

**Employment and Hours Worked in National Accounts:
A Producer's View on Methods and a User's View on Applicability¹**

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Abstract:

This paper provides a detailed assessment of the methods and procedures used for integration of labour input measures in the national accounts for 31 countries. The paper provides detailed bridge tables which were based on the outcomes of an OECD/Eurostat questionnaire. Hence the quantitative impact on the numbers of persons employed and hours worked is indicated. The paper also groups countries depending on the basic primary sources (labour force survey, business statistics and administrative sources) that are used. The paper does not only adopt a producers' perspective but also looks at these measures from a user's point of view. For example, national accounts-based measures of labour input are an obvious source to be used more intensively for productivity research. However, given the large differences across countries, a careful judgement from the perspective of the user is required before jumping to use these national accounts series. This issue is explicitly addressed in the framework of the productivity databases of the Groningen Growth and Development Centre and The Conference Board and in the EU KLEMS project. On the whole, from the perspective of productivity there seems to be a greater usefulness for national accounts-based measures of labour input when these are based on business surveys, and in particular when used in combination with working time accounts.

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1. Introduction

Consistent measurement of output and inputs is crucial for the study of economic growth, labour markets and productivity. Integration of labour input measurement in the comprehensive measurement framework of national accounts is therefore an important matter. The topic is not at all new as appears, for example, from a detailed discussion of these issues in the *Review of Income and Wealth* by Angus Maddison more than 25 years ago.² In recent years, however, substantial progress has been made in the integration of labour input figures with the national accounts of individual countries.³ This follows recommendations in the latest comprehensive revision of the System of National Accounts (1993; chapter 12)⁴ and the European System of Accounts (ESA; chapter 11)⁵. This process is highly desirable from the perspective of various applications of national accounts for economic research, especially for studies that make use of integrated parts of the national accounts system. Productivity analysis is one of the most obvious applications that can benefit as it is bound to lead to an improved consistency between the numerator (value added) and the denominator (labour input).

Nevertheless the integration of labour accounts into national accounts has turned out to be a cumbersome process, as the primary sources for labour input turn out to be quite different from the statistical requirements within the national accounts system. Before using national accounts-based labour input estimates for economic analysis, one therefore needs to look more closely into the quality of these estimates, and in particular into the quality of the adjustments made to the original primary data on employment. The same holds for annual hours worked data, which has been incorporated in the national accounts for many countries only recently. We also need to assess quality of these estimates relative to other possible sources and – for productivity analysis – we need to look into data availability and quality at industry level.

These concerns define the major aims and context of the present paper. The concerns are in part an important matter for the producers of national accounts-based estimates of employment. How can one guarantee a set of labour statistics that fits into a national accounts framework and – at the same time – realize a minimum amount of international inconsistency, taking into account the very different primary

² Maddison, A. (1980). Monitoring the Labour Market: A Proposal for a Comprehensive Approach in Official Statistics, *Review of Income and Wealth*, June, pp. 175-217.

³ Only a limited number of countries had already included labour input estimates with the national accounts for a considerable length of time, including Denmark, France, Germany, the Netherlands, Sweden and the United States. However, the processes of integration of labour and national accounts estimates and consistency with output estimates has – to our knowledge – not been addressed in great detail by any of these countries.

⁴ See <http://unstats.un.org/unsd/sna1993/toctop.asp>

⁵ See <http://forum.europa.eu.int/irc/dsis/nfaccount/info/data/esa95/en/een00462.htm>

source structure of labour accounts and their related reliability? But this paper also looks at these issues from the perspective of the user. How can the user be confident that he is using a dataset that can be better used for analysis than the original primary source on which he has mostly relied so far?

Indeed the labour input series in the national accounts are typically secondary statistics, which are derived from primary sources, in particular labour force surveys (LFS), business surveys and micro datasets such as social security statistics. National accountants then try to rework estimates so that these comply with the national accounts framework. This should lead to a set of labour statistics, which are consistent with output and compensation figures and uses the best available sources at each level. Different sources are tested on their applicability at sector and industry level. Further adjustments are based on the view of experienced industry experts.

However, there are also some drawbacks to this approach. The complexity of the adjustments made many raise concerns about their international comparability. In addition, as the national accounts for most countries have extended figures for employment and (especially) hours in the national accounts only recently, the documentation structure is therefore not as well developed as in for example the labour force survey.⁶ As the employment series in the national accounts are based on a cocktail of sources, a clear description of how the figures have been constructed is of eminent importance to enhance credibility and support acceptance of the results. The present paper aims at giving a first push to developing a meta database structure on a country-by-country basis.

