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Ashley Ward,

Belen Zinni,

Pascal Marianna

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Ashley Ward, Statistics and Data Directorate, ashley.ward@oecd.org, +33 (0)1 45 24 99 36
María Belén Zinni, Statistics and Data Directorate, belen.zinni@oecd.org, +33 (0) 1 45 24 94 53
Pascal Marianna, Directorate for Employment, Labour and Social Affairs,
pascal.marianna@oecd.org , +33(0) 1 45 24 92 23

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International productivity gaps: Are labour input measures comparable?

Ashley Ward and María Belén Zinni (OECD Statistics and Data Directorate)
Pascal Marianna (OECD Directorate for Employment, Labour and Social Affairs)[1]

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Abstract / Résumé

Cross-country differences in the measurement of labour input contribute to observed productivity gaps across countries. In most countries, labour force surveys (LFS) form a primary source of information for employment related statistics, such as persons employed, employees and hours worked. However, because the coverage of LFS does not fully align with the coverage of activities used to estimate GDP, additional adjustments relying on complementary sources, such as administrative or business statistics, are often applied to bridge conceptual differences, and in many countries, the use of these sources is often preferred to LFS data. Evidence from the 2018 OECD/Eurostat national accounts labour input survey shows that the adjustments made to align measures of labour input with the corresponding measures of production according to the domestic concept, vary considerably across countries, with many countries making no adjustments, in particular, for the measurement of hours worked. This paper demonstrates that countries making no adjustments to average hours worked measures extracted from the original source, such as self-reported hours actually worked in the LFS, appear to systematically over-estimate labour input and, so, under-estimate labour productivity levels. To illustrate the size of this bias, for this group of countries, the paper adopts a simplified component method that introduces a series of explicit adjustments on working time using information available in LFS and complementary sources. The results point to a reduction in relative productivity gaps of around 10 percentage points in many countries compared to current estimates. Although future releases of OECD productivity (levels) statistics will incorporate these changes, it is important to stress that these estimates will only be used as a stop-gap while countries making no, or minimal adjustments, work to leverage all available data sources to produce average hours worked estimates that align with the national accounts domestic concept and that address self-reporting bias; which is the paper's principal recommendation for those countries that currently make no or only partial adjustments. Indeed, many EU member states, coordinated by Eurostat, are already moving in this direction, with ESA 2010 derogations set to expire by 2020.

Keywords: labour productivity, mismeasurement, labour input, hours worked, employment.

JEL Classification: E1, E24, E26.

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Les différences entre les pays en matière de mesure du facteur travail contribuent aux écarts de productivité observés entre les pays. Dans la plupart des pays, les enquêtes sur la population active (EPA) constituent une source d'informations essentielle pour les statistiques relatives à l'emploi, telles que les actifs occupés, les salariés et les heures travaillées. Cependant, étant donné que la couverture de l'EPA n'est pas totalement alignée sur celle des activités utilisées pour estimer le PIB, des ajustements supplémentaires reposant sur des sources complémentaires, telles que des statistiques administratives ou des statistiques sur les entreprises, sont souvent appliqués pour résorber les différences conceptuelles. Dans de nombreux pays, l'utilisation de ces sources est souvent préférée aux données de l'EPA. Les résultats de l'enquête conjointe de 2018 OCDE / Eurostat sur les mesures du facteur travail rapportées dans les comptes nationaux montrent que les ajustements effectués pour aligner les mesures du facteur travail sur les mesures correspondantes de la production varient considérablement d'un pays à l'autre, de nombreux pays n'effectuant aucun ajustement, notamment, pour la mesure des heures travaillées. Ce document montre que les pays n'effectuant aucun ajustement sur la moyenne des heures travaillées extraites de la source d'origine, telles que les heures effectivement travaillées déclarées dans l'EPA, semblent systématiquement surestimer le facteur travail et, par conséquent, sous-estimer les niveaux de productivité du travail. Pour illustrer l'ampleur de ce

biais, le document adopte pour ce groupe de pays une méthode par composantes simplifiée qui introduit une série d'ajustements explicites sur le temps de travail en utilisant les informations disponibles dans l'EPA et des sources complémentaires. Les résultats indiquent une réduction *des écarts de productivité relatifs* d'environ 10 points de pourcentage dans de nombreux pays par rapport aux estimations actuelles. Bien que les publications futures de statistiques de l'OCDE sur la productivité (niveaux) intégreront ces changements, il est important de souligner que ces estimations ne serviront que de solution de remplacement, pendant que les pays qui n'effectuent aucun ajustement ou un ajustement minimal s'efforcent de mobiliser toutes les sources de données disponibles pour produire des estimations du nombre moyen d'heures travaillées selon le concept intérieur des comptes nationaux après traitement des biais de réponses auto-déclaratives; qui est la principale recommandation du document à l'intention des pays qui n'effectuent actuellement aucun ajustement, ou seulement un ajustement partiel. En effet, de nombreux États membres de l'UE, coordonnés par Eurostat, vont déjà dans cette direction, les dérogations du SEC 2010 devant expirer en 2020.

Mots clés: productivité du travail, erreur de mesure, facteur travail, heures travaillées, emploi.

Classification JEL: E1, E24, E26.

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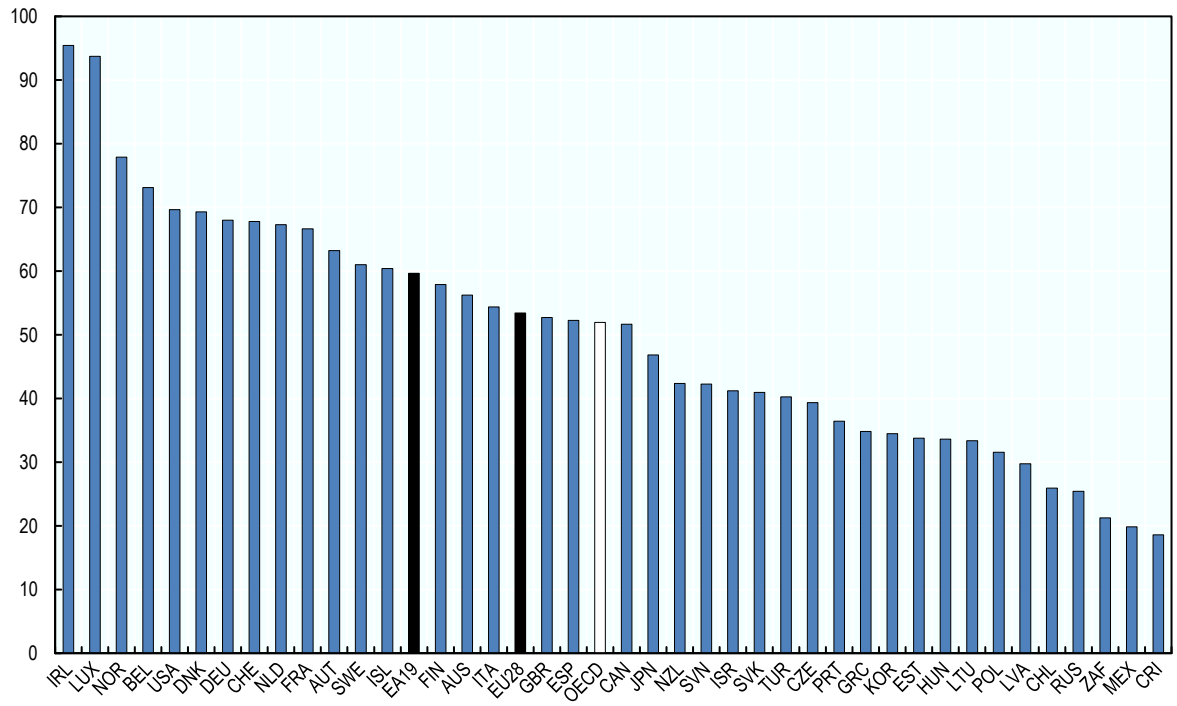
1. Introduction

1. Official statistics point to considerable differences in labour productivity levels across countries (Figure 1.1). While significant efforts are made to ensure international comparability of GDP estimates, i.e. the numerator (Ahmad et al., 2003), partly reflecting its importance, efforts on ensuring comparability of labour input measures have been less systematic and irregular, notwithstanding the work of OECD, in particular, on the measurement and data collection of hours worked (OECD, 2004; OECD, 2009).

Figure 1.1. Labour productivity, 2016

GDP per hour worked, total economy, US dollars, current prices and current PPPs



Note: http://dx.doi.org/10.1787/888933733695
Source: OECD (2018), OECD Compendium of Productivity Indicators 2018, OECD Publishing, Paris. http://dx.doi.org/10.1787/pdtvy-2018-en.

2. From the perspective of productivity measurement, labour input is most appropriately measured as the total number of *hours actually worked*.[2] Simple though this concept is, in practice there are a number of challenges that complicate measurement and that may impact on international comparability of productivity *levels*. At the extreme end of the scale are countries where no data exist on hours worked, but even in countries with data, differences in the coverage of data sources and their alignment with national accounts concepts of output, and the range of adjustments used to estimate actual hours worked may differ. Because they are typically the main source used to estimate output, business sources

2. See also the 2008 SNA (para 19.47).

for labour input measures might intuitively be seen as the ideal vehicle for collection. However, business sources typically report hours paid or contractual hours, which differ from the concept of hours actually worked, which refers to all hours engaged in production, whether paid or not, and excludes hours not used in production, even if some compensation is received, such as paid holidays and sick leave. Moreover, business sources will not be able to provide information on labour input for many unobserved activities in the informal economy, the output of which is, at least in theory, included in GDP.

3. The impact that differences in data sources and scale of adjustments made by countries may have on international comparability of labour productivity levels is difficult to quantify. While it is plausible that sizeable differences may exist in measures of labour productivity per se, reflecting a wide range of factors, including structural, substantial differences in the average hours worked by individuals are harder to explain, if only because they are necessarily bounded by the 24 hours in a day that can theoretically be worked. For example, labour statistics in national accounts suggest that the average American worker worked around 28% longer than their German counterpart in 2016. That is not to say that the size of the difference is necessarily an indication of mismeasurement, especially as labour productivity levels are almost identical, but the absence of information on how countries measure hours worked creates some uncertainty.

4. To better understand the potential scale of differences in sources and methods, in February 2018, the OECD and Eurostat launched a survey to collect data and metadata on national accounts labour input measures. This paper draws on the results of the survey and provides an assessment of the approaches followed by countries to estimate labour input measures (employment and hours worked) in their national accounts, and, in turn, their comparability. It's important to stress up-front that the broader issue of alignment of labour input and value-added measures is not new, as the earlier surveys conducted by the OECD and Eurostat testify. Indeed, it's also important to note that the process of improved alignment, which is advocated in this paper, is on-going: many EU member states for example with derogations in place are working towards full implementation of ESA 2010 regulations by 2020. What is new, however, and which is presented in this paper for the first time, are the empirical estimates that highlight the potential impact of differences in the approaches used by countries to measure labour input on estimates of labour productivity levels.

5. The paper is structured as follows: Section 2. outlines the key concepts necessary for estimating labour input, consistent with national accounts output measures, and that are comparable across countries; Section 3. describes the survey used and presents the results; Section 4. draws on the survey results and assesses the quality and comparability of national labour input measures used in the national accounts; Section 5. presents the conclusions of the paper and a series of recommendations on the basis of the concepts, results and analysis in the preceding sections.

2. Measuring labour input in national accounts

6. Countries' national accounts generally present two different measures of labour input: employment and hours worked. The most important measurement issues that affect the international comparability of these indicators relate to (a) the unit of measurement used in the case of employment (e.g. persons employed or jobs), (b) the distinction between actual hours worked and other concepts of hours worked including, for example, statutory hours, and (c) the alignment of principles used to define both employment and hours worked concepts with those relating to the national accounts production boundary.

2.1. Employment: Persons vs. jobs

7. Employment figures are currently compiled by countries in their national accounts in terms of persons employed and/or number of jobs, with most reporting on a person's basis. When the metric is headcounts, a multiple job holder counts as one person. To the extent that some persons may have more than one job, the number of jobs in the economy generally exceeds the number of persons employed.[3] For the purposes of productivity analysis, in particular at the industry level, both units of measure are imperfect, especially as neither account for differences in the degree of full and part-time working within and across countries. In other words, they are not measures of hours actually worked, and, so, in turn, are not ideal measures for comparisons of labour input across countries. Indeed, when there are substantial changes in the share of individuals working part-time within a country they may not be good proxies for changes in labour input (and productivity growth) over time.

2.2. The concept of working time: Hours actually worked

8. Statistics on working time were first collected with the aim of assessing and monitoring working conditions, giving rise to the concept of *normal hours worked*, defined as the number of hours of work fixed by laws or collective agreements, or by the number of hours in excess of which any time worked is remunerated as overtime and/or forms an exception (ILO, 2008). The concept of *hours actually worked* was developed later as a tool for economic analysis and, in particular, to construct economic indicators such as labour productivity, average hourly earnings and average labour cost per unit of time.

9. The 2008 SNA and the *Measuring Productivity OECD Manual* (OECD, 2001) state that neither the number of persons employed, nor employees, job-counts or full-time equivalent employment measures are ideal for productivity indicators.[4][5] The recommended measure is the *total number of hours actually worked* by all persons engaged in production, i.e. employees and self-employed. Measures of working time as opposed to head- or job-counts capture variations in the incidence of part-time work, absences from work and shifts in normal working hours, and hence, bear a closer relation to the amount of productive

3. Job sharing, where two or more persons share a single job can also drive differences.

4. See para 19.47.

5. Full-time equivalent employment is defined in the 2008 SNA as 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 (2008 SNA, para 19.43).

services (labour input) actually provided by workers in the production of goods and services. Productivity analysis is concerned with measuring the volume of inputs engaged in the production of a given volume of output, so the underlying concept for working time should include all hours effectively used in production, whether paid or not. The concept, in turn, excludes hours not used in production, even if some compensation is received for those hours. The International Labour Organisation (ILO, 2008) defines *total hours actually worked*, as follows:

- hours spent directly on carrying out the tasks and duties of a job regardless of the amount of working time agreed contractually between employers and employees;
- hours spent in activities in relation to them, including maintenance time, cleaning time, training time, waiting time, time spent on call duty, travelling time between work locations;
- time spent in between these hours when the person continues to be available for work, which includes periods where a person cannot work for reasons that are either inherent to the job or due to temporary interruptions; and
- short resting time.

10. Conversely, hours actually worked exclude:

- all types of leave (annual, public holidays, sick leave, maternity and parental leave, etc.);
- longer breaks from work (e.g. meal breaks);
- commuting time when no productive activity is performed;
- educational activities other than on-the-job training time.

11. Measures of *hours actually worked* during a reference period, generally a week, are collected in labour force surveys (LFS) directly from respondents. As such, this information may be prone to "rounded" answers and recall problems, as well as over-estimation of actual working time and/or underestimation of part-week absences due to illness and holidays, and indeed under-declaration of actual working hours in some cases (which may for example be the case for respondents working in the grey or informal economy). For this reason, and to help producers of labour statistics to ensure the correct implementation of definitions of working time, LFS also collect information on the number of usual or normal hours worked and include questions on absences and on paid and unpaid overtime, although even here reporter bias can be problematic (see Box 4.1). In business surveys and administrative sources, working time concepts are generally linked to payments and employment contracts, with estimates of hours actually worked necessarily arrived at by adjusting information on hours paid or contractual hours for overtime and absences.

2.3. Aligning with the SNA production boundary

12. Measures of employment and total hours actually worked required in national accounts and productivity analysis relate to the hours performed in domestic economic units. LFS and other conventional sources however do not typically align with the national accounts production boundary (Box 2.1). Employment figures covered in the primary employment data source, such as the LFS, may have definitional differences due to the inclusion (or exclusion) of resident (non-resident) persons working in non-resident (resident) units, as well as the exclusion of military personnel and individuals living in collective households.

Box 2.1. Sources commonly used to construct employment and hours worked in national accounts

A wide variety of primary data sources are used to estimate employment and hours worked in line with the national accounts production boundary. In practice, these vary substantially across countries, as revealed by the 2018 OECD/Eurostat survey on national accounts labour input measures (Table 3.2 and Table 3.3), reflecting their applicability and use within each country with regards to coverage, reliability, timeliness, and purpose of analysis. The most widely used primary data sources are labour force surveys, population census, business statistics and administrative sources. While the first two are commonly used to monitor the "supply-side" of the labour market, the latter two provide a "demand-side" perspective.

Labour force survey – The labour force survey (LFS) is the most comprehensive and well-established source for information on the composition and characteristics of the labour force. International harmonisation is achieved by complying with definitions set out by the International Labour Organisation (ILO, 1982 and 2013), although sample selection, survey techniques, survey responses and the implementation of ILO concepts may vary between countries. An advantage of the LFS is that it covers a broad range of employment situations, including the self-employed, unpaid family workers and informal employment, as well as collecting information on multiple-job holdings, hours usually and actually worked, and paid and unpaid overtime. Moreover, it provides information on the structure of employment in terms of age, sex, education level and professional status. Its main limitation from the perspective of national accounting, and hence, productivity analysis, is the often limited consistency with output and value-added measures, in particular, by industry, as the LFS is a household survey for which the stratification process may not adequately capture the homogenous strata required in productivity analysis. For example, in the LFS, industry coding is often conducted on the basis of information given by the respondent about the type of product, service or function provided by his/her place of work, which may not align with the industry coding of that firm in the business register, and hence national accounts (although in some countries this alignment is improved by matching respondents information, such as the name and address of the firm with equivalent information on the business register). In addition, in many countries, the LFS does not cover some groups of the population such as persons below or above certain age thresholds (which varies by country), those living and working in communal establishments (such as prisons or long-term care facilities), collective households (such as religious institutions) and the armed forces, all of whose output is included, at least in theory, in estimates of GDP. In addition, the sampling structure of LFS is based on the population usually residing in the country and includes workers in non-resident production units, whereas non-resident cross-border workers working in resident production units are excluded. There may also be biases in LFS responses, reflecting the self-reporting nature of LFS, and these biases, that may also be cultural, appear to be significant with respect to responses on hours actually worked. For example, in some countries, certain categories of workers, such as managers, professionals, and some self-employed may over-report their hours actually worked. On the other hand, despite reassurances that the LFS is purely for statistical purposes, there

may be a tendency to hide or under-report hours actually worked by those working in the grey or informal economy.

