respect to their capacity to provide data of good quality for the whole population for the whole year.

The second issue relates to the rationale behind the two estimation procedures developed to impute values for the gaps left by these measurement methodologies and so be able to cover the whole year. No recipes are given, because the exact procedures depend on the type and quality of data available in a country.

Finally, the third issue relates to the adjustments that need to be made to the employment figure to arrive at a domestic employment measure which can be used to estimate the volume of employment.

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