In more concrete terms, this paper aims to document what activities are covered by the employment and annual hours worked figures in the national accounts, and how the transition from primary sources to the national accounts is made. The assessment is based on results from a joint questionnaire by the OECD and Eurostat, which was answered by all 25 countries of the European Union, Bulgaria, Iceland, Norway, Romania and Switzerland.⁷ For non-European OECD countries the information is mostly based on Lequiller (2005)⁸.

The next section focuses on the variables and the concepts of labour input that have been used for the national accounts. It briefly discusses the primary sources and the adjustments to these sources. Section 3

⁶ See ILO Laborsta database (<http://laborsta.ilo.org/>), where all surveys and sources have clearly been documented.

⁷ See also Arturo de la Fuente (2006), Employment: Results of the Questionnaire on sources and methods, Eurostat C2/CN 603, presented on the Working Group on National Accounts Luxembourg, 15-16 May 2006.

⁸ See Lequiller, F. (2005), Using National Accounts for Productivity Analysis, OECD, STD/NAES(2005)25. Turkey and Korea did not reply on the questionnaires and these countries are therefore only briefly mentioned in this paper.

contains a more elaborate discussion of the sources and set-up of the employment figures. Countries are grouped according to the methods and sources that have been used. Section 4 describes the set up for hours worked estimates, also based on clustering countries according to the methods they use.

In addition to the producer perspective, this paper will also provide a picture of the quality of employment and hours worked numbers at industry level and the applicability for economic research, in particular productivity analysis. At the end of sections 3 and 4 we will provide a number of qualitative comments on the nature of the adjustments made from the perspective of the user of national accounts-based labour input estimates. In Section 5 we address the user perspective more explicitly by identifying the criteria which need to be met for adopting national accounts-based labour input in productivity studies. We also provide recommendations to further the use of national accounts for productivity analysis. Finally, in Section 6 conclusions and areas for further work are identified.

An important contribution of this study has been the construction of bridge tables, which quantify the adjustments of employment and hours from the primary sources to the national accounts. Annex 1 does contain country sheets for 36 countries, which describe how each country has set up its system of employment and hours worked figures in the national accounts. The sources underlying the final numbers and the adjustments which have been made to the original sources are also described. Although the information is still incomplete, and the country sheets are currently waiting to be validated by the countries, these sheets provide a first impression of the common practices used to construct national accounts estimates for employment and hours worked.

2. Measures and concepts of employment and hours in the national accounts

This Section describes which variables have been included in the employment and hours worked measures of the national accounts and what they really measure. The focus here is on the variables and the concepts used. A more elaborate discussion of the sources and the methods to construct the estimates follows in Sections 3 and 4.

2.1 Primary sources for labour input

There are roughly three primary sources to be distinguished for labour input figures. The most comprehensive and well-established source is the labour force survey (LFS), which aims to provide reliable information on the composition and characteristics of the labour force. There is a substantive international harmonisation of concepts in labour force surveys as it uses definitions set out by the

International Labour Organization (ILO), although sampling size and techniques may still differ substantially between countries. The main problem of labour force surveys from the perspective of national accounting (and productivity analysis) is the limited consistency with output data, like production and value added. Most notably, LFSs survey the national labour force instead of the domestic labour force.⁹ Another problem is the relatively small sample size and the exclusion of particular groups such as people in communal establishments (for example prisons), illegal economy and armed forces. An advantage of labour force surveys is that they cover the whole economy, and both persons and hours worked of employees, self-employed and unpaid family workers.

Business surveys provide detailed industry data on hours and employment. The information is often consistent with output measures, as value added and so on are also mostly collected this way. The coverage by business surveys is reasonably good for goods producing industries, but services (such as financial services) are not always fully covered. Moreover business surveys typically only cover firms which employ a minimum number of employees (most of the times more than 20). This excludes smaller firms, which can be a problem for the analysis of industries where small firms have large shares (retail, personal services). Another limitation is that data on self-employed and unpaid family members are usually not collected. This is problematic for sectors like agriculture, where these categories make up a significant share of total employment. A third drawback is the measurement of employment in jobs, which complicates the transition to persons and the adjustment for part-time workers at the aggregate level.