Population census – The population census (PC) is a comprehensive source covering the whole population of a country, making it a useful tool to benchmark household surveys, including the LFS. The main disadvantages are the low frequency of data collection, which is typically carried out every five or ten years, and the possibility that unregistered migrants may not be captured.

Business statistics – Business statistics (BS) include establishment and/or enterprise surveys, business census, and dedicated labour cost surveys. Another important data source is the statistical business register (SBR) which is typically sourced from multiple primary data sources, including business surveys and a variety of administrative data.[6] BS typically provide detailed data on employment and hours worked following a detailed industrial classification of firms that is generally consistent with their classification in national accounts output and value-added data – indeed structural business statistics are an important input to, and building block for, the national accounts. One of the main limitations of BS, however, is that they sometimes exclude establishments or enterprises below a certain employment or turnover threshold and certain categories of firms, such as unincorporated businesses, self-employed persons and informal labour. A further limitation of some business statistics, such as dedicated labour cost surveys, is that they often provide information on hours paid or contractual hours only, and not information on absences from work and unpaid overtime, and, so, do not align with the concept of hours actually worked required to measure labour input in productivity analysis.

Administrative data sources – Administrative data sources (AS) are typically collected by government bodies – but also increasingly by private data providers (e.g. associations for specific groups) – based on some form of statutory or voluntary registration. For example, statistics from social security institutions and tax administrations can provide information on all persons required to pay income tax or social insurance contributions. Social security records, tax registers, compulsory business registration systems, resident permit registers, migration statistics, and statistics on the armed forces, are the administrative sources most commonly used by countries in compiling estimates of labour input. AS may include information on wages, entrepreneurial income, taxes, etc. as well as a series of demographic variables describing age, gender, and family ties. The main advantage of AS is that they are generally comprehensive, at least with regards to the population that they purport to cover, and do not entail additional collection costs to the national statistical offices (NSOs) as compared to surveys. Like BS however, AS often struggle to capture informal labour.

Other sources – Statistical offices may use other complementary sources to estimate labour input that do not fall neatly into any of the above categories. Among others (see also Table 3.2, Table 3.3 and Annex B) these can include time-use surveys, surveys on households' living conditions, tourism surveys, and surveys of insurance companies. In some ways, these sources are similar to administrative sources and so, for simplicity,

6. There is ongoing work to harmonise Statistical Business Registers (SBR) via both the UN Wiesbaden Group on Business Registers and the joint UNECE-Eurostat-OECD expert group on business registers.

and without prejudicing the analysis and results presented here, this paper groups AS and these other sources together.

13. Similarly, data from administrative sources, such as social security records, cannot provide an exhaustive measure of working time in the unobserved economy. This necessarily implies that, whichever primary data source is used, adjustments to the main original data source(s) are needed to address, as a minimum, the coverage of all relevant economic territory, including flows of cross-border workers, employment in the unobserved economy, as well as any other adjustments that are specific to the country or data source (Box 2.2).[7]

14. In practice therefore, different data sources collect information on different concepts of employment and working time, and might well cover a different set of production units that do not necessarily match the national accounts concepts. As such, data from more than one statistical source and additional computations are usually needed to align with national accounts' requirements.

Box 2.2. Common adjustments needed to align employment and hours worked estimates with the national accounts

Periodicity – National accounts are generally compiled on a quarterly and annual basis. However, original data sources can have different periodicities and so adjustments to original source data – ranging from simple arithmetic averages of higher-frequency data (e.g. annual figures are obtained as the arithmetic mean of quarterly values) to interpolations based on information from additional data sources – are required. The latter are often used to extend series backwards, as the periodicity of original data sources has increased over years.

Persons to jobs / jobs to persons – Original data sources may provide information on employment in terms of persons and/or jobs. Whenever the units of measure used in the original data source and those referred to in the presentation of a country's national accounts differ, an adjustment from persons to jobs or vice versa is required.

Economic territory – A number of adjustments are necessary to ensure alignment of estimates of workers with the economic territory in which they work. For example, adjustments are needed to capture non-resident persons working in domestic (resident) production units and to exclude those in the resident population that work in non-resident units (e.g. foreign embassies, consulates and foreign military bases within the reporting country or work abroad). Adjustments are also needed to ensure the inclusion of subsets of the resident population not covered in the original data source(s): in the case of the LFS, this may refer to military and conscripts, collective households and workers in territories not covered by the LFS but that are within the country's economic territory;

7. Adjustments to ensure the consistency between output and labour input measures are especially important when it comes to the measurement of productivity on an industry basis, in particular when the LFS is the main original source (Box 2.2).

in the case of business statistics, the subsets of resident population typically not covered include the self-employed and unpaid family workers, as well as workers in economic activities such as public administration, education, health and other non-market services (although the latter are generally well covered by administrative data).

Unobserved economy – By their nature, business statistics and administrative data sources typically miss information on employment and hours worked in the unobserved economy. Whenever this is the case, adjustments to capture employment and hours worked are required to ensure consistency with the production boundary of output measures. Depending on the country and the original data sources, these adjustments may be more relevant in some economic activities, such as construction, trade, catering and personal services. In addition, the digital economy has increased the importance of peer-to-peer transactions, with the emergence of platforms intermediating, for example, the renting of apartments/houses or the provision of taxi services, by households to other households. While, in principle, the measurement framework used by national accountants covers the output of these activities, the increase in the scale of these activities by, typically, the 'occasionally self-employed' may require an examination of methods (and sources) currently used to measure both output and labour input (Ahmad et al., 2016; Ahmad et al., 2017).

Other adjustments – Many countries introduce additional adjustments to the data obtained from original sources to comply with national accounts concepts. These include adjustments for working students, workers engaged in production undertaken entirely for their own final consumption or own capital formation either individually or collectively, working prisoners, workers below or above age thresholds covered by original data sources, and, for estimates of labour productivity at the industry level, adjustments may be needed to ensure that persons employed in temporary employment agencies are included in the industry of the agency and not in the industry of the enterprise for which they actually work (2008 SNA, para. 19.21). In addition, albeit with marginal impact on actual estimates of labour input, when the original data source is the LFS, a common adjustment is the reclassification of owners of corporations and quasi-corporations working in their companies as employees rather than as self-employed persons, which is often how they classify themselves (see also 2008 SNA, para. 19.21).

3. The 2018 OECD/Eurostat survey on the methodology underlying labour input data in the national accounts

3.1. Survey objectives, contents and procedures

15. To assess the consistency between output and labour input measures within a country but also the international comparability of employment and hours worked data in national accounts, in February 2018, the OECD and Eurostat launched a survey to collect data and metadata on national accounts labour input measures.[8]

16. Overall, 45 countries participated in the survey (see Table 3.1), which was divided into four parts:

- The first aimed at determining the availability of labour input data in terms of employment and hours worked for the total economy and by industry.
- The second consisted of the completion of a set of "bridge tables" intended to show in practice how, and to what extent, countries adjust original employment and hours worked source data to concepts required in the national accounts framework.
- The third was an extension to the second, requesting additional detail on how national accounts estimates of employment and hours worked are derived from original source data. This recognises the fact that in practice countries may use different data sources for employment and hours: labour force survey; administrative data; business statistics, among others (Table 3.2 and Table 3.3).
- The final part was an opportunity for countries to describe any initiatives in the measurement of labour input and productivity to provide a means for countries to benefit from experiences that have already been undertaken or are on-going in other countries.

3.2. Results of the survey

17. This section provides a synthesis of national responses to the survey.

3.2.1. Availability

18. For each country, Table 3.1 shows the availability of employment and hours worked data for the whole economy and by industry, including details of the industrial classification system used and the industry breakdown available.

19. All countries surveyed produce estimates of employment. The majority of countries, with the exception of Argentina, Brazil, Costa Rica and Japan, produce estimates of hours worked for all persons in employment. Japan produces hours worked estimates only for employees and Argentina and Brazil do not produce any of these estimates (although Argentina and Brazil, and Japan for self-employed, acknowledged their plans to do so in the near future).

20. Most countries produce estimates of both employment and hours worked on a NACE Rev 2 basis and at least for the A64 industry breakdown (partial 2-digit), which is the industry classification required in the standard Eurostat questionnaire for employment

8. The survey is a follow-up to previous surveys conducted in 2004 and 2009.

and hours worked series in the national accounts, (for hours worked only A21 is compulsory).[9] The NACE Rev 2 industry classification system is also used in Argentina, for which employment series are available at the 2-digit industry detail.

21. Canada, Mexico and the United States produce employment and hours worked on a North American Industrial Classification System (NAICS) basis, with breakdowns at the 3 digit level (and up to 6 digit level in some cases). Australia and New Zealand produce employment and hours on an Australian and New Zealand Standard Industrial Classification System (ANZSIC) basis, with 1 and 3 digit breakdowns and 1 to 2 digit breakdowns, respectively. Brazil follows the National Classification of Economic Activities 2.0 (CNAE 2.0), which aligns with ISIC Rev 4 at the section level (1-digit). The Russian Federation follows the Russian Classification of Economic Activities system (OKVED) OK-029-2007, which is in line with NACE Rev 1.1, up to 2-digit industry detail for data until 2016 and the OK-029-2014 classification for 2017 data onwards. South Africa follows the SIC Fifth edition, which is in line with ISIC Rev 3. Other countries – Chile, Colombia, Costa Rica (only employment), Japan, Korea and Peru – produce employment and hours worked on an ISIC Rev 4 basis, with varied levels of industry breakdown.

3.2.2. Sources

Employment

22. Table 3.2 and Figure 3.1 present information on the original data sources used for employment, for employees and self-employed workers respectively, which are classified into Labour Force Survey (LFS), Population Census (PC), Business Statistics (BS), and Administrative sources + Other (AS) (see also Box 2.1), and highlights whether a given source is the main or secondary source. In some cases two "Main" sources are cited, reflecting for example, when a population census is used as the benchmark every fifth year with LFS data used in non-census years. The table also describes whether a country provides data in terms of persons or in terms of jobs.

9. NSOs of EU and EFTA countries may produce statistics at a higher industry detail, but these are not requested in the Eurostat questionnaire for labour input measures in national accounts. In Latvia the industry breakdown for hours worked is A21 (1-digit) and in Switzerland it is A21 (1-digit) for employment and partial 1-digit for hours worked.

Table 3.1. Data availability for employment and hours worked

Country	Employment (persons or jobs)		Hours worked	
	Industrial classification system	Level of industry detail	Industrial classification system	Level of industry detail
OECD countries				
Australia	ANZSIC 2006	1 and 3 digits	ANZSIC 2006	1 and 3 digits
Austria	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Belgium	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Canada	NAICS	Mix of 3 to 6 digits	NAICS	Mix of 3 to 6 digits
Chile	ISIC Rev 4 adapted for Chile	1-digit	ISIC Rev 4 adapted for Chile	1-digit
Czech Republic	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Denmark	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Estonia	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Finland	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
France	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Germany	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Greece	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Hungary	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Iceland	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Ireland	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Israel	ISIC Rev 4	Partial 2-digit	ISIC Rev 4	1-digit
Italy	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Japan	ISIC Rev 4	1-digit, except manufacturing (2-digit)	ISIC Rev 4 (employees only)	1-digit, except manufacturing (2-digit) (employees only)
Korea	ISIC Rev 4 (and KSIC)	30 large-sized sectors, 82 medium-sized sectors, 161 small-sized sectors	ISIC Rev 4 (and KSIC)	30 large-sized sectors, 82 medium-sized sectors, 161 small-sized sectors
Latvia	NACE Rev 2	Partial 2-digit	NACE Rev 2	1-digit
Lithuania	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Luxembourg	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Mexico	NAICS 2013	3-digit (80 industries)	ISIC Rev 4	Partial 1-digit
Netherlands	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
New Zealand	ISIC Rev 4	2-digit	ISIC Rev 4	
New Zealand (PS) [1]	ANZSIC 2006	1 to 3 digit level	ANZSIC 2006	1 digit level
Norway	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Poland	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Portugal	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Slovak Republic	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Slovenia	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Spain	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Sweden	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit

Table 3.1 Data availability for employment and hours worked (continued)

Country	Employment (persons or jobs)		Hours worked	
	Industrial classification system	Level of industry detail	Industrial classification system	Level of industry detail
OECD countries				
Switzerland	NACE Rev 2	1-digit	NACE Rev 2	Partial 1-digit
United Kingdom	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
United Kingdom (PS) [1]				
United States	ISIC Rev 4	Partial 2-digit	ISIC Rev 4 (employees only)	Partial 2-digit (employees only)
United States (PS) [1]	2007 NAICS	3 to 4 digit	NAICS	3 to 4 digit
Selected non-member countries				
Argentina	NACE Rev 2	1-digit	Do not produce hours worked	Do not produce hours worked
Brazil	CNAE 2.0.	68 industries	Do not produce hours worked	Do not produce hours worked
Bulgaria	NACE Rev 2	2-digit	NACE Rev 2	Partial 2-digit
Colombia	ISIC Rev 4 adapted for Colombia	up to 4-digit	ISIC Rev 4 adapted for Colombia	up to 4-digit
Costa Rica	ISIC Rev 4	4-digit	Do not produce hours worked	Do not produce hours worked
Croatia	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Cyprus	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Malta	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Peru	ISIC Rev 4	54 ad hoc activities	ISIC Rev 4	54 ad hoc activities
Romania	NACE Rev 2	Partial 2-digit	NACE Rev 2	Partial 2-digit
Russian Federation	OKVED OK-029-2007 until 2016; OK-029-2014 since 2017	1- and 2-digit	OKVED OK-029-2007 until 2016; OK-029-2014 since 2017	1- and 2-digit
South Africa	SIC Fifth edition - based ISIC REV 3	1-digit	SIC Fifth edition - based ISIC REV 3	2- and 3-digit

Notes: For all EU + EFTA countries the information in this table reflects the data available in the Eurostat database. For Chile, Israel, Mexico (only for hours worked), New Zealand and the United States, the information corresponds to the data available in the OECD Annual National Accounts Statistics (database). For all other countries, the table reflects the information provided through the survey by NSOs.

1. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between their NSOs and the OECD. Information on labour input measures in the national accounts for the United States was provided directly through the survey.

Source: OECD-Eurostat 2018 labour input survey, OECD National Accounts Statistics (database) and Eurostat database, August 2018.

Table 3.2. Sources used for employment

The sources used by countries, main original sources and other sources, to construct estimates

	Unit	Employees				Self-employed			
		LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
OECD countries									
Australia	Persons	Main	-	-	Secondary	Main	-	-	-
Austria	Persons and jobs	-	-	Secondary*	Main & Secondary	Secondary	-	-	Main
Belgium	Persons	-	-	-	Main	-	-	-	Main
Canada	Jobs	Main	Secondary	Secondary	Secondary	Main	Secondary	-	Secondary
Chile	Persons	Main	-	-	-	Main	-	-	-
Czech Republic	Persons	Main	-	Secondary	Secondary & Estimates	Main	-	Secondary	Secondary & Estimates
Denmark	Persons	-	-	-	Main	Secondary	-	-	Main
Estonia	Persons and jobs	Main	-	-	-	Main	-	-	-
Finland	Persons	Secondary	-	Main*	Secondary & Estimates	Secondary	-	Main*	Secondary & Estimates
France	Persons and FTE	Secondary	-	Secondary	Main & Secondary & Estimates	Secondary	-	-	Main & Secondary & Estimates
Germany	Persons	Secondary	-	Main*	Main & Secondary & Estimates	Main	-	-	-
Greece	Persons	Main	Secondary	Secondary*	Secondary	Main	Secondary	Secondary*	Secondary
Hungary	Persons	Main	Secondary	Secondary	Secondary	Main	Secondary	Secondary	Secondary
Iceland	Persons and jobs	-	-	-	Main	Secondary	-	-	Main
Ireland	Persons	Main	-	Main	Secondary	Main	-	-	-
Israel	Persons and jobs	Main	-	Secondary	Secondary	Main	-	-	Secondary
Italy	Persons and jobs	Main	-	Main*	Main & Secondary	Main	-	Main*	Main & Secondary
Japan	Jobs	Main	Main	-	Secondary	Main	Main	-	Secondary
Korea	Persons and FTE	Main	-	-	-	Main	-	-	-

Table 3.2 Sources used for employment (continued)

	Unit	Employees				Self-employed			
		LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
OECD countries									
Latvia	Persons	Main	-	-	-	Main	-	-	-
Lithuania	Persons	Main	-	-	Secondary & Estimates	Main	-	-	Secondary & Estimates
Luxembourg	Persons and jobs	-	-	Main	Main & Secondary	-	-	Main	Main & Secondary
Mexico	Persons	Secondary	-	Main	Secondary	Main	-	Secondary	-
Netherlands (2009)	Persons	Secondary	-	Secondary	Main	Main	-	-	-
New Zealand	Persons	Main	-	-	-	Main	-	-	-
New Zealand (PS) [1]	Persons and jobs	Secondary (until 2000)	Secondary (until 2000)	Main (until 2000) / Main (from 2000)*	Main	Main (unitl 2000)	Main (until 2000)	Main (from 2000)*	Main
Norway	Persons	-	-	Main	Main	Main	-	Secondary*	Secondary
Poland	Persons	Main	-	Secondary	-	Main	-	-	-
Portugal	Persons and jobs	Main	-	Main (jobs)	Main (jobs)	Main	-	Main (jobs)	Main (jobs)
Slovak Republic	Persons	Main	-	Secondary	Secondary	Secondary	-	Main*	Main & Estimates
Slovenia	Persons	Secondary	Secondary	Secondary	Main	Secondary	-	Secondary	Main
Spain	Persons and jobs	Main	-	Secondary	Secondary	Main	-	Secondary	Secondary
Sweden	Persons	Main	-	Secondary	Secondary	Main	-	-	Secondary
Switzerland	Persons	Main	-	Secondary	Secondary	Main	-	Secondary	Secondary
United Kingdom	Persons	Main	-	-	-	Main	-	-	-
United Kingdom (PS) [1]	Jobs	Main	-	Secondary	Secondary	Main	-	-	-
United States	Persons and jobs	-	-	Main	Secondary	Main	-	-	-
United States (PS) [1]	Jobs	-	-	Main	Secondary	Main	-	-	-

Table 3.2 Sources used for employment (continued)

	Unit	Employees				Self-employed			
		LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
Selected non-member countries									
Argentina	Jobs	Secondary	-	-	Main & Estimates	Main	-	-	Estimates
Brazil	Jobs	Main	-	Main	Main	Main	-	-	-
Bulgaria	Persons	Secondary	-	Main	-	Main	-	-	Secondary
Colombia	FTE Jobs	Main	-	Main	Secondary	Main	-	Main	Secondary
Costa Rica	Jobs	Secondary	-	Main	Main	Secondary	-	-	Main
Croatia	Persons	Main	-	-	-	Main	-	-	-
Cyprus	Persons	Secondary	Secondary	Main	Main & Secondary	Secondary	Secondary	Main	Main & Secondary
Malta (2009)	Persons / Jobs	Secondary	-	Main	Main	Secondary	-	Main	Main
Peru	FTE Jobs	Main	-	-	Secondary	Main	-	-	-
Romania	Persons	Main	-	-	Secondary	Main	-	-	Secondary
Russian Federation	Persons and jobs	Secondary	-	Main	Secondary	Main	-	Secondary	Secondary
South Africa	Persons and jobs	Main	-	Main	-	Main	-	-	-

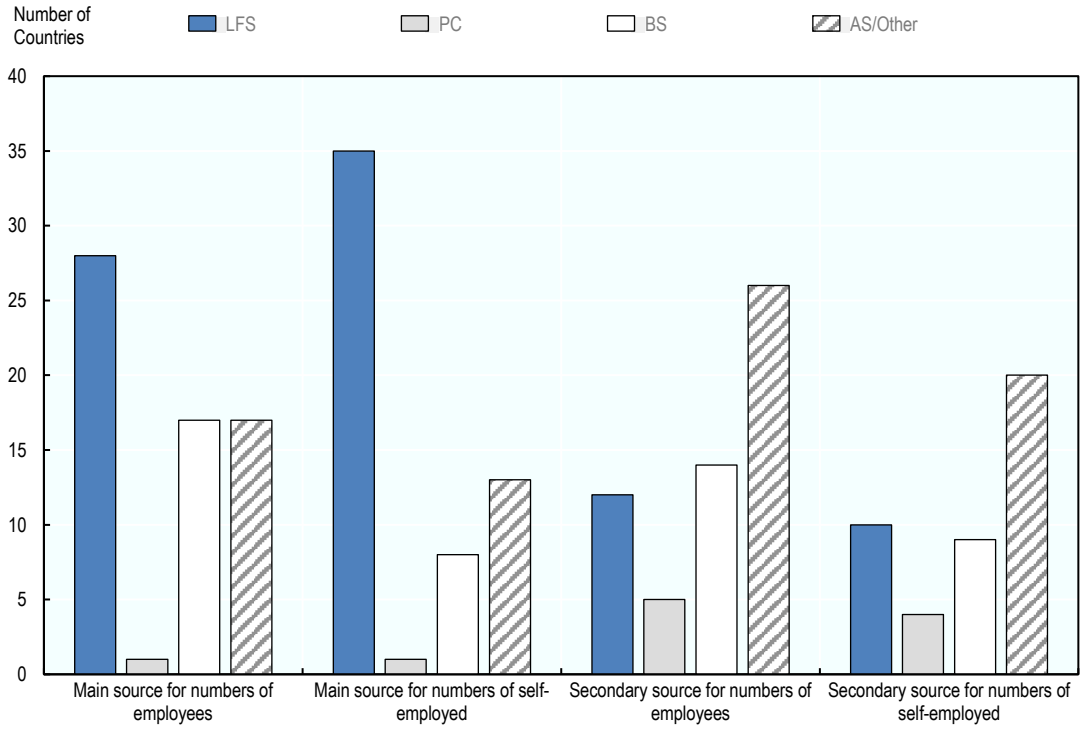
Note: A main source constitutes the basis of the estimates upon which adjustments might be made. Secondary data sources are used to make adjustments, or to supplement the main data source. FTE stands for full-time equivalent.
1. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between their NSOs and the OECD. Information on labour input measures in the national accounts for the United States was provided directly through the survey.
* Business statistics includes the use of a statistical business register. Business registers are constructed in different ways in different countries, but are typically sourced from multiple primary data sources, principally utilising administrative data complemented by business surveys.
Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

23. While most countries report employment data in terms of persons with the LFS as the main source, the types of adjustments needed to ensure exhaustive coverage, and the source information used (see Box 2.1) differ significantly (see Annex B). To some extent differences are to be expected, as much depends on the appropriateness of the source used as the starting point for estimates, in particular, its coverage of activities and alignment to concepts. The range of adjustments needed when the starting point is the LFS will necessarily differ to those required when the starting point is based on BS.

24. However, and as shown in more detail below (Table 3.4), the survey clearly reveals that the range of adjustments made by countries is not always exhaustive with a corresponding impact on international comparability. This in part reflects the range and scope of sources used; for example, Iceland uses only AS as their source, which is unlikely to capture informal activities, while Croatia uses only the LFS, which may exclude certain categories of workers (e.g. in collective households) and is unlikely to provide sufficient information to adjust for Croatian cross-border workers. Even if the incidence of these factors is likely to be small in both countries, what is clear is that neither data source, used alone, can present a complete picture of employment consistent with national accounts production boundary concepts.

Figure 3.1. Sources used for employment

The sources used by countries, main original sources and other sources, to construct estimates



Note: A main source constitutes the basis of the estimates upon which adjustments might be made. Secondary data sources are used to make adjustments, or to supplement the main data source.
Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

Hours actually worked

25. Table 3.3 presents information on the original data sources used for hours worked, for employees and self-employed workers respectively. As before, sources are distinguished between "Main" sources and "Secondary" sources. The table also describes whether a country starts by computing hours actually worked per person, per job, or on the basis of full-time equivalent.

26. In essence there are two main approaches to arrive at estimates of total hours actually worked:

a. The *direct method*, which consists of annualising average actual weekly hours worked derived from continuous surveys in all weeks of the calendar year (i.e. multiplying the number of self-reported actual hours worked in the reference week by the number of working weeks in a year).[10] This method often relies on a single source, generally the LFS, and assumes that full- and part-week absences and extra hours worked in the main and/or additional job/s are well captured in self-reported monthly or quarterly estimates of weekly actual hours worked averaged over the year. For surveys with fixed monthly reference weeks (i.e. where the survey is not conducted continuously in all weeks of the month or the quarter but in a given week of the month), the method consists of averaging hours worked during those 12 reference weeks after applying adjustments for special events, such as holidays, falling outside each reference week. This is the method applied, for example, in Australia and Canada. As demonstrated in national responses to the survey, a few countries using this method make a number of additional adjustments to correct for annual leave and public holidays, which are the most important reasons for work absences, followed by sickness leave. Annual leave and public holidays are also the most important reason, after differences in usual hours, explaining cross-country differences in annual working time. To reflect this, a further distinction is made in Table 3.3 and Table 3.4 between countries that use the direct method with additional adjustments for annual leave and public holidays (referred to as *DM, with adj*) and those using the direct method without any further adjustments (referred to as simply *DM*). While many countries using the direct method make additional adjustments to correct for under-coverage of activities, ensure representative coverage of respondents, and to adjust for potential over/under recording of self-reported hours worked, the impact of these on actual working time estimates is considered to be minimal, and so the method applied is considered a direct approach (DM).

b. The *component method*, which starts from estimates of contractual, paid or usual hours per week from establishment surveys, administrative sources or, indeed, the LFS, with adjustments for absences (holidays, sickness, maternity leave, etc.) and (paid and/or unpaid) overtime. This is an indirect approach, as its starting point is not the target concept (hours actually worked) and, rather, requires a series of explicit adjustments (i.e. accounting for each component) to align with the concept, which is why it is often referred to as the component method (here referred to as CM). Because the starting point differs from the target concept, by design, all countries that implement the component method include necessary adjustments, and so reference is only made to CM in Table 3.3 and Table 3.4.

10. A continuous labour force survey has the reference weeks spread uniformly throughout the year.

Table 3.3. Sources used for hours worked

The sources used by countries, main original sources and other sources, to construct estimates

	Unit (Hours worked per)	Method	Employees				Self-employed			
			LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
OECD countries										
Australia	Person	DM, with adj	Main	-	-	Secondary	Main	-	-	-
Austria	Job	DM	Main	-	Main	-	Main	-	-	-
Belgium	Person	CM emp, Indirect method self	-	-	-	Main	Main	-	-	Secondary
Canada	Job	DM, with adj	Main	-	-	Secondary	Main	-	-	Secondary
Chile	Person	DM, usual hours	Main	-	-	-	Main	-	-	-
Czech Republic	FTE Job	CM emp, DM self	-	-	Main	-	Main	-	-	-
Denmark	Job	Ratio of worked to paid hours	Secondary	-	Secondary	Main	Secondary	-	-	Main
Estonia	Person	DM	Main	-	-	-	Main	-	-	-
Finland	Person	Regressions	Secondary	-	Main	-	Secondary	-	Main	-
France[1]	FTE	CM	Secondary	-	Main	Secondary	Secondary	-	-	Main & Secondary
Germany	Person	CM	Secondary	-	Secondary	Main & Secondary	Main	-	-	Secondary
Greece	FTE person	DM	Main	-	-	-	Main	-	-	-
Hungary	Person	CM emp, DM self	Secondary	-	Main	Secondary	Main	-	-	-
Iceland	Job	CM	-	-	Main	Secondary	-	-	Main	Secondary
Ireland	Person	DM	Main	-	Main	-	Main	-	-	-
Israel	Person	DM	Main	-	-	Secondary	Main			Secondary
Italy	Person	CM	Main	-	Secondary	Main & Secondary	Main	-	Secondary	Main & Secondary
Japan	Job	CM	Secondary	-	Main	-	N/A	N/A	N/A	N/A
Korea	Unclear	Not described	Secondary	-	Main	-	Main	-	-	-
Latvia	Person	DM	Main	-	-	-	Main	-	-	-
Lithuania	Person	DM	Main	-	-	-	Main	-	-	-
Luxembourg	Person	CM	-	-	Main	Main	-	-	Main	Secondary
Mexico	Unclear	DM	Main	-	-	-	Main	-	-	-

Table 3.3 Sources used for hours worked (continued)

	Unit (Hours worked per)	Method	Employees				Self-employed			
			LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
OECD countries										
Netherlands (2009)	Person	CM emp, DM self	-	-	Secondary	Main	Main	-	-	-
New Zealand	Person	DM	Main	-	-	-	Main	-	-	-
New Zealand (PS)[2]	Persons or jobs	DM, paid and usual hours	Secondary	Secondary	Main	-	Main	Main	-	-
Norway	FTE job	CM	Main	-	-	Main	Main	-	-	Main
Poland	Person	DM	Main	-	-	-	Main	-	-	-
Portugal	Jobs	DM	Main	-	Main	Main	Main	-	Main	Main
Slovak Republic	Person	CM emp, DM self	-	-	Main	Estimates	Main	-	-	-
Slovenia	Person	CM emp, Ratio of worked to paid hours self	Main	-	Main	Main & Secondary	Main	-	-	-
Spain	Person and FTE job	CM emp, DM self	Main	-	Main	Main	Main	-	-	-
Sweden	Person	DM	Main		Secondary		Main	-	-	-
Switzerland	Person	CM	Main	-	-	Secondary	Main	-	-	Secondary
United Kingdom	Persons	DM	Main	-	-	-	Main	-	-	-
United Kingdom (PS)[2]	Job	DM	Main	-	-	Secondary	Main	-	-	-
United States	Persons and jobs	Ratio of worked to paid hours emp, DM self	Secondary	-	Main & Secondary	-	Main	-	-	-
United States (PS)[2]	Job	Ratio of worked to paid hours emp, DM self	Secondary	-	Main & Secondary	-	Main	-	-	-
Selected non-member countries										
Argentina	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brazil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bulgaria	Person	DM	Secondary	-	Main	-	Main	-	-	Secondary
Colombia	FTE Job	CM	Main	-	Main	Secondary	Main	-	Main	Secondary
Costa Rica	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3.3 Sources used for hours worked (continued)

	Unit (Hours worked per)	Method	Employees				Self-employed			
			LFS	PC	BS	AS/Other	LFS	PC	BS	AS/Other
Selected non-member countries										
Croatia	Person	DM	Main	-	-	-	Main	-	-	-
Cyprus	Person	CM	-	-	Main	Secondary	Main	-	-	Secondary
Malta (2009)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A-
Peru	Job	DM	Main	-	-	-	Main	-	-	-
Romania	Person	DM, with adj	Main	-	-	-	Main	-	-	-
Russian Federation	Person	DM	Secondary	-	Main	-	Main	-	-	-
South Africa	Job	DM	Main	-	-	-	Main	-	-	-

Note: A main source constitutes the basis of the estimates upon which adjustments might be made. Secondary data sources are used to make adjustments, or to supplement the main data source. FTE stands for full-time equivalent.
1. While France applies the component method to estimate hours worked by self-employed, their original base is the average number of hours worked by employees.
2. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between their NSOs and the OECD. Information on labour input measures in the national accounts for the United States was provided directly through the survey.
* Business statistics includes the use of a statistical business register. Business registers are constructed in different ways in different countries, but are typically sourced from multiple primary data sources, principally utilising administrative data complimented by business surveys.
Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

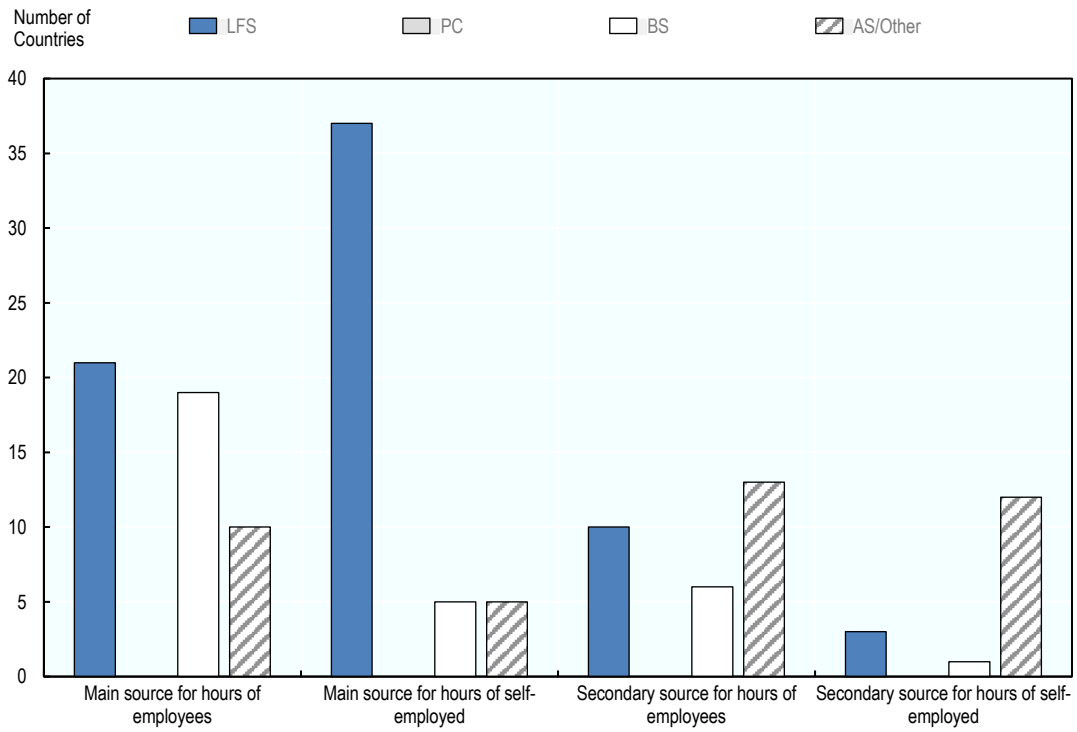
27. Almost all countries compile statistics on hours worked. Argentina, Brazil and Costa Rica, do not currently compile hours worked series for employees or self-employed in their national accounts, and while Japan compiles data on hours worked for employees it does not currently construct hours worked for self-employed, meaning the total economy figure cannot be calculated. Nonetheless, Argentina, Brazil and Japan expressed their intention to compile these statistics in the future. For New Zealand, while estimates in their national accounts correspond to hours actually worked directly sourced from LFS, in their productivity statistics, estimates correspond to hours paid.

28. Of those countries that compile data on hours worked[11] in their national accounts 26 countries start from self-reported declarations of hours actually worked in the LFS (the direct method): 20 countries for both employees and self-employed and 6 countries (Bulgaria, the Czech Republic, Hungary, the Slovak Republic, Spain and the United States) only for the self-employed. Chile also applies the direct method to extract usual hours worked from the LFS. Bulgaria uses this method to extract hours actually worked by employees from BS. On the other hand, 16 countries start from contractual, paid or usual hours worked and introduce adjustments for absences and overtime (the component method).