Micro databases like social security statistics are in principle developed for other purposes than the measurement of labour input, but do provide useful information on employment and compensation. These databases normally involve all legal inhabitants and contain data for individual employees. They can be very useful for detailed industry comparisons, especially when they are linked to complementary micro sources, such as business surveys. However, access to micro data is often restricted and can be very resource-intensive.

2.2 Employment

Employees, self-employed and total employment

Almost all countries now provide data for employees as well as for self-employed and unpaid family workers in their national accounts. It should be noted here that a lot of countries have recently adjusted

⁹ For example, the national labour force concept is a major drawback for productivity analysis as it can lead to misleading productivity figures in small countries, where the numbers of residents working abroad and non-residents working within the economic territory differ significantly. Luxembourg, which shows a difference of 34.3% between the national and domestic concept of employment in 2004, is the most striking example. Table 1 shows the differences for all countries.

their employment figures for the national accounts, so figures are sometimes based on new sources or prone to changes in methodology. Some countries have reported their new methodology in the questionnaires, but the new series have not yet been included in the databases of Eurostat and OECD. When looking at the industry level, most countries provide data at the level of 31 industries or more. Only Australia, Japan, Korea, Mexico and Switzerland still provide data for only 7 industries. Most of these countries use a different national industry classification, which is difficult to concord to the NACE classification.

Full-time equivalents

Next to the headcount figures above, some countries also provide figures for full-time equivalents. This concept converts all employment to full-time jobs, which basically means that two people working 2.5 days per week will be counted as 1 full-time equivalent. Full-time equivalent measures depend of course on the definition of 'full-time' and is a derived measure which requires both information on employment and hours worked. The main formula used for the calculation of full-time equivalents is:

Number of FTE= Number of employed persons x conversion factor for part-time employees

The conversion factor is mostly calculated from labour force surveys in combination with establishment surveys, wage statistics and employee registers. It varies according to industry and gender. Due to its complexity, FTEs are not a very good proxy of total hours worked. It is to be noted that international organisations (OECD, Eurostat) have abandoned the collection of FTE data in favour of hours worked, which is more informative.

Adjustments to employment figures

Dependent on the primary sources underlying the employment numbers, adjustments have to be made to satisfy the requirements of the System of National Accounts. We have subdivided the adjustments applied to the original numbers in stocks to flow adjustments, adjustments from jobs to persons, adaptations for the economic territory, underground adjustments and other adjustments.

To get an impression of the impact of these adjustments, **Table 1** shows the percentage gap between LFS and national accounts figures of employment and %-difference between the domestic and the national concept. It is clear that the magnitude of the differences strongly depends on the country specific situation. Especially for smaller countries and countries with a relatively open economy, the differences can be quite large.

Table 1 Differences between concepts and sources for employment

	Gap between	Gap between
	LFS and NA	Nat. and Dom. Concept
	2004	2004
Luxembourg	0.2%	34.3%
Austria	10.0%	0.8%
United Kingdom	2.2%	7.2%
Italy	8.6%	-0.2%
Czech Republic	3.4%	2.5%
Switzerland	n.a.	5.2%
Belgium	5.2%	-1.3%
Japan	3.0%	0.0%
Sweden	2.4%	0.2%
Denmark	2.3%	0.1%
Ireland	2.2%	0.0%
Spain	2.1%	0.1%
Canada	1.7%	0.0%
France	1.7%	0.0%
Norway	1.7%	0.0%
United States	1.6%	0.0%
Portugal	0.9%	0.0%
Germany	0.6%	0.2%
Australia	0.8%	-0.1%
Netherlands	0.5%	0.2%
Hungary	0.6%	0.0%
Finland	0.5%	0.1%
Korea	-0.1%	0.0%
New Zealand	n.a.	0.0%
Estonia	n.a.	-1.0%
Greece	-5.8%	-2.9%
Poland	0.0%	-5.4%
Slovakia	n.a.	-5.6%
Source: Ameco Database and OECD NA		

1. Adjustments from stocks to flows

Except for Greece, Portugal, Iceland and Poland, all countries are publishing quarterly national accounts including figures for employees, total employment and in some cases hours (Denmark, Finland, Germany, Hungary, Italy, Norway, Spain, Sweden and the Slovak Republic). Quarterly figures are calculated as an average of weekly or monthly figures. Annual figures are mostly calculated as an average of the quarterly figures. However, some countries base their quarterly figures on annual levels of the preceding year, and use, for example, LFS data for the quarterly trend. In some cases the periodicity of the underlying sources of the annual estimate leads to an inconsistency between the quarterly and annual data. When the sources for the annual figures appear only once a year, the quarterly figures are adjusted after the calculation of the

final annual figures. Germany is a clear example of such a procedure: they provide monthly flash-estimates, which are revised when the “real” data is available. Today, there are no countries anymore that provide a stock estimate like the employment level at mid-year or end-year. All measures are calculated as an average for the whole year. The effect of seasonal adjustments can only be measured on monthly or quarterly data. For annual estimates these seasonal adjustments do not have any effect.