[11] As can be seen in comparing Table 3.2 and Table 3.3, some countries use different sources for employment and hours worked, reflecting the fact that some of the sources used for the compilation of employment (i.e. administrative data or population census) do not provide information on hours worked, but are considered by the country as the most reliable and exhaustive source available to compute employment measures.

Figure 3.2. Sources used for hours worked

The sources used by countries, main original sources and other sources, to construct estimates



Note: A main source constitutes the basis of the estimates upon which adjustments might be made. Secondary data sources are used to make adjustments, or to supplement the main data source.
Source: Table 3.3.

3.2.3. Adjustments to bridge the source data and national accounts

Employment

29. Depending on the nature of employment data in the original data sources, various adjustments are needed to conform to the 2008 SNA. Table 3.4 and Table 3.5 summarise the impact of these adjustments, for employees and self-employed respectively, broken down into five categories:

- from jobs to persons (or vice versa);
- for the economic territory;
- for the unobserved economy; and
- other adjustments.

30. For employees, Table 3.4 reveals that:

- adjustments **increase** estimates in **22 countries**;
- adjustments **decrease** estimates in **7 countries** (Finland, Ireland, Latvia, Lithuania, Luxembourg, Poland and Sweden); and
- **no adjustments** are applied in **6 countries** (Austria, Chile, Croatia, Iceland, New Zealand and the United Kingdom).

31. For the self-employed Table 3.5 shows that:

- adjustments **increase** estimates in **14 countries**;
- adjustments **decrease** estimates in **10 countries;** and
- **no adjustments** are made in **6 countries** (Australia, Chile, Iceland, Ireland, Lithuania and the United Kingdom).

32. As detailed above, whether standard BS or LFS sources are used, adjustments are necessary to align with the concepts of economic territory required within the national accounts, and so it is not surprising that most countries report making an adjustment. Again not surprisingly, because the adjustment is not typically necessary, only a handful of countries make adjustments to convert jobs-to-persons (or vice-versa). A number of countries, especially those using BS or AS as their main source, make adjustments for the unobserved economy. Korea and South Africa were not able to provide information regarding adjustments of data from original sources of employment to produce national accounts estimates, further discussion and investigation is pending.

Table 3.4. Adjustments made to the number of employees

Impact of adjustments made by countries to bridge original data sources and the national accounts data, % of original source estimates

	Period	Main source	Total (%)	Persons-jobs (%)	Economic territory (%)	Unobserved Economy (%)	Other adjustments (%)
OECD countries							
Australia	2017	LFS	0.5	n.a.	0.5	-	-
Austria	2014	AS	0.0	n.a.	n.a.	-	-
Belgium	2015	AS	1.6	n.a.	n.a.	0.3	1.3
Canada	2016	LFS	10.0	X	X	-	X
Chile	2017Q4	LFS	0.0	-	-	-	-
Czech Republic	2016	LFS	4.9	n.a.	-0.5	2.2	3.2
Denmark	2014	AS	2.1	X	X	X	-
Estonia	2017	LFS	2.7	n.a.	2.7	-	-
Finland	2015	BS	-2.1	n.a.	X	X	X
France	2015	AS	0.3	n.a.	0.2	-	0.1
Germany	2016	BS/AS	6.3	n.a.	0.5	2.3	3.5
Greece	2010	LFS	11.4	n.a.	X	X	-
Hungary	2014-2016 (average)	LFS	0.19	n.a.	-0.36	-	0.54
Iceland	2017	AS	0.0	n.a.	-	-	-
Ireland	2016	LFS/BS	-0.003	n.a.	-0.003	-	-
Israel	2016	LFS	8.8	n.a.	X	X	X
Italy [1]	2011	LFS/BS/AS	9.9	X	2.9	1.9	5.1
Japan	2010	LFS/PC	3.3	2.3	-0.05	-	1.1
Korea	No reply	LFS	No reply	No reply	No reply	No reply	No reply
Latvia	2017	LFS	-1.2	n.a.	-1.9	-	0.8
Lithuania	2016	LFS	-0.013	n.a.	-0.013	-	-
Luxembourg	2016	BS/AS	-1.2	n.a.	-1.2	0.04	-
Mexico	2013	BS	X	X	-	X	-
Netherlands (2009) [1]	2008	AS	3.3	n.a.	-	3.3	-
New Zealand		LFS	0.0	-	-	-	-
New Zealand (PS) [2]	2016	AS	-	-	-	-	-
Norway	2017	BS/AS	3.1	n.a.	1.0	-	2.2
Poland	2015	LFS	-0.7	n.a.	-0.7	-	-
Portugal	2015	LFS/BS	5.3	X	X	-	-
Slovak Republic[1]	2016	LFS	6.9	n.a.	-4.8	n.a.	-2.1
Slovenia	2016	AS	4.8	n.a.	n.a.	X(c.)	X(c.)
Spain	2010	LFS	X	n.a.	X	X	X
Sweden	2015	LFS	-0.62	n.a.	-0.57	-	-0.05
Switzerland	2017Q4	LFS	8.9	n.a.	8.9	-	-
United Kingdom		LFS	0.0	-	-	-	-
United Kingdom (PS) [1, 2]	2017	LFS	X	-	X	-	-
United States	2016	BS	up	X	up	up	up
United States (PS)[2]	2017 Q4	BS	2.6	-	up	-	up

Table 3.4 Adjustments made to the number of employees (continued)

Period	Main source	Total (%)	Persons-jobs (%)	Economic territory (%)	Unobserved Economy (%)			Other adjustments (%)
Selected non-member countries								
Argentina		2016	AS	X	up	up	up	down
Brazil		2015	LFS/BS/AS	11.0	up	-	up	-
Bulgaria		2017	BS	7.4	-	3.5	-	3.9
Colombia		2015	LFS/BS	X	X	X	-	X
Costa Rica		2015	BS/AS	X	X	X	X	-
Croatia		2016	LFS	0.0	n.a.	-	-	-
Cyprus		no reply	BS/AS	X	n.a.	X	-	-
Malta (2009) [1]		-	BS/AS	-	n.a.	X	X	-
Peru		2016	LFS	9.9	X	X	-	-
Romania		2015	LFS	X (c.)	n.a.	X (c.)	-	X (c.)
Russian Federation		2016	BS	X	n.a.	X	X	X
South Africa		No reply	LFS/BS	No reply	No reply	No reply	No reply	No reply

Note: *"X":* adjustment made but not quantified; "*n.a.*": adjustment not applicable given the original data source; "*X(c.)":* adjustment made but confidential; "-" : adjustment not made; "*no reply*": no information provided.
1. Information correspond to both employees and self-employed.
2. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between their NSOs and the OECD. Information on labour input measures in the national accounts for the United States was provided directly through the survey.
Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

Table 3.5. Adjustments made to numbers of self-employed

Impact of adjustments made by countries to bridge original data sources and the national accounts data, % of original source estimates

	Period	Main source	Total (%)	Persons-jobs (%)	Economic territory (%)	Unobserved Economy (%)	Other adjustments (%)
OECD countries							
Australia	2017	LFS	0.0	n.a.	-	-	-
Austria	2014	AS	X (c.)	n.a.	X (c.)	-	X (c.)
Belgium	2015	AS	-25.4	n.a.	n.a.	-	-25.4
Canada	2016	LFS	-41.0	X	X	-	X
Chile	2017Q4	LFS	0.0	-	-	-	-
Czech Republic	2016	LFS	-13.7	n.a.	-	4.6	-18.4
Denmark	2014	AS	-9.2	X	X	X	-
Estonia	2017	LFS	1.8	n.a.	1.8	-	-
Finland	2015	BS	21.8	n.a.	-	-	21.8
France	2015	AS	0.1	n.a.	0.3	0.04	-0.2
Germany	2016	LFS	0.9	n.a.	-	0.9	-
Greece	2010	LFS	-0.5	n.a.	-	X	-
Hungary	2014-2016 (average)	LFS	31.1	n.a.	7.4[e]	0.9	22.8
Iceland	2017	AS	0.0	n.a.	-	-	-
Ireland	2016	LFS	0.0	n.a.	-	-	-
Israel	2016	LFS	0.7	n.a.	-	-	X
Italy		LFS/BS/AS					
Japan	2010	LFS/PC	8.6	13.4	-	-	-4.9
Korea	no reply	LFS	no reply	no reply	no reply	no reply	no reply
Latvia	2017	LFS	0.2	n.a.	-0.8	-	1.0
Lithuania	2016	LFS	0.0	n.a.	-	-	-
Luxembourg	2016	BS/AS	2.4	n.a.	n.a.	2.4	-
Mexico	2013	LFS	X	X	-	X	-
Netherlands		LFS					
New Zealand		LFS	-	-	-	-	-
New Zealand (PS) [1]	2016	BS/AS	-	-	-	-	-
Norway	2017	LFS	-11.2	n.a.	-	-	-11.2
Poland	2015	LFS	-0.6	n.a.	-0.6	-	-
Portugal	2015	LFS/BS	-21.7	X	X	-	X
Slovak Republic		BS/AS					
Slovenia	2016	AS	171.7	n.a.	n.a.	X(c.)	X(c.)
Spain	2010	LFS	X	n.a.	X	X	-
Sweden	2015	LFS	-0.7	n.a.	-1.6	-	0.9
Switzerland	2017Q4	LFS	0.21	n.a.	0.21	-	-
United Kingdom		LFS	0.0	-	-	-	-
United Kingdom (PS) [1]		LFS					
United States	2016	LFS	-	n.a.	-	-	-
United States (PS) [1]	2017 Q4	LFS	-	-	-	-	-

Table 3.5 Adjustments made to numbers of self-employed (continued)

Period	Main source	Total (%)	Persons-jobs (%)	Economic territory (%)	Unobserved Economy (%)			Other adjustments (%)
Selected non-member countries								
Argentina		2016	LFS	up	up	up	up	-
Brazil		2015	LFS	0.3	-	-	-	0.3
Bulgaria		2017	LFS	60.4	-	-	9.9	50.5
Colombia		2015	LFS/BS	X	X	-	-	X
Costa Rica		2015	AS	X	X	-	X	-
Croatia		2016	LFS	X	n.a.	-	X	-
Cyprus		no reply	BS/AS	X	n.a.	X	X	-
Malta			BS/AS					
Peru		2016	LFS	-4.3	X	-	-	-
Romania		2015	LFS	X (c.)	n.a.	-	-	X (c.)
Russian Federation		2016	LFS	X	n.a.	-	X	X
South Africa		no reply	LFS	no reply	no reply	no reply	no reply	no reply

Note: *"X":* adjustment made but not quantified; "*n.a"*: adjustment not applicable given the original data source; "*X(c.)":* adjustment made but confidential; "-" : adjustment not made; "*no reply"*: no information provided; and *[e]*: quantification of the adjustment made by the OECD on the basis of data reported by the country.

1. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between their NSOs and the OECD. Information on labour input measures in the national accounts for the United States was provided directly through the survey.

Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

Adjustments from jobs to persons and vice versa

33. As noted above, the target concept used by countries to measure employment varies, but most countries target the number of persons, partly reflecting its relevance as a measure of employment among the population. Depending on the actual target adopted by countries, it may be necessary to convert the original data from a jobs basis to a persons basis or vice versa.

34. BS or AS data, for example, typically capture employment in terms of jobs, and so adjustments are needed to convert these data to a persons basis. Adjustments are often made using known ratios from the LFS (which often provides data on persons and jobs) and/or AS. Adjustments can be significant. For example in Japan, where the target for measuring employment in national accounts is jobs, estimates of persons in LFS are adjusted upwards by approximately 2.3% for employees and 13.4% for self-employed.[12]

Adjustments for economic territory: Domestic versus national concept

35. Depending on the starting source, adjustments for economic territory may be needed to move from the national to the domestic concept of employment (i.e. to exclude resident persons working outside the economic territory of a country and adding non-resident persons working within the economic territory). Further adjustments may be needed to account for workers in foreign and national embassies, consulates and military bases located within the country and overseas; other collective households; and for economic territories that are typically not captured in the source data.

36. Adjustments can be particularly large for smaller countries with high cross-border flows and that use LFS data as their starting point, such as the Slovak Republic (-4.8%, for employees, where many residents work abroad) and Switzerland (+8.9%, for employees, which hosts many cross-border workers). The size of the adjustment is generally smaller when the starting source is BS or AS, which provide estimates much closer to the domestic rather than the national concept. In Luxembourg, for example, which also has a significant degree of cross-border workers, but uses BS and AS as main sources, the adjustment is -1.2%.

37. Nearly all other countries make some explicit adjustment; however, Chile, Croatia, New Zealand, and the United Kingdom (in its national accounts) make none, despite all four using the LFS as their main source, where, as noted above, there are known coverage issues. Belgium, Brazil, Mexico, Slovenia and Austria (for employees only) also make no adjustments, but data are originally sourced from BS and administrative data with an appropriate coverage of their economic territory.

Adjustments for the unobserved economy

38. The 2008 SNA defines employment to include all employment engaged in productive activities, including in the informal, grey, illegal, or unobserved economy. This therefore includes workers involved in illegal activities (e.g. drugs, prostitution, illegal

12. Argentina, Colombia, Costa Rica and Peru also begin with a persons-based measure; however, they make adjustments to arrive at a jobs or full-time equivalent jobs measure. Portugal and Spain, for comparison purposes, convert persons to jobs using data from different sources (LFS, BS, AS). Denmark, Italy and the United States, adjust data on jobs from their original sources into number of persons for the purposes of the national accounts.

migration, child labour) as well as workers engaged in legal activities but whose income is not declared. It also includes any employment related to activities engaged in own-account production such as own use agricultural production.

39. Although LFS are generally considered to be a relatively good source to capture unobserved employment, they are not necessarily perfect as they may not (fully) capture under-declarations nor will they necessarily capture activities conducted by undocumented migrants. As such, even among countries that use the LFS as their starting point, many of them make an explicit adjustment for unobserved employment, typically, by confronting different sources of data from BS and/or AS with LFS estimates.

40. France, for example, estimates work in illegal activities using previous studies on the non-observed economy in national accounts (Louvot, 2011) and data from the French Monitoring Centre for Drugs and Drug Addiction (OFDT). Hungary estimates the number of employees and self-employed persons in drug trafficking based on the approximate income available from this activity and criminal statistics, and the number of workers in prostitution based on information from the Association of Hungarian Sex Workers. Israel estimates the number of foreign illegal workers using data from border controls and assumes that tourists not leaving the country shortly after expiry of their tourist visa become undocumented workers. Italy integrates information from many different sources to make a thorough assessment of employment in the unobserved economy, including an estimate for domestic work using its Multipurpose Survey on Households, the number of potential jobs in the transport of goods and persons derived from administrative data on circulating vehicles, and an estimate for undeclared work performed by residents and non-residents resulting from the integration of LFS data with administrative sources (LFS-ADMIN), data from the Ministry of Interior and data elaborated by private research institutions monitoring immigration. Similarly, Slovenia uses data from the Ministry of Interior and the National Institute for Public Health, among other sources, to produce estimates of illegal trafficking of drugs and prostitution, and the number of alternative doctors, baby-sitters, teachers providing private tutoring and persons providing assistance to elderly people. The United States, for productivity measurement, does not adjust for unobserved activities, but the Bureau of Economic Analysis (BEA) does make adjustments when preparing employment estimates for the BEA/BLS integrated production accounts. Finally, Croatia adds about 10,000 people every quarter (since 2008) to its LFS totals.

Adjustments for other factors

41. Various additional adjustments made by countries to employment figures to align with underlying national accounts concepts have been included in a catch-all category "other adjustments". In many cases, these include, at least in part, adjustments that should in theory be recorded in the categories above but they have been left under the category "other" to reflect the actual data provided by countries.

42. Other adjustments made by countries include:

- working students (Belgium, Germany, Slovenia);
- workers engaged in production undertaken entirely for their own final consumption or own capital formation either individually or collectively (Hungary, Italy, Portugal);
- working prisoners (Germany, the Slovak Republic);
- workers below or above the age thresholds covered by original data sources (Germany, Hungary);

- workers that had a job but were absent from work, such as persons in maternity leave (Romania, and the Russian Federation);
- workers in other activities not covered in the main source, such as workers on ships and notably for agriculture, hunting, forestry and fishing activities (Argentina, Bulgaria, France, the Russian Federation, Slovenia, the United States (NA and PS)).

43. In addition countries include a number of adjustments that have a net zero overall impact, reflecting the reclassification of persons employed across sectors, for example, for workers in temporary employment agencies (Spain) and reclassifications of owners of corporations and quasi-corporations to employees (Canada, Czech Republic, Norway, Slovenia and Sweden).

44. Regarding their magnitude, "other adjustments" can make up a significant proportion of the overall adjustment for some countries: Italy (5.1%, for total employment) and Bulgaria (3.9%, employees). Adjustments for the self-employed can be especially large: Belgium (-25.4%), to eliminate double counting of workers registered in more than one social security plan (the main data source); Bulgaria (50.5%), reflecting in large part adjustments to include agricultural workers in the self-employed category.

Hours worked

45. Table 3.6 and Table 3.7 summarise the impact of adjustments, as a percentage of the original data, for employees and self-employed respectively. Adjustments can be categorised as:

- holidays and annual leave;
- sickness leave;
- strikes and temporary lay-offs;
- paid but unreported overtime;
- unpaid overtime;
- under or over-reporting;
- jobs to persons or vice-versa;
- unobserved economy and other adjustments.

46. From the results of the survey, and for the years reported by countries, 31 countries make some kind of adjustment to the average hours worked by employees or total employees' hours resulting from their original source(s), only 28 countries make an adjustment for hours worked by the self-employed.

47. The impact of adjustments to the original source(s) for employees' hours worked is:

- **positive** for **7 out of 20 countries** for which it was possible to quantify the total adjustment (Denmark, Estonia, Israel, Japan, Latvia, Poland and Sweden); and
- **negative** for **7 countries** (Belgium, France, Germany, Greece, Hungary, Luxembourg and Peru).

48. In the case of self-employed hours, the adjustment is:

- **positive** for **6 out of 18 countries** for which it was possible to quantify the total adjustment (Estonia, France, Latvia, Luxembourg, Poland and Peru); and
- **negative** for **5 countries** (Denmark, Germany, Greece, Hungary and Sweden).

49. There are however **6 countries** out of the 36 that replied that make **no adjustment** to the hours worked obtained from original source(s) (Chile, Ireland, Lithuania, New Zealand and the United Kingdom for both employees and self-employed; and Israel for the self-employed only). All of these countries use LFS as their original source and extract actual hours worked directly reported by respondents. In theory, this obviates the need for some adjustments already captured in the definition of actual hours worked (e.g. absences and overtime), however, adjustments for under/over reporting, coverage and the unobserved economy may still be necessary.[13]

50. Most adjustments on employee data, correct for holidays and annual leave as well as making adjustments for sickness leave. Indeed, annual leave and public holidays, together with sickness leave, constitute the second most important factor, after usual/normal hours, in explaining differences in actual working time (Box 4.1). These adjustments are applied in all countries departing from contractual, usual, normal or paid hours (the component method), but they are also adopted in Australia, Canada and Romania all of which source hours actually worked directly collected through their LFS (the direct method). Consequently, the method applied in these three countries is referred to as a *direct method with adjustments*.

51. Adjustments for the unobserved economy are also very common, in particular, in countries that use the component method, although, for the self-employed, adjustments are also made in Croatia, Greece, Israel, Luxembourg, the Russian Federation and Sweden, all of whom use the direct method. In those countries that make no adjustment for the unobserved economy it is assumed that the LFS adequately captures employment or that the average hours worked by observed workers is equal to those worked by unobserved workers: in other words, if unobserved workers are captured in employment estimates no adjustment is necessary for average hours.

52. Adjustments for under/over reporting, notably with respect to under-reporting by the self-employed, are applied in a number of countries that apply the component method (Bulgaria, Colombia, Italy, Luxembourg, Norway), and the United States (for employees only), which uses a ratio of 'worked to paid' hours. In addition, Austria also applies correction factors to account for differences in self-reported hours actually worked in LFS and actual hours worked derived from (enterprise) labour cost surveys (usual hours minus paid leave) but only for the services sector, which, together with the lack of other adjustments, is why it is classified in this paper as a country using the direct method; indeed Figure 4.1 shows that the direct method approach generates very similar results to national accounts estimates).

53. Other adjustments are widespread across countries independently of the method and source(s) used and can vary substantially in nature. These include, among others: adjustments to fit hours worked by industry to total economy figures; inclusion of hours worked by groups of workers excluded from the original main source(s) such as farmers, loggers and military personnel; addition of hours worked in secondary jobs; and adjustments for the underestimation of domestic housework.

54. As regards the magnitude of the corrections, the largest adjustments are typically observed in countries that use the component method such as Belgium, Denmark, France, and Germany.

13. While the Czech Republic didn't report any adjustment in the bridge table, the country explained that their estimates are not directly available and instead constructed using BS data.

55. In Belgium (for employees' hours only), France and Germany, the largest adjustments correspond to corrections for holidays and annual leave, which are derived from information on collective agreements for different industries, tourism surveys, duration of school holidays, and/or research studies based on the LFS and other household surveys.

56. Adjustments for sickness leave are generally derived from data collected by insurance institutions, health reports, and social security statistics. In France, hours worked by the self-employed are estimated on the basis of employees' hours, with upward adjustments to account for differences in holidays and sickness leave; information available in the LFS and the social security scheme for the self-employed indicate that self-employed workers take fewer days of annual and sickness leave than employees (see Table 3.7). In this country, other adjustments in self-employed hours are significant and include a correction for the underestimation of hours worked by the self-employed, with respect to employees' hours, based on LFS data. In Peru, large adjustments are made to convert hours per person estimates to hours per job.

Table 3.6. Adjustments made to employee average hours worked

The adjustments made by countries to bridge their original data sources and the national accounts data

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Paid but unreported overtime	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries												
Australia	2017	LFS, DM with adj	No reply	X	-	-	-	-	-	-	-	-
Austria	2014	LFS/BS, DM	X(c.)	-	-	-	-	-	X(c.)	-	-	X(c.)
Belgium	2015	AS, CM	-9.31	-10	X	-	-	-	-	n.a.	0.7	0.02
Canada	2016	LFS, DM with adj	X	X	-	X	-	X	-	X	-	X
Chile	2017Q4	LFS, DM, usual hours	0.0	-	-	-	-	-	-	-	-	-
Czech Republic	2016	BS, CM	0.0	-	-	-	-	-	-	-	-	-
Denmark[3]	2014	AS, Ratio of worked to paid hours	6.8	X	X	X	X	X	-	n.a.	X	-
Estonia	2017	LFS, DM	0.27	-	-	-	-	-	-	n.a.	-	X
Finland [3]	2015	BS, Regression	X	-	-	-	-	-	-	n.a.	X	X
France [3]	2015	BS, CM	-18.8	-14.4	-8.8	-0.1	-	-	-	n.a.	0.6	2.0
Germany	2016	AS, CM	-12.4	-12.6	-4.3	-0.003	1.3	1.6	-	n.a.	X	1.6
Greece	2010	LFS, DM	-2.8	-	-	-	-	-	-	n.a.	X	-
Hungary	2014-2016 average	BS, CM	-1.6	-	-	-	-	-	-	-	-	X
Iceland	2017	BS, CM	X	X	X	-	- (in progress)	- (in progress)	-	n.a.	- (in progress)	-
Ireland	2016	LFS/BS, DM	0.0	-	-	-	-	-	-	-	-	-

Table 3.6 Adjustments made to employee average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Paid but unreported overtime	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries												
Israel	2016	LFS, DM	2.0	-	-	-	-	-	-	n.a.	2.0	-
Italy [1]	no reply	LFS/AS, CM	No reply	X*	X	-	-	-	X	-	X	X
Japan	2010	BS, CM	1.0	-	-	-	-	-	-	-	-	1.0
Korea	no reply	BS, not described	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Latvia	2017	LFS, DM	4.8	-	-	-	-	-	-	n.a.	-	-
Lithuania	2016	LFS, DM	0.0	-	-	-	-	-	-	n.a.	-	-
Luxembourg	2016	BS/AS, CM	-0.6	X	X	X	X	X	-1.3	n.a.	0.1	0.6
Mexico	No reply	LFS, DM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Netherlands[1]	2008	AS, CM	n.a.	X	X	X	X	X	-	no reply	-	-
New Zealand		LFS, DM	0.0	-	-	-	-	-	-	-	-	-
New Zealand (PS) [2]	2016	BS, DM hours paid	0.0	-	-	-	-	-	-	-	-	-
Norway	2017	LFS/AS, CM	X	X	X	X	X	-	X	n.a.	-	-
Poland	2015	LFS, DM	1.0	-	-	-	-	-	-	-	-	1.0
Portugal	2015	LFS/BS/AS, DM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Slovak Republic	2016	BS, CM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Slovenia	2016	LFS/BS/AS, CM	No reply	X	X	-	X	X	-	-	-	X
Spain	2010	LFS/BS/AS, CM	X	-	-	-	-	-	-	X	-	X

Table 3.6 Adjustments made to employee average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Paid but unreported overtime	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries												
Sweden [3]	2015	LFS, DM	1.0	-	-	-	-	-	-	n.a.	1.7	-0.7
Switzerland	2016	LFS, CM	X	X	X	X	X	X	-	X	-	X
United Kingdom		LFS, DM	0.0	-	-	-	-	-	-	-	-	
United Kingdom (PS) [2]	2016	LFS, DM	0.0	-	-	-	-	-	-	-	-	X
United States	2016	BS, Ratio of worked to paid hours	X	down	down	-	-	-	X	-	-	X
United States (PS) [2]	2017 Q4	BS, Ratio of worked to paid hours	X	down	down	-	-	-	X	-	-	X
Selected non-member countries												
Argentina	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brazil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bulgaria [3]	2017	BS, DM	X	-	-	-	-	-	X	-	-	X
Colombia	2015	LFS/BS, CM	X	X	X	X	X	-	X	X	-	-
Costa Rica	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply
Croatia	2016	LFS, DM	X	-	-	-	-	-	-	n.a.	-	X
Cyprus	no reply	BS, CM	no reply	X	X	X	X	X	-	n.a.	-	X
Malta	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3.6 Adjustments made to employee average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Paid but unreported overtime	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
Selected non-member countries												
Peru	2016	LFS, DM	-0.9	-	-	-	-	-	-	X	-	-
Romania	2015	LFS, DM with adj	X(c.)	X(c.)	-	-	-	-	-	X(c.)	-	X(c.)
Russian Federation	2016	BS, DM	X	-	-	-	-	-	-	n.a.	X	X
South Africa	no reply	LFS, DM	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply

Note: *"X":* adjustment made but not quantified; "*n.a"*: adjustment not applicable given the original data source; "*X(c.)":* adjustment made but confidential; **"-"** : adjustment not made; "*no reply"*: no information provided.
1. Information correspond to both employees and self-employed.
2. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between the OECD National Accounts and Productivity Statistics teams and the NSOs for these countries. Information on labour input measures in the national accounts for the United States was provided directly through the survey.
3. Information for Bulgaria, Denmark, Finland, France and Sweden refers to adjustments made on total hours worked number and not on average hours worked per person/job as for other countries in the table.
Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

Table 3.7. Adjustments made to self-employed average hours worked

The adjustments made by countries to bridge their original data sources and the national accounts data

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries											
Australia	2017	LFS, DM with adj	No reply	X	-	-	-	-	-	-	-
Austria	2014	LFS, DM	X(c.)	-	-	-	-	X(c.)	-	-	-
Belgium	2015	LFS, Indirect method	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Canada	2016	LFS, DM with adj	X	X	-	-	-	-	X	-	X
Chile	2017Q4	DM, usual hours	0.0	-	-	-	-	-	-	-	-
Czech Republic	2016	LFS, DM	0.0	-	-	-	-	-	-	-	-
Denmark [1]	2014	AS, Ratio of worked to paid hours	-9.8	X	X	X	X	-	n.a.	X	-
Estonia	2017	LFS, DM	0.38	-	-	-	-	-	n.a.	-	-
Finland [1]	2015	BS, Regression	X	-	-	-	-	-	-	-	X
France [1]	2015	Other, CM	53.5	7.8	4.7	-	-	-	n.a.	6.8	34.3
Germany	2016	LFS, CM	-6.4	-7.1	-1.8	-	-	-	n.a.	-	2.5
Greece	2010	LFS, DM	-4.9	-	-	-	-	-	n.a.	X	-
Hungary	2014-2016 average	LFS, DM	-3.5	-	-	-	-	-	-	-	X
Iceland	2017	BS, CM	X	X	X	-	- (in progress)	-	n.a.	- (in progress)	-

Table 3.7 Adjustments made to self-employed average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries											
Ireland	2016	LFS, DM	0.0	-	-	-	-	-	-	-	-
Israel	2016	LFS, DM	0.0	-	-	-	-	-	-	-	-
Italy	no reply	LFS/AS, CM	No reply	X*	X	-	-	X	-	X	X
Japan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Korea	no reply	LFS, Not described	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Latvia	2017	LFS, DM	12.6	-	-	-	-	-	n.a.	-	-
Lithuania	2016	LFS, DM	0.0	-	-	-	-	-	n.a.	-	-
Luxembourg	2016	BS, DM	2.4	-	-	-	-	-	n.a.	2.4	-
Mexico	No reply	LFS, DM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Netherlands	no reply	LFS, DM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
New Zealand		LFS, DM	0.0	-	-	-	-	-	-	-	-
New Zealand (PC) [2]	2016	LFS/PC, DM usual hours	0.0	-	-	-	-	-	-	-	-
Norway	2017	LFS/AS, CM	No reply	X	X	-	X	X	n.a.	No reply	-
Poland	2015	LFS, DM	0.6	-	-	-	-	-	-	-	0.6
Portugal	2015	LFS/BS/AS, DM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Slovak Republic	2016	LFS, DM, usual hours	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Slovenia	2016	BS, Ratio of worked to paid hours	X	-	-	-	-	-	-	-	X
Spain	2010	LFS, DM	X	-	-	-	-	-	-	-	X

Table 3.7 Adjustments made to self-employed average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
OECD countries											
Sweden [1]	2015	LFS, DM	-0.02	-	-	-	-	-	-	-	-0.02
Switzerland	2016	LFS, CM	X	X	X	X	-	-	X	-	X
United Kingdom		LFS, DM	0.0	-	-	-	-	-	-	-	-
United Kingdom (PS)[2]	2016	LFS, DM	0.0	-	-	-	-	-	-	-	-
United States	2016	LFS, DM, total economy only	X	-	-	-	-	-	-	-	X
United States (PS) [2]	2017 Q4	LFS, DM	X	-	-	-	-	-	-	-	X
Selected non-member countries											
Argentina	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brazil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bulgaria [1]	2017	LFS, DM	X	-	-	-	-	4.3	-	-	X
Colombia	2015	LFS/BS, CM	X	X	X	-	-	-	X	-	-
Costa Rica	no reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Croatia	2016	LFS, DM	X	-	-	-	-	-	n.a.	X	-
Cyprus	no reply	LFS, CM	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply	No reply
Malta	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3.7 Adjustments made to self-employed average hours worked (continued)

	Period	Main source and method	% change in average hours worked	Holidays & annual leave	Sick-ness leave	Strikes & temporary lay-offs	Unpaid overtime	Under or over-reporting	Jobs to persons or vice versa	Unobserved economy	Other adjustments
Selected non-member countries											
Peru	2016	LFS, DM	10.3	-	-	-	-	-	X	-	-
Romania	2015	LFS, DM with adj	X(c.)	X(c.)	-	-	-	-	-	-	-
Russian Federation	2016	LFS, DM	X	-	-	-	-	-	-	-	X
South Africa	no reply	LFS, DM	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply	no reply

Note: *"X":* adjustment made but not quantified; "*n.a"*: adjustment not applicable given the original data source; "*X(c.)":* adjustment made but confidential; **"-"** : adjustment not made; "*no reply"*: no information provided.

1. Information for Bulgaria, Denmark, Finland, France and Sweden refers to adjustments made on total hours worked number and not on average hours worked per person/job as for other countries in the table.

2. New Zealand, the United Kingdom and the United States replied to the survey providing methodological information on the construction of labour input measures in their productivity statistics releases. This information is provided for these three countries indicated as PS (Productivity Statistics). Information on labour input in national accounts for New Zealand and the United Kingdom are sourced from exchanges between the OECD National Accounts and Productivity Statistics teams and the NSOs for these countries. Information on labour input measures in the national accounts for the United States was provided directly through the survey.

Source: OECD-Eurostat 2018 labour input survey. For the Netherlands and Malta, the information is sourced from the OECD-Eurostat 2009 labour input survey.

4. Assessing the comparability of labour input measures for cross-country productivity comparisons

57. Average hours worked as reported by countries in their national accounts show large differences in actual hours worked even in countries at similar stages of development. For example, Germany (1 363 hours per person) and Italy (1 724 hours per person), both large G7 economies, display marked differences in average actual hours worked per person in 2016.[14] Although these differences will, in part, reflect real structural differences across countries, the results from the survey suggest that measurement may also play a role.

4.1. Using the component method to measure average hours actually worked

58. While the direct method has major practical advantages in that it (typically) uses a singular data source and simple calculations (albeit in some countries – e.g. Australia and Canada – often with some additional source data), estimates of working time derived from LFS often require adjustments for over-reporting of hours worked (compared with hours worked reported in time use surveys), in particular for those working long hours, like managers and professionals, but also because respondents are likely to underestimate absences from work due to public holidays and annual leave (see Box 4.1).

59. Similarly, estimates derived from employer or business surveys using the direct method do not account for unpaid overtime hours nor for potential under-reporting of hours worked (Eldridge et al., 2003), which is why additional complementary sources are often used by many countries; for instance, social security registers or health surveys to estimate hours lost due to sickness absences, and establishment data to adjust for paid leave or the number of days of statutory leave entitlements (Box 4.1).

60. To illustrate the potential importance of adopting the full range of adjustments needed when using the component method and to give some sense of the scale of the potential impact that the implementation of these adjustments may have on international comparability, Table 4.2 illustrates component method estimates for EU economies, Turkey and the United States *using only LFS data.* To differentiate the estimates produced below with those estimates produced by countries that use the component method in their national accounts, we refer to this approach as the *simplified component method*. The starting point for the calculation is estimates of usual weekly hours of work (column c), which, in the absence of an internationally agreed definition, has been defined as the hours worked on the main job during a typical week, on which adjustments (d) to (j) are applied to arrive at an estimate of *actual* hours worked per week (column b).[15]

14. These numbers for average hours worked per person are sourced from the OECD National Accounts Statistics (database) in August 2018.

15. It includes, in addition to normal hours of work (i.e. legal or contractual hours of work), any overtime work – whether paid or unpaid – performed on a regular basis and excludes main meal breaks. It is considered as "the modal value of the workers' hours actually worked per week over a long period".

Box 4.1. LFS reporting bias in responses to estimates of annual leave

The international comparability of annual actual hours worked directly derived from self-reported actual hours collected through the labour force surveys (LFS) can be affected by reporting biases by respondents. Perhaps the key bias in this respect concerns estimates of leave take-up rates. In fact, annual leave and public holidays represent by far the most important reason for work absences in a given year, and are the second most important factor in explaining differences in annual working time, after differences in standard (usual) hours worked.