2. Jobs versus headcounts

The System of National Accounts 1993 suggests the use of jobs instead of persons in the national accounts. Some countries (Austria, Canada, Greece, Japan, and Switzerland) provide employment data measured in terms of jobs only, but OECD and Eurostat are now requesting all countries that deliver employment in jobs, to deliver headcounts (or persons) as well.¹⁰ The United Kingdom recently started to provide (preliminary) data expressed in persons, but their job concept has been worked out much more thoroughly. The following equation shows the relationship between persons and jobs:

$$\text{Jobs} = \text{Number of persons with at least one job} + \text{Number of second jobs} + \text{Number of third, fourth, etc. jobs}$$

At industry level, even if the metric are headcounts, in practice the concept is very close to jobs: for example, a person who has a job in manufacturing and a job in agriculture will be counted twice.¹¹ As a result the industry-level headcounts will not add up to total persons in employment. The difference between jobs and persons at the aggregate level can be reconciled by information on multiple jobholding, which is provided in most labour force surveys.

3. The economic territory: Domestic versus National concepts

Employment can describe different populations or economic territories. The national accounts employment measures are available in two concepts: the domestic and the national concept. For most types of research (including productivity analysis) the domestic concept is the preferred measure, as this concept is consistent with domestic output measures. The domestic concept includes all employment within the

¹⁰ See Lequiller, F. (2005), Using National Accounts for Productivity Analysis, OECD (continued), STD/NAES(2005)25. The situation of the United States is somewhat special. Its national accounts data on employment are expressed in terms of jobs, but the US recently also transmitted data to the OECD in terms of persons. However, the latter is based on the LFS (called CPS in the US: Current Population Survey) while the data in terms of jobs is based on business surveys (called CES: Current Employment Statistics). Thus the difference between the number of jobs and the number of persons in the US national accounts is not only due to multiple jobs but also to other (mostly yet unexplained) differences between the two surveys.

¹¹ The only exception is when a person has two (or more) jobs in the same industry, the job-count will be two (or more) but the headcount will be only one.

economic territory. According to the System of National Accounts (SNA 93, 14.9) the economic territory of a country includes:

- (a) the airspace, territorial waters, and continental shelf lying in international waters over which the country enjoys exclusive rights or over which it has, or claims to have, jurisdiction in respect of the right to fish or to exploit fuels or minerals below the sea bed;
- (b) territorial enclaves in the rest of the world (clearly demarcated areas of land which are located in other countries and which are used by the government which owns or rents them for diplomatic, military, scientific or other purposes with the formal political agreement of the government of the country in which they are physically located)
- (c) any free zones, or bonded warehouses or factories operated by offshore enterprises under customs control (these form part of the economic territory of the country in which they are physically located).

Most national accounts also measure the national concept of employment, which does include all residents of a country. To move from the national concept to the domestic concept, residents working abroad should be subtracted, while non-residents working within the economic territory should be included. As embassies, consulates and (some) military bases of the reporting country are part of the economic territory, their staff is included in both concepts. The only distinction is that foreign workers in those organizations are not included in the national concepts. The reverse is true for foreign embassies, consulates and military bases within the reporting country, which are not part of the territory. International organizations (like the European Commission and the OECD) do not belong to any territory, and are therefore only included as residents working abroad in the national concept.

Unobserved economy

In terms of the exhaustiveness criteria laid down in the national accounting rules, employment should cover the “non-measured” or unobserved part of the economy as well. This includes among others illegal workers, the grey and black market workers, but also legal workers such producers of agricultural production for own use (often as a second job) and construction workers building their own house. There is however no obligation for NSIs to make adjustments for the unobserved economy. Each country should explore what the size of their non-measured market is and consider adjustments. The only (and important) condition is that adjustments should be consistent in output and labour figures. Still, the latter condition might be the Achilles’ heel for productivity measurement including the unobserved part of the economy.