To illustrate the potential scale of reporting bias in this area, the table below compares responses to LFS questions on leave and public holidays in France and Germany and, in turn, compares these with the contractual leave entitlements in these countries. The comparison is limited to full-time employees, considered to be homogeneous groups with the greatest impact on average hours actually worked (Körner et al., 2016).

The results suggest that in France, employees take on average 2.7 hours more holiday per week than their German counterparts (6.1. hours versus 3.4 hours), despite the statutory (France) and collectively agreed (Germany) leave entitlements in both countries being the same (40 days per year).

To put this difference into context, and to illustrate the potential for reporting bias, annualising the weekly estimates indicates that German employees only take just over a half of their leave (22 days out of 40) compared to just over 100% for French employees, showing that self-reported leave in the EU LFS for Germany is likely to be underestimated (Körner et al., 2016). In turn, and as a result, actual weekly hours of work of full-time employees in Germany (and by extension all workers) are likely to be overestimated in the survey.

Table 4.1. The impact of self-reported annual leave and public holidays on actual hours worked

Full-time employees in the main job, 2016

	France	Germany
Leave and public holidays in LFS data (average hours per week)	6.1	3.4
Leave and public holidays in LFS data (average days per year) (1)	41	22
Leave and public holidays according to statutory leave (days per year) (2)	40	40
Take-up rates (percentage of LFS versus statutory leave)	102.0%	55.1%
Average weekly usual hours worked LFS	39.1	40.4
Average weekly actual hours worked LFS	32.4	35.8
Average weekly actual hours worked corrected for potential reporting bias on leave and public holidays (3)	33.1	33

Note:
(1) The number of days of leave per year is obtained by dividing the number of hours of leave per week (6.1 for France, 3.4 for Germany) by the usual weekly hours (39.1 for France, 40.4 for Germany), all multiplied by 52 * 5.
(2) France: on average 30 days of statutory minimum annual leave + 10 public holidays. Germany: on average around 30 days of annual leave negotiated in collective agreements + 10 public holidays.

(3) The number of actual hours worked is computed using leave and public holidays as sourced from statutory leave (Eurofound, 2015), with all other components of actual hours worked (e.g. sickness leave and other absences, overtime) being equal (i.e. as derived from LFS).
Source: Secretariat estimates derived from the European Union Labour Force Survey (EU LFS) and Eurofound (2015) on entitlements to paid annual leave and public holidays.

Put in simple terms, analyses of the data provided in the EU LFS highlight the weakness of international comparisons of annual and weekly actual hours worked based on a single source of self-reported data, such as LFS, and the considerable care needed in interpreting them, even when these sources are, in principle, harmonised between countries.

To mitigate these clear signs of bias, arising from the estimation of hours actually worked using the direct method, the measurement of annual working time reported in the table above, and in Table 4.1, uses a component type approach that draws on LFS and on statutory leave entitlements. Usual hours worked per week are used as a benchmark to derive annual working time estimates as they are generally considered to be less affected by reporting biases. The component method then relies on responses to a number of questions on working time available in LFS (including for overtime and sick-leave), but rather than use declared (and potentially biased declarations) of leave and public holidays, the approach uses estimates of statutory annual leave entitlements and public holidays from Eurofound (2015). Implementing such an approach provides more comparable estimates of actual hours worked in France and Germany, with estimates for France increasing from 32.4 hours to 33.1 hours and estimates for Germany decreasing from 35.8 hours to 33 hours, with all other components of actual weekly hours worked being equal.

Although using statutory annual leave entitlements can address potential biases in self-reported leave data in LFS, where the size of the bias may vary significantly by country (as shown above), it is important to note that it, in turn, implicitly assumes that workers in all countries take, on average, all the leave to which they are entitled – which is not necessarily the case, as among other factors, actual take-up rates are likely to reflect differences in working cultures across countries.

Through necessity this is the approach used in this paper to illustrate the broad impact that the adoption of a component based approach could make to estimates of actual hours worked in countries that use direct methods. In this context it is important to note that both Germany and France use business statistics and administrative sources as main source of employees' hours worked and make additional adjustments, using their LFS data as well as other complementary sources, which is why this paper does not advocate for changes to the current estimates they provide in their national accounts. Countries pursuing the implementation of a component method are, in turn, encouraged to exploit all available data sources in the same way, especially with regards to estimates of actual leave taken which should take priority over statutory leave entitlements, unless this is the only available source and LFS estimates of take-up rates generate implausible (biased) estimates.[16]

16. Proper estimation of sickness absences using, for example, administrative sources or health surveys, is also advised to better account for the second most important reason of absences after leave and public holidays, and hence improve the estimation of annual hours from a component method.

61. It is important to stress that the simplified component approach used here is very much a second best to national efforts that make use of all available data sources to align with the national accounts and to address reporter bias, and, so, maximise quality and international comparability. The quality of LFS data (in particular proxy responses, self-reporting and recall problems in LFS data) can vary significantly across countries, and moreover (as shown above and below) the size of adjustments needed across countries using LFS can vary considerably across countries reflecting, in part, differences in LFS coverage across countries but also differences in the size of the phenomena for which adjustments may be needed, for example the size of the unobserved economy or cultural factors that may cause reporting biases. While these concerns remain, it should be noted that the comparability is expected to improve with the implementation of the Integrated European Social Statistics (IESS) Framework Regulation. For these reasons, the estimates presented in Table 4.2 should not be interpreted as being more comparable across countries than national estimates but rather they are presented to illustrate the relative importance across countries of adjustment factors.

62. The results reveal large cross-country variations in estimates of usual weekly hours worked on the main job, ranging from 30 hours in the Netherlands to almost 41 hours in Poland and 47 hours in Turkey, partly reflecting the prevalence of part-time working in the Netherlands. These variations in average usual weekly hours worked, together with cross-country differences in the number of days of paid leave and public holidays per year, largely explain differences in average annual hours actually worked across countries.[17]

17. See also Box 4.1. The results presented in Table 4.2 assume that part-time workers are entitled to the same quantity of holidays as their full-time counterparts, but pro-rated on time actually worked. These estimates can be, however, refined using administrative and other sources that would better reflect actual holiday take-up rates of workers in non-standard forms of employment, such as certain categories of temporary workers.

Table 4.2. The anatomy of a typical work year of workers in 26 OECD European countries, Turkey and the United States, 2016

Decomposition of average annual hours actually worked by full-year equivalent workers into its components

	Annual hours of work[a]	Average weekly hours on all jobs	Usual weekly hours of work in the main job	Extra hours on main job = Overtime + variable hours (eg. flexible hours) + others	Hours on additional jobs	Annual weeks worked	Holidays and vacation weeks	Full-week absences due to non holiday reasons	Part-week absences due to non holiday reasons	Absences due to sickness & maternity [b]
	(a) = (b)*(f)	(b) =(c)+(d)+(e)	(c)	(d)	(e)	(f) = 52 - [(g) + (h) + (i) + (j)]	(g)	(h)	(i)	(j)
	Hours	Weekly hours worked				Weeks worked/not worked				
Austria	1488	38.5	36.5	1.4	0.6	38.7	6.7	2.3	2.2	2.1
Belgium	1562	38.0	37.0	0.6	0.4	41.1	6.4	0.7	1.9	1.9
Czech Republic	1826	42.5	40.4	1.9	0.3	43.0	5.8	0.9	1.1	1.3
Denmark	1446	37.6	32.7	4.2	0.7	38.5	6.3	2.8	2.4	2.0
Estonia	1812	40.9	38.4	2.0	0.6	44.2	4.9	1.4	0.7	0.7
Finland	1535	40.3	36.9	2.8	0.6	38.1	6.0	3.7	2.0	2.2
France	1511	39.0	37.3	1.4	0.4	38.7	6.9	2.3	2.1	2.0
Germany	1448	37.2	35.2	1.7	0.3	39.0	7.0	1.3	2.6	2.2
Greece	1892	43.0	42.3	0.3	0.3	44.0	4.9	1.9	0.7	0.5
Hungary	1838	40.3	39.7	0.3	0.2	45.6	5.5	0.1	0.3	0.4
Iceland	1796	44.5	40.2	2.8	1.5	40.4	5.3	3.1	1.5	1.6
Ireland	1579	36.7	35.7	0.8	0.3	43.0	5.6	0.6	1.4	1.4
Italy	1641	37.7	37.1	0.4	0.2	43.6	5.7	0.6	1.2	0.9
Latvia	1715	40.1	38.8	0.5	0.8	42.7	5.3	0.3	1.9	1.8
Lithuania	1643	39.2	38.3	0.3	0.6	41.9	6.2	0.4	1.7	1.8
Luxembourg	1745	41.1	37.4	3.2	0.6	42.5	5.9	1.2	1.2	1.1
Netherlands	1433	34.9	30.3	3.9	0.7	41.1	5.4	2.0	1.9	1.6
Norway	1369	38.0	33.7	3.5	0.8	36.0	6.0	3.3	2.9	3.8
Poland	1832	42.4	40.8	0.7	0.8	43.2	5.2	0.7	1.5	1.4
Portugal	1716	40.9	39.7	0.7	0.5	41.9	5.2	0.9	2.0	2.0
Slovak Republic	1778	41.0	40.1	0.7	0.2	43.4	5.8	0.5	1.0	1.3
Slovenia	1694	41.3	39.4	1.4	0.4	41.1	5.6	0.7	2.3	2.3
Spain	1637	38.6	37.7	0.7	0.3	42.3	5.9	0.7	1.6	1.5
Sweden	1465	40.2	36.4	3.0	0.8	36.5	6.4	3.1	2.7	3.4
Switzerland	1691	40.3	34.7	5.0	0.6	42.0	5.4	2.0	1.4	1.2
Turkey	2220	48.0	46.9	0.6	0.5	46.3	4.4	0.4	0.6	0.3
United Kingdom	1515	38.4	36.7	1.3	0.3	39.5	5.8	2.7	2.2	1.8
United States	1842	39.4	38.6	0.7	0.1	46.8	2.9	0.8	1.3	0.4

a) See Annex 1.A1 of OECD Employment Outlook 2004 for a succinct explanation of the method used by the OECD Secretariat to estimate annual actual hours worked per person in employment. b) These weeks are already included in columns h and i, but are included a second time in order to correct for an assumed 50% under-reporting (see Annex A1.1 of OECD Employment Outlook 2006).

Note: This simplified component method uses statutory leave for each country to measure leave taken. The implicit assumption made is that uptake rates for holidays and annual leave are uniform across countries. Using statutory leave, from the perspective of the OECD, is a good approximation given the data available. However, from the perspective of countries compiling component method estimates of hours worked, the preferred measure for holidays and annual leave would be *actual* leave taken as opposed to statutory leave. That is, countries should take advantage of the sources available to them in order to produce their best component method estimates (actual leave taken being one of the most important differences).

Source: Unpublished OECD estimates based on European Labour Force Surveys results and Eurofound (2015) for statutory leave for European countries, and the Current Population Survey (CPS) microdata and an estimated 15 days of annual paid annual leave and public holidays (Ray et al., 2007) for the United States. Estimates first presented in OECD (2004).

4.2. Comparing methods and estimates

63. Figure 4.1 below compares the simplified component method estimates presented above, with estimates of actual hours worked sourced directly from LFS, and the estimates presented in the national accounts, with results differentiated between those countries that use the direct method with adjustments to arrive at their national accounts estimates, those that use the direct method without adjustments, and those that use component methods.

64. The results show that for all countries, estimates of actual hours worked directly sourced from LFS are systematically higher than those derived using the simplified component approach, and almost always higher than the national accounts estimates of countries adopting component methods, providing strong evidence of upward bias in direct estimate approaches. Indeed, for some countries (but not all) that use a component method to generate national accounts estimates the simplified component method estimates are very close to the published national accounts.[18]

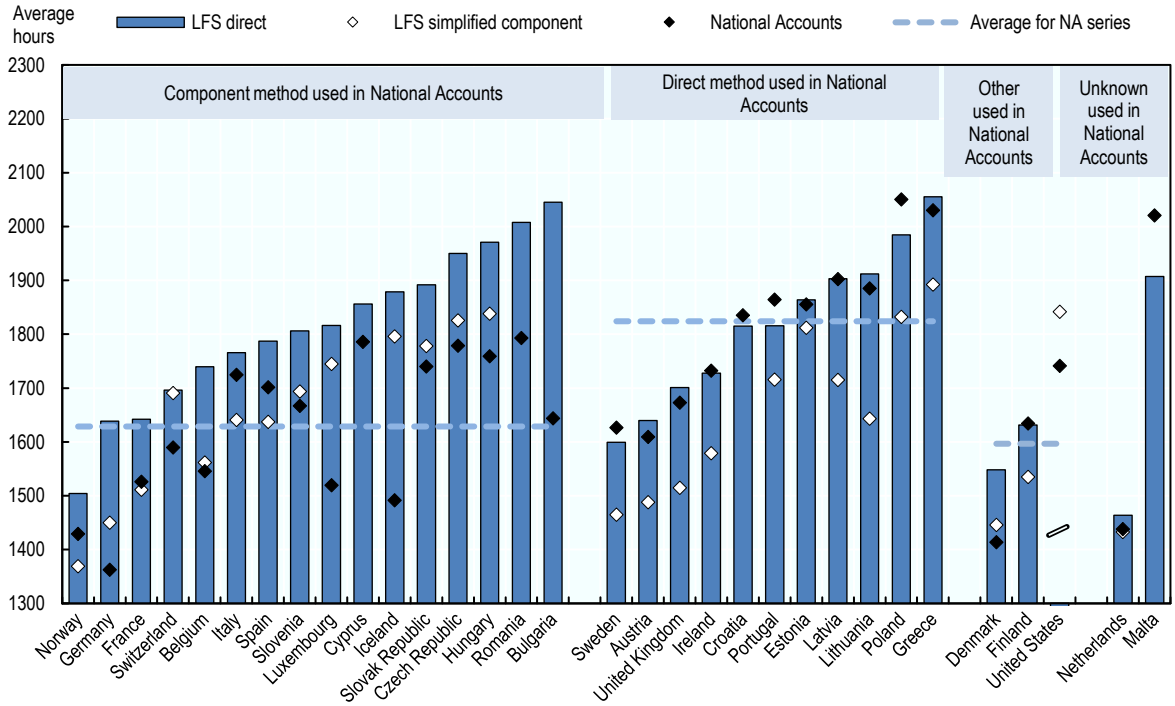
65. The results reveal marginal differences between national accounts estimates and direct based estimates for those countries making no or negligible adjustments, and bear out the findings of the survey concerning the lack of adjustments.

66. Overall, the results provide strong evidence that comparisons of actual hours worked data across countries are significantly affected by the method used to estimate labour input. For countries producing national accounts estimates based on the component method there is a close correlation with estimates produced via the simplified component approach above, which points strongly to their exhaustive coverage of adjustments needed to bridge contractual, paid or normal hours and actual hours. For those countries that use only the direct method, however, national accounts estimates are significantly higher than those using the simplified component method. To put it bluntly, the evidence points strongly to an upwards bias in the actual hours worked estimates of those countries adopting the direct approach without additional adjustments. For example average hours worked per person in Lithuania's national accounts are over 240 hours higher than estimates derived using a simple component approach.

18. For Iceland, Luxembourg, and Switzerland national accounts estimates are significantly lower than those produced using the LFS-based simplified component approach, reflecting in large part adjustments needed for cross-border workers (for, Luxembourg and Switzerland) and seasonal workers (in Iceland); which are not captured in LFS but are typically captured in BS or AS.

Figure 4.1. Average hours worked per person, 2016

LFS-based direct method, LFS based simplified component method and official national accounts



Note: Data for all countries is for 2016, apart from Germany which presents data for 2013.
The Netherlands did not respond to the 2018 survey, hence the method used by this country is reported as 'unknown' in this chart.
Source: OECD National Accounts Statistics (database), April 2018. Unpublished OECD estimates based on European Labour Force Surveys results and Eurofound (2015) for statutory leave for European countries, and the Current Population Survey (CPS) microdata and an estimated 15 days of annual paid annual leave and public holidays (Ray et al., 2007) for the United States. Estimates first presented in OECD (2004).

67. Table 4.3 below illustrates the scale of the potential comparability problem by comparing (a) differences between countries' average hours as estimated by the national accounts, (b) differences between countries' average hours as estimated by the LFS simplified component method used above, and (c) difference in the differences, that is, differences between (a) and (b). The differences observed between countries, particularly between Germany and other large European economies, are larger in comparisons of national accounts estimates than in comparisons of LFS based estimates under the simple component method.

Table 4.3. Cross-country differences in measured average hours

Differences in national accounts, in LFS simplified component method, and difference-in-difference average hours worked, selected large European countries plus the United States, 2016

Differences between average hours based on National Accounts estimates

	Germany	Spain	France	Italy	United Kingdom	United States
Germany	-	-343	-167	-366	-314	-383
Spain	343	-	175	-23	29	-40
France	167	-175	-	-199	-147	-216
Italy	366	23	199	-	52	-17
United Kingdom	314	-29	147	-52	-	-69
United States	383	40	216	17	69	-

Differences between average hours based on LFS Simplified component method estimates

	Germany	Spain	France	Italy	United Kingdom	United States
Germany	-	-189	-63	-193	-67	-394
Spain	189	-	126	-4	122	-205
France	63	-126	-	-130	-4	-331
Italy	193	4	130	-	126	-201
United Kingdom	67	-122	4	-126	-	-327
United States	394	205	331	201	327	-

Difference in difference

	Germany	Spain	France	Italy	United Kingdom	United States
Germany	-	-154	-104	-173	-247	11
Spain	154	-	49	-19	-93	165
France	104	-49	-	-69	-143	115
Italy	173	19	69	-	-74	184
United Kingdom	247	93	143	74	-	258
United States	-11	-165	-115	-184	-258	-

Note: Each cell of the third panel is calculated as the difference between the bilateral gap in average hours' measures from the national accounts (first panel) and from the LFS simplified component method (second panel). Specifically, the figure "-154" shown in the second row of the second column of the third panel is calculated as the difference between Spanish and German average hours as measured in the national accounts minus the difference between Spanish and German average hours as measured by the LFS simplified component method.
Source: OECD National Accounts Statistics (database), April 2018. Unpublished OECD estimates based on European Labour Force Surveys results and Eurofound (2015) for statutory leave for European countries, and the Current Population Survey (CPS) microdata and an estimated 15 days of annual paid annual leave and public holidays (Ray et al., 2007) for the United States. Estimates first presented in OECD (2004).

68. It is important to note that the use of the simplified component method highlights the current bias in international comparisons of productivity *levels*. However, it does not follow that the same holds for international comparisons of productivity *growth rates*, as these would only be distorted if the impact of the adjustments required showed significant disproportional change over time, which is not supported by the evidence.

4.3. Productivity counterfactual

69. The results above illustrate that current comparisons of labour productivity estimates based on official national accounts statistics may be greatly affected by the varying degree with which countries make adjustments to employment and hours worked estimates in order to align with the underlying national accounts concepts used in estimating value added.

70. What is clear is that the scope of estimates implemented by countries varies substantially. This is to some extent inevitable given differences in the main sources used to estimate actual hours worked, but it is also clear that for some countries not all of the conceptually required adjustments are being implemented.

71. For those countries adopting the component approach, which requires, *by design*, explicit adjustments to align with the hours actually worked concept, comparisons with the estimates produced using the simplified component approach (based only on LFS data) suggest that the coverage of adjustments made by countries is relatively exhaustive. However, for those countries where national accounts estimates are very close to, or the same as, those reported for actual hours worked in the LFS (Austria, Croatia, Estonia, Greece, Ireland, Latvia, Lithuania, Poland, Portugal, Sweden and the United Kingdom), the evidence (together with responses to the survey) suggests that only limited adjustments are made, and as a consequence, national accounts estimates for average hours actually worked appear to be upwardly biased; certainly, when compared with estimates of other countries, in particular with those adopting the more methodical component method approach. In turn, estimates of labour productivity levels for this same group of countries points to a downward bias.

72. To illustrate the potential impact of any mismeasurement that may arise from the use of the direct approach (with limited or only partial implementation of adjustments that are needed for full alignment with the hours actually worked concept), Figure 4.2 shows labour productivity levels for all countries (referenced to the United States) using official national accounts average hours estimates, and average hours actually worked estimated with the simplified component approach for those countries that produce estimates with the direct method without adjustments.[19] [20] For both series, the figure points to substantial

19. National accounts average hours worked estimates are sourced from the OECD National Accounts Statistics (database), April 2018. At the time of publication, Iceland had very recently revised their statistics on average hours, departing from an LFS-based direct method and adopting a component method using BS as a main source. Iceland has been excluded from the comparisons shown in the chart, pending further discussions and ongoing review of the new methodology.

20. As shown in Figure 4.1, national accounts estimates of labour input for Denmark, Finland and the United States are not classified to either a component or a direct method, and are instead classified to "Other". For Denmark and the United States, methodologies incorporate sufficient adjustments for the key components of working time to align with national accounts concepts, and, as such, this paper does not recommend changes to their figures for the purposes of international comparisons of productivity. Finland currently uses a regression approach and so is also classified to "Other". Although Finnish statistical authorities are currently revising their estimation process, the evidence presented in Figure 4.1 suggests that the current Finnish methodology generates results closer to a direct, rather than a component based approach, and so, is likely to be upward biased compared to other countries. As such, for the short-term at least, future releases of the OECD on productivity levels will incorporate adjustments for Finland. Both the Netherlands and Malta are classified as "Unknown", as neither country were able to provide a response to the 2018 OECD/Eurostat national accounts labour input survey. In the case of the Netherlands national

improvements in the relative productivity of countries that currently use the direct method (without adjustments) through the adoption of the simplified component based approach, which is in turn more comparable with the majority of countries that also use a component approach.[21]

73. For all countries in this group, changing the average hours actually worked series from national accounts estimates to component method estimates results in an improvement in productivity position relative to the United States, averaging 8.5%. This effect is most pronounced for Lithuania (15.7%), Poland (11.9%), Sweden (11.0%), Latvia (10.9%), the United Kingdom (10.4%) and Portugal (8.7%).

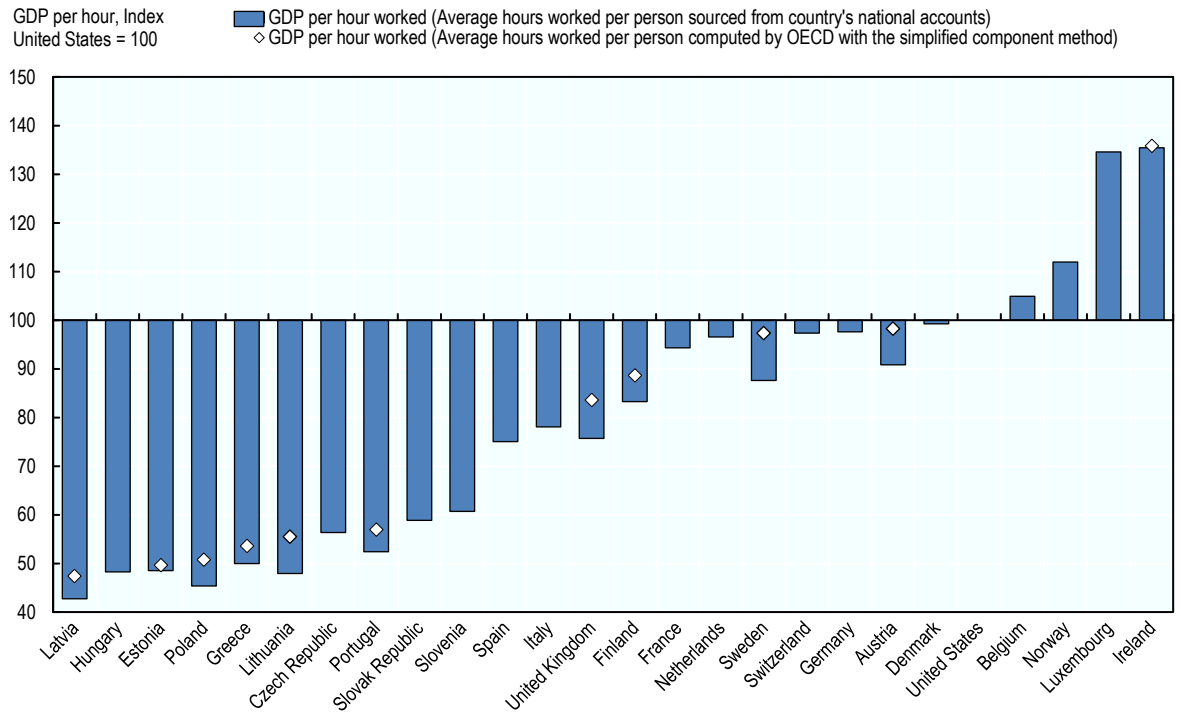
74. While the broad order of countries – in terms of the bottom, middle and top of the productivity spectrum – remains consistent across the two methods, there are some important changes in country rankings internationally. Notable ranking changes include the changing order of, Estonia and Poland; Lithuania moving ahead of Hungary, Estonia and Greece; the United Kingdom shifting ahead of Italy; Austria and Sweden moving ahead of France and the Netherlands (with Austria also moving ahead of Switzerland and Germany).

accounts figures are closely aligned with simplified component method estimates, and, as such, this paper does not recommend changes for the purposes of international comparisons of productivity. The Maltese national accounts estimates on the other hand are noticeably higher than those calculated using the direct method, indicating potential upward bias, but, unfortunately, there does not, currently, exist sufficient data at the OECD to generate simplified component method estimates, so some care is needed in their application in international comparisons.

21. To the extent that the total number of hours worked used to compile labour productivity levels is derived by combining available estimates of average hours worked per person in employment with the corresponding average employment levels, differences in national practices to adjust employment measures in line with the national accounts concept are carried over to the estimates of total hours worked, and hence labour productivity. These differences are not captured in Figure 4.2.

Figure 4.2. Estimated labour productivity gaps, selected OECD countries, 2016

Gaps in GDP per hour worked as measured using average hours worked from official national accounts and from the OECD LFS based simplified component method, United States = 100



Note: The national accounts series is calculated from the OECD's Productivity Database using all national accounts data. The counterfactual series is calculated only for those countries using an unadjusted direct method and in exactly the same way as the national accounts series with the exception of average annual hours, which are based on the simplified component method previously discussed.
Source: National accounts estimates from OECD Productivity Statistics (database), April 2018. Unpublished OECD estimates based on European Labour Force Surveys results and Eurofound (2015) for statutory leave for European countries, and the Current Population Survey (CPS) microdata and an estimated 15 days of annual paid annual leave and public holidays (Ray et al., 2007) for the United States. Estimates first presented in OECD (2004).

75. That is not to say, unequivocally, that the direct estimation method is necessarily inferior to the component based approaches but it is clear that its use, without additional adjustments, can generate, in practice, downward biases for the purposes of international comparisons of labour productivity levels.

76. It is clear therefore that improved comparability, and quite likely improved quality, could be achieved if countries currently using a direct method with no adjustments adopted component based approaches, or at the very least made systematic efforts to ensure full alignment of their direct based estimation methods with underlying national accounts requirements.

5. Conclusion

77. The results from the comparison of national practices reveal that differences in the measurement practices used to estimate working time can distort cross-country comparisons of labour input and productivity levels. Quantifying the scale of these differences is, of course, in itself a non-trivial exercise but comparisons of labour productivity estimates when using approaches that adopt more harmonised and more exhaustive adjustments that better align with the national accounts concepts underpinning production and that address potential reporter bias suggest that the scale is significant – for example the United Kingdom's productivity gap with the United States would reduce by about 8 percentage points from 24% to 16% if a simple component method approach were adopted.

78. It is important to stress however that the simplified component approach used in this paper, which uses only sources made available to the OECD, is very much a second best to efforts that make use **of all available data** sources to align with the national accounts and to address reporter bias, and, so, maximise quality and international comparability.

79. In addition, it is equally important to stress, that various differences exist in the way that countries compile their labour force surveys, for example, including, among others, sample selection, and coverage of the population, both of which can have a not insignificant impact on the quality of the adjustments needed to arrive at internationally comparable estimates of actual hours worked.[22] In this sense, adopting the simplified component approach for all countries cannot be seen as a short-cut to improved international comparability of productivity levels, which is why this paper implements this approach only for those countries that make no, or minimal, adjustments. The evidence points very clearly to biases using direct approaches, but there is no evidence of bias in estimates of countries using the component approach. In other words, where countries have more solid and robust sources for the estimation of these adjustments, and indeed for any of the components of labour input, these should always be preferred to the simplified component method used in this paper.

80. Moreover, while the present analysis has looked primarily at comparability from the perspective of the whole economy, where labour force surveys may provide a good starting point for measures of labour input, including those unobserved activities not typically covered in business surveys, this does not necessarily make them the ideal vehicle for comparisons at the industry level; reflecting the well-known difficulty that respondents to labour force surveys have in identifying the economic sector in which they work and whose value added they generate. For example, designers in a factory-less firm managing the production of garments but classified by national accountants to the distribution sector following the International Standard of Industrial Classifications – and growing digitalisation in the economy, in particular, increases in the occasional self-employed, e.g. those participating in the gig economy, may be exacerbating these challenges.

81. But neither does that mean that business sources are necessarily the optimal vehicle. Business sources for example cannot capture unobserved activities, including many observable and market activities below administrative thresholds, such as those based on,

22. It should be noted that comparability is expected to improve with the implementation of the Integrated European Social Statistics (IESS) Framework Regulation.

for example, VAT registration, incorporated status, turnover, etc. Ideally, a combination of the two sources, and indeed administrative sources where these are available should be adopted, with the strict proviso that they adhere to the concept of *domestic*, as opposed to national, employment and *actual hours worked* covering all economic activities included in GDP, as described in Section 2. The evidence suggests that this is not currently the case for all countries, in particular those currently using the labour force survey as a single source without implementing any adjustment.

82. In this sense, countries should be encouraged to continue to work to ensure that the measures of labour input (employment and hours worked) used in their official statistics align with these principles, using all available sources of data, including administrative sources, and, indeed, to consider adapting existing business surveys if necessary. Indeed, efforts in this direction are already on-going: many EU member states for example with derogations in place are working towards full implementation of ESA 2010 regulations by 2020.

83. This recommendation is of particular relevance for those countries using the direct method to estimate hours actually worked based on labour force surveys but that make no or only partial adjustments. This, of course, may not be feasible in all countries, reflecting constraints on internal resources and indeed constraints on imposing onerous reporting burdens on respondents to surveys. However, as demonstrated above, it is feasible to achieve significant improvements in quality and comparability through the use of the simple component method.

84. All countries, therefore, currently adopting the direct method without any additional refinements and that cannot improve their approaches by capitalising on other, including administrative sources, are strongly encouraged to adopt the simple component method in their official releases and in the presentation of productivity levels for international comparability purposes.

85. That being said, while the approach recommended in the paper clearly highlights the current bias in international comparisons of *levels* it does not follow that the same holds for international comparisons of productivity *growth* - indeed growth estimates would only be distorted if the impact of the adjustments required showed significant disproportional change, and the evidence does not support this.

86. As such, it is important to reiterate that this paper does not challenge the robustness of trend estimates of national labour input in countries' national accounts, and so it does not advocate any change in current estimates of labour productivity *growth*.

87. Productivity measurement is far from a simple endeavour, with this paper's contribution being only a small part of a much larger and ongoing conversation in the literature. Looking forward, there is more work to be done on the measurement of labour input for productivity analysis, not only within the statistical framework of individual countries but also in international organisations, such as the OECD, for the production of estimates for international comparisons.

88. First, there needs to be continuing engagement with and within national statistical offices, particularly those using direct methods for the calculation of actual hours worked, to explore and develop the sources and methods used in the compilation of employment and hours worked in line with national accounts concepts. The results described in this paper suggest that there is considerable scope for countries to further exploit and capitalise on their own data sources in order to triangulate, cross-check and improve the quality and international comparability of their estimates.

89. Second, for agencies disseminating cross-country statistics, the lessons learned and take-aways from this exercise, also point to considerable scope for improved comparability. In its future disseminations of comparisons of labour productivity levels, the OECD will work in this direction by implementing the simplified component method, conditional on data availability, for those countries where the evidence points strongly to comparability issues: namely those that apply the direct approach with no or minimal adjustments to align with the actual hours worked concept, while in parallel working closely with them to adapt their estimation procedures accordingly. At this stage, based on the data available to the OECD, the implementation of the simplified component method will apply to the following countries: Austria, Estonia, Finland, Greece, Ireland, Latvia, Lithuania, Poland, Portugal, Sweden and the United Kingdom. Again, it is important to stress that the use of the simplified component method for this group of countries is intended to be only a stop-gap until such a time that these countries are able to improve their estimates, and, as noted above, many countries are already moving in this direction.

90. In the first instance, OECD efforts will necessarily be restricted to comparisons at the whole economy level but future work will look to explore how labour input measures at the industry level can also be improved. Efforts to improve comparability of labour input measures at the industry level will involve reallocations of recorded labour input across industries. This will, at least in theory, have no impact on the whole economy estimates of levels presented above, nor indeed on whole economy estimates of productivity growth. However it is clear that such an exercise may have an impact on current estimates of productivity levels – and potentially productivity growth – of *industries within countries*. In addition, it is important to note that improved estimates of labour input measures at the industry level are not only of relevance for productivity analyses. Having more comparable estimates of labour input at this level could significantly improve analytical capacity in other spheres, for example in analyses of globalisation, e.g. estimates of jobs dependent on foreign demand, but also to better understand the labour impact of the digital transformation.

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Annex A. The survey questionnaire

OECD/Eurostat 2018 questionnaire on the methodology underlying labour input data in national accounts

The widespread slowdown in productivity growth in many countries in recent years has led many users to question whether measurement may be a factor, with many highlighting the potential impact of mismeasurement in activities, such as those in the sharing economy, where significant changes in working arrangements may have had an impact.

Magnifying these concerns, a point that has also been raised by a number of statistical agencies, are the considerable differences in the average number of hours worked per person or per job between OECD countries; which in turn translate into substantial differences in measured labour productivity between countries at similar stages of development.

To respond to these concerns and to better understand the factors that may be driving these differences, the

OECD Secretariat and Eurostat agreed to relaunch a joint survey of methods used to estimate employment and hours worked. This is a follow-up on previous surveys conducted in 2005 and 2009 respectively, and will help to update the OECD's public national accounts meta-database.

The present questionnaire is divided into four parts:

- The first part is relatively simple and aims to determine the availability of labour input data in terms of employment and hours worked for the total economy (GDP) and by industry.
- The second part is slightly more complex and involves the completion of a set of 'bridge tables', included in the accompanying excel document, which are intended to describe how, and to what extent, countries adjust original employment and hours worked source data to concepts required in the national accounts framework and that provide the basis for coherent productivity estimates.
- The third part is an extension to the second, asking for additional detail on how national accounts estimates of employment and hours worked are derived from the source data. This recognises the fact that in practice, countries may use different sources for employment data: Labour Force Survey; administrative data; business surveys.
- The final part is an opportunity to take stock of various initiatives in the measurement of labour input and productivity that may be on-going in your country and that may be of interest to other countries or benefit from experiences that have already been under-taken or on-going in other countries.

We would appreciate receiving your response by 9 March, 2018, and sooner if possible. Please inform Belen Zinni (Belen.Zinni@oecd.org), if this will not be possible. All completed questionnaires, and indeed questions for clarification should also be sent to Belen Zinni.

Country:
Name of respondent:
Department/organisation of respondent:
Email address of respondent:
Date: DD/MM/YYYY

Part I: Data availability

1. Employment

Question 1.1: Do you compile statistics of the number of employees and self-employed persons in the framework of the national accounts for the total economy, domestic concept?

☐ Yes ☐ No

Further comments or information -

Question 1.2: Do you compile statistics of the number of employees and self-employed persons in the framework of the national accounts by industry?

☐ Yes ☐ No

Further comments or information -

Question 1.2.1: Which system of industrial classification do you follow? (e.g. NACE Rev. 2, ISIC Rev. 4, 2017 NAICS, etc.) :

Question 1.2.2: Which level/s of industry detail do you produce? (e.g. A10, A21, one digit, two digit etc.):

Question 1.3: If you do not compile estimates of number of employees and/or self-employed persons, domestic concept, please explain why. Please indicate if you have plans in the near future to compile these data.

2. Hours worked

Question 2.1: Do you compile statistics of total hours worked for both employees and self-employed persons in the framework of the national accounts for the total economy?

☐ Yes ☐ No

Further comments or information -

Question 2.2: Do you compile statistics of total hours worked for both employees and self-employed persons in the framework of the national accounts by industry?

☐ Yes ☐ No

Further comments or information -

Question 2.2.1: Which system of industrial classification do you follow? (e.g. NACE Rev. 2, ISIC Rev. 4, 2017 NAICS, etc.):

Question 2.2.2: Which level/s of industry detail do you produce? (e.g. A10, A21, one digit, two digit etc.):

Question 2.3: If you do not compile estimates of total hours worked for employees and/or self-employed, please explain why. Please indicate if you have plans in the near future to compile these data.

Part II: Bridge tables between original source data and national accounts

The objective of this section of the questionnaire is to understand the steps you follow in practice to compile national accounts estimates of employment and hours worked, starting from the data you collect from the original data source/s. The questionnaire consists of a quantitative table, i.e. *bridge table*, constructed for a recent year. A model format is provided in the excel file accompanying this questionnaire. For your convenience the model format distinguishes between employees and self-employed; however, we invite you to modify this table as needed to more accurately reflect the steps followed in your compilation process.

While the coverage of the table is expected to be the total economy (GDP wide), please, feel free to modify and provide additional information in these tables to reflect different methods followed for different industries, employment status, enterprise size, etc.

The bridge table is deliberately designed to be flexible. The range of adjustments described is designed to be exhaustive, and countries are encouraged to provide exact estimates if possible. However we recognise, that in some cases and for some countries, it may not be possible to provide an exact estimate for any specific adjustment, reflecting in part that the national compilation system may arrive at national accounts based estimates using broader

approaches. If you are not able to provide an exact estimate, approximate estimates are encouraged as a secondary outcome. Adjustments can be included numerically (e.g. +123, -321) or in percentage terms (e.g. +2.5%, -0.5%). If neither an exact or approximate estimate is possible then a directional indicator will be useful (e.g. upwards, downwards).

Please also specify whether the estimates provided in the 'bridge tables' should be treated as confidential. For those countries that provide estimates and prefer that they remain confidential, please also specify whether information on the direction of the adjustment (upward/downward) should also be treated as confidential, and whether the overall size of the adjustment should be treated as confidential.

If you have any additional comments or information you would like to provide regarding your bridge tables, please do so below:

Part III: Methods

3. Employment

***Question 3.1*:** Please describe the architecture of your estimation method for employment (in persons/jobs). Please include details of differences in methods and data sources that may exist at different points in the time series (e.g. a break in the series resulting from the introduction of a continuous labour force survey) or due to the timing of the estimate (e.g. flash estimate, regular estimate or annual data). Please also provide links to articles that may be relevant.

***Question 3.2*:** What is the main original source for employment in the national accounts (e.g. administrative source, labour force survey, business survey, other)? Briefly describe this source, its coverage (including over time, range of businesses/households covered etc.), its availability and whether it is in terms of jobs and/or persons.

Please specify if the sources used differ for different parts of employment (in particular if sources differ between employees and self-employed, and/or between industries, firms of different size, etc.). If sources differ, please provide a clear distinction when answering the questions that follow.

Question 3.3: Please describe how estimates of annual figures based on higher frequency data (e.g. weekly, monthly, quarterly) are derived. Please also specify, if relevant, how annual figures are derived if survey information is less periodic (e.g. every 5 years)?

***Question 3.4*:** Please describe the adjustments made to pass from jobs to the concept of persons (if the original source is in terms of jobs), or vice versa.

***Question 3.5*:** Please describe the adjustments made to correct for coverage of the economic territory. This refers specifically to residents working for non-resident units and non-residents working in resident units. If relevant, please also describe adjustments for military (including conscripts, where applicable) and other collective households not covered by your main source.

***Question 3.6*:** Which adjustments are made for the unobserved economy (e.g. producers that deliberately do not register, individuals providing their labour that are not required to register, illegal workers, etc.)?

***Question 3.7*:** Which, if any, other adjustments are made (e.g. inclusion of resident workers below the age threshold, prisoners, adjustments made to account for statistical deficiencies in the source data, etc.)?

Question 3.8: In cases where Labour Force Survey data have not been used as the main source (even if only for some activities or groups of workers), please explain why. Are LFS data used for adjustments or cross-checking? Are differences monitored?

4. Hours worked

Question 4.1: Please describe the architecture of your estimation method for hours worked (in terms of per person/per jobs). Please include details of differences in methods and data sources that may exist at different points in the time series (e.g. a break in the series resulting from the introduction of a continuous labour force survey). Please also provide links to articles that may be relevant.

Question 4.2: What is the main original source for hours worked in the national accounts (e.g. administrative source, Labour Force Survey, Business survey)? Briefly describe this source, its coverage and its ability to reflect the definition of hours worked (see paragraphs 19.47 to 19.54 of the 2008 SNA). In particular, does it capture a 'usual' hours, 'actual' hours, or some other concept?

Please specify if the sources used differ for different parts of the employed population (in particular if sources differ between employees and self-employed, and/or between industries, firms of different size, etc.). If sources differ, please provide a clear distinction when answering the questions that follow.

***Question 4.3*:** Please describe the adjustments made to transform the original source to adapt it to the concept of working hours as defined in national accounts. Please, describe each adjustment separately. These adjustments might include:

- Accounting for holidays and annual leave
- Accounting for sickness leave
- Accounting for strikes and temporary lay-offs
- Accounting for paid but unreported overtime
- Accounting for unpaid overtime

***Question 4.4*:** Is a specific adjustment made to account for under or over reporting in the source data? Please specify if these adjustments are made for employees and/or self-employed workers.

***Question 4.5*:** If an adjustment is made for the number of persons employed in relation to the unobserved economy, what assumption is made regarding the hours worked by these persons?

***Question 4.6*:** Which other adjustments, if any, are made?

Question 4.7: If necessary, please describe any additional calculations needed to derive total hours worked and average hours worked from the sources and adjustments specified above. This includes, but is not limited to, adjustments made to align the coverage of hours worked with that of employment (i.e. the coverage produced by the process followed in section 3).

Part IV: Other work in this area

5. Differences between national accounts and Labour Force Survey estimates

Question 5.1: To what extent do you consider your Labour Force Survey an accurate tool for the measurement of employment and hours worked? Please describe any issues or shortcomings of which you may be aware.

Question 5.2: If the Labour Force Survey is not the primary source of data used to derive your estimates of employment in persons hours worked: Are you able to quantify, even approximately, what the difference would be between your current national accounts estimates and those you would obtain if you did use the Labour Force Survey data as your primary source?

Question 5.2.1: Where differences between these estimates exist, can you provide a brief assessment of the source of these differences?

6. Timely estimates of employment

Question 4.1: Are you currently producing timely estimates of employment (t+30 or t+45)? If so, please describe briefly the methodology, coverage and sources. If you are not producing a timely estimate, do you have plans to start doing so in the future?

Question 4.2: Please provide information on the quality of the estimates (e.g. revision analysis).

7. Other data produced (Optional)

Question 6.1: Do you produce labour input data other than that already discussed, for example quality adjusted labour input or labour input in terms of full-time equivalents? If so, please provide details and/or links to these data.

Question 6.2: Do you produce productivity statistics (e.g. labour productivity for the total economy, further breakdowns of labour productivity, capital productivity, multi-factor productivity etc.)? If so, please provide details and/or links with regards to these data.

Question 6.3: If there is any other work that you produce currently, or are looking to produce in the future, in the areas or labour input or productivity, please use the space below to inform us about this work.

Annex B. Detailed information on data sources

This annex provides further information on the data sources used in different countries for measuring employment and hours worked in national accounts drawn from the 2018 OECD/Eurostat survey.

Data sources for employment

Table 3.2 shows that most countries national accounts employment data are in terms of persons. Argentina, Brazil, Canada, Costa Rica and Japan report employment only in terms of jobs, and Colombia and Peru report only full-time equivalent (FTE) jobs.

Most countries rely on the LFS as their main original source for employment (persons, jobs or some form of FTE measure). When the LFS is used as the main source, most countries supplement it with other sources, predominantly BS or AS or some combination of the two, in particular to construct the employees' series. Only Chile, Croatia, Estonia, Korea, Latvia, New Zealand and the United Kingdom use LFS as their only source to construct both employees and self-employed numbers.[23] However, in its productivity statistics, the United Kingdom uses LFS as its only source for employees' numbers in the total economy, and AS and BS for the purposes of industry allocations.

For the construction of employees' series, many countries use LFS as their main source and supplement it with AS (Australia, Lithuania, Peru, and Romania), with BS (Poland), or with a combination of the two (Czech Republic, Israel, the Slovak Republic, Spain, Sweden and Switzerland). However, the use of the LFS as the main source is more widespread across countries when it comes to measuring the self-employed workers, as most countries (34 out of 45 surveyed) rely on LFS as a main source and many of them use it as their only source (17 countries). Some countries use the LFS as the main source for self-employed statistics but use it with AS/Other (Argentina, Bulgaria, Israel, Lithuania, Romania and Sweden) or a combination of BS and AS/Other (Colombia, Czech Republic, Norway, the Russian Federation, Spain and Switzerland). Canada combines the use of its LFS with its quinquennial PC for the purposes of industry allocation and makes use of LFS data from neighbouring countries for adjustments of economic territory (this is classified within AS/Other in Table 3.2). Only Canada, New Zealand (in its productivity accounts) and Slovenia, (for employees only), and Cyprus, Greece and Hungary, (for both employees and self-employed), use all other sources in combination with their main source (the LFS).[24]

When the LFS is used as the main source and combined with other sources, the latter are utilised principally for the purposes of:

- adjustments for economic territory (all countries using the LFS as the main source with the exception of Norway and the Russian Federation),
- to account for workers in the unobserved economy (Czech Republic, Greece, Israel, Portugal, the Russian Federation, Spain and the Slovak Republic),

[23] Portugal, also estimates number of jobs using BS and AS

[24] In the reply to the survey, Greece mentioned it will start using administrative sources in the year 2018 to enrich the estimation of employment in national accounts.

- for the allocation of employees (Canada, Hungary, the Slovak Republic, Sweden, Switzerland) or self-employed data over different industries (Canada, Sweden, Switzerland),
- and for the reclassification of self-employed workers in corporations and quasi-corporations into the employees' category (Czech Republic, Norway, Spain).

Further to this, all countries except Belgium and Luxembourg use the LFS in the compilation of employment as at least a secondary source. Belgium monitors differences between the results obtained from other sources and the LFS but not systematically, and Luxembourg measures the differences regularly but does not rely on the LFS as a source due to the open nature of the country and hence the difficulties involved in transforming estimates derived from the national employment concept in the LFS into those required for the domestic concept in the national accounts.

Austria, Belgium, Costa Rica (only for self-employed), Denmark, France, Iceland and Slovenia use AS as their singular main source to compile both employees and self-employed numbers. Argentina uses the AS as its main source for employees, supplemented with LFS data to estimate employees in the unobserved economy, but uses the LFS as its main source for the self-employed. Belgium uses data from various social security agencies as the only source for both employees and self-employed recognising their exhaustiveness and consistency with other national accounts estimates such as value added and wages; however an adjustment is made to take into account the undeclared employment and illegal workers estimated consistently with adjustments made in the estimation of value added and wages in national accounts. Denmark and Iceland use AS as their only source for employees data but supplement AS with LFS data in the estimation of self-employed numbers and their industry breakdown, respectively. Austria, France and Slovenia use the LFS as an additional source to estimate workers in agriculture (Slovenia), unpaid family workers (Austria and Slovenia) and to capture workers in economic territories not covered by the main source (France). They also use BS as an additional source in the estimation of employees to introduce the industry breakdown (Austria), to capture employees in activities or corporations not covered in the main source (Slovenia, which uses also the PC to this end) or to collect quarterly data on part-time activity (France).

Japan is the only country surveyed using its PC as the main source for both employees and self-employed. The PC numbers are used as the employment benchmark (each September) every five years and extrapolated to other months using the LFS; the Employment Status Survey, another household survey, is used for the conversion of number of persons to number of jobs. Finland is the only country that uses the BS as its singular main source for both employees and self-employed but supplements it with LFS data for cross-checking purposes and to capture employment in some sectors, as well as with tax information and the EU-SILC to make adjustments for economic territory. Bulgaria, Mexico, the Russian Federation and the United States also rely on BS as their singular main source for employees and use the LFS as the main source for self-employed.

Fourteen countries rely on multiple "main" sources for the compilation of employment. Cyprus, Germany, Luxembourg, New Zealand in its productivity accounts, Norway and the Slovak Republic principally use labour demand sources (BS and AS) to estimate numbers of employees, self-employed or both. These countries highlight the better coverage and/or timeliness of their BS and AS data, as well as their consistency with the industry breakdown of output and wages and with the domestic concept of employment required in national accounts. Moreover, with the exception of Norway, all these countries use LFS and/or other sources to supplement and/or cross-check the information obtained

from BS and AS sources.[25] Ireland and South Africa rely equally on LFS and BS to compile series of employees, although they use their LFS as their only source to estimate numbers of self-employed. Brazil uses LFS, AS and BS as main sources for the construction of employees' series. Italy is the only country using LFS, BS and AS as the main sources for both employees and self-employed. Italy relies on the use of a database on employers, which is based on the integration of its statistical business register and other sources, including business surveys, and which is used as the source for declared labour, and a database on workers known as the LFS-ADMIN database, which results from the integration of the Italian LFS sample with administrative records and allows regular jobs to be traced for irregularities through comparisons with the employment status reported by the independent sources (ISTAT, 2015).

Data sources on hours worked

Table 3.3 shows that the majority of the countries surveyed use LFS as their main source for hours worked. LFS is the only source in 13 countries to compile hours worked by employees and self-employed (Chile, Croatia, Estonia, Greece, Latvia, Lithuania, Mexico, New Zealand, Poland, Peru, Romania, the United Kingdom and South Africa), is supplemented with AS in eight countries (Australia, for employees' hours only, Bulgaria, Belgium, Cyprus and Germany, for self-employed hours only, Canada, Israel, and Switzerland, for hours worked by both employees and self-employed), with BS in one country (Sweden, for employees' hours only) and with both BS and AS in other country (Colombia).

While nine countries use BS as their main source for employees' hours (Bulgaria, Cyprus, Czech Republic, Hungary, Korea, Japan, the Russian Federation, the Slovak Republic and the United States) and LFS as their main source for hours worked by the self-employed (with the exception of Japan that does not compile hours worked for this workers' category), two countries use BS as their main source to compile hours worked for both employees and self-employed (Finland and Iceland). In using BS, some countries, such as Cyprus (for employees' hours only), Iceland and France (for employees' hours only), use a component method and then take normal hours, contractual hours or hours paid as a starting point, adjusting these for absences and overtime, which may be available in other sources, hence the need to supplement BS with LFS or AS.

Denmark is unique in its use of AS as a main source for the compilation of hours worked for both employees and self-employed. The country reports the use of its Working Time Accounts database as its main and only source, which ultimately gathers and integrates information from administrative data sources complemented with information from BS, including the statistical business register, and the LFS.[25] While the hours worked by employees are mainly paid contractual and overtime hours minus paid absences, and include paid meal breaks, the hours worked by self-employed are estimated on the basis of hours worked by full-time employees and a ratio of extra work performed by self-employed derived from LFS. Belgium and Germany, instead, use AS as the main source for employees' hours and switch to the use of LFS as the main source for the measurement of

[25] Germany, for example, reports the use of 60 different data sources to estimate employment in their national accounts, and points to monthly administrative statistics compiled by the Federal Agency of Employment, the business register and statistics on public service personnel as the main sources for numbers of employees, and the Micro census (i.e. the German LFS) as the main source for self-employed numbers.

hours worked by the self-employed. But while Germany uses a component method to estimate hours worked for both employees and self-employed, Belgium uses the component method to estimate employees' hours only and combines information on self-employed hours from LFS with the average number of hours worked by employees sourced from AS (indirect method).

To estimate employees' hours, Cyprus uses a component method based on BS data.[26] However, to estimate self-employed hours the country employs a simplified component method, making use of the LFS, using, in particular, answers provided by individuals concerning normal hours worked plus/minus hours worked more or less than usual, due to holidays, sickness, unpaid overtime, national holidays, labour disputes, maternity leave, etc.

A few countries use multiple main sources to compute employees' hours (Austria, Ireland, Luxembourg, Slovenia and Spain) or to compute hours for employees and self-employed (Colombia, Italy, Norway and Portugal). The use of multiple main sources aims to cover different time spans (Ireland), to estimate working time in different sectors (Austria, Spain) or to determine the different components of hours actually worked (Italy, Luxembourg, Norway and Slovenia).

[26] Further information on the Danish Working Time Accounts is available here: https://www.dst.dk/en/Statistik/dokumentation/documentationofstatistics/the-annual-and-quarterly-working-time-accounts.