Belgium, Czech Republic, Denmark, France, Germany, Greece, Italy, Luxembourg, Malta, Spain, Sweden, the Slovak Republic and the United States are all correcting for the underground economy, with

adjustments between 0.15% (Czech Republic) and 7.45% (Germany). Other countries (e.g, Australia) state that they have estimated their underground economy and concluded that this not significant. Most labour force surveys cover part of the underground economy, and in some cases specific questions about the informal work have been asked. A number of countries do not make any adjustments because the LFS is assumed to measure employment exhaustively. Hence concealed labour is implicitly the difference between business surveys and LFS.

Other adjustments

A range of other adjustments are made to the employment figures from original sources. Mostly these adjustments have to be made because surveys do not cover all workers or because persons are counted twice. Most common adjustments are the addition of persons living in institutional households like prisons, convents or students houses, who are not covered by surveys. It is for example well-known that an (although small) part of manufacturing takes place within the walls of prisons. It is likely that the output of this work is counted in the national production, so the employment should be adjusted accordingly. Students who are living in workers-hostels and persons working in convents, are also not included in most surveys. The addition of employees falling outside the age boundaries of surveys, like workers below 15 or above 75, is another frequently executed adjustment.

2.3 Hours worked

With the exception of France, most countries have only recently begun to include annual hours worked in their national accounts. The Netherlands and the United States also already provided hours for employees, but do provide hours for total employment now as well. Austria, Czech Republic, France, Italy, Slovak Republic, Spain and Switzerland have included such estimates since last year. Belgium, Japan and Poland are only delivering hours for employees and Australia only provides an index of total hours worked. Iceland, Ireland, Latvia, Malta, Mexico, Portugal, Slovenia, Turkey and the United Kingdom do not include hours worked in their national accounts. Because of the recent inclusion of hours for many countries, these figures may not have been included in the databases of the OECD and Eurostat yet.

The combination of employment and hours makes it of course possible to measure total hours. For productivity analysis this is the preferable concept to work with, as it measures labour intensity most adequately and because it makes disaggregation to industry level less ambiguous. At the level of the aggregate economy [jobs * hours worked per job] should equal [persons * hours worked per person] by definition. To convert hours worked per job to hours worked per person, the OECD Secretariat uses the following equation in the framework of the OECD Employment Outlook:

Person-based annual hours = Job-based annual hours of work * (1 + share of multiple jobholders in total employment)¹²

The breakdown to industries can be done in terms of total hours worked. However, when employment is measured in either persons or jobs, users should be careful to match this with hours per person or hours per job respectively at the industry level. In practice, hours per job and hours per person are quite similar at industry level, as the hours of a person with two or more jobs in different industries are distributed across industries with a general key of, for example, 0-10 hours, 10-20 hours for each industry. But a bigger difference between hours per person and hours job occurs when a person has two jobs in the same industry. Fortunately, all countries delivering employment figures in terms of jobs, do provide hours per job as well so that the transition can be made relatively easily with the use of multiple jobholder shares.

Most figures on annual hours worked are provided at least at the level of 31 industries in the national accounts. Australia (which only provides an index for the annual hours of the total economy), Japan and Korea are the only countries providing hours at less detail. For Bulgaria, Cyprus, Estonia and Luxembourg it is not clear at which level of industry detail hours estimates are available.

Actual, normal, paid or contractual hours

Hours worked can be defined in many different ways. The four most used concepts are displayed below, including their relationship to each other.

For employees:

- *Paid hours of work* = paid hours actually worked + paid hours of absence
- *Hours actually worked* = paid hours actually worked + unpaid hours worked (voluntary work and unpaid overtime)
- *Contractual/agreed hours* = paid hours of work – paid overtime hours
- *Usual hours of work* = average hours actually worked in normal weeks (including usual paid and unpaid overtime)

¹² See OECD Compendium of Productivity Indicators 2005. Reworking hours per person to hours per job is more complicated, and would typically require fulltime equivalents, which are not in common use anymore.

For self-employed and unpaid family workers, paid or contractual hours are difficult to measure and distinguish. It is in this field that there is probably the biggest risk of international incomparability. Actual hours are most of the times regarded similar to usual hours worked for this category:

Usual hours of work = average hours actually worked in normal weeks (including usual paid and unpaid overtime).

It depends on the purpose of the research which hours concept is the best to use. For calculation of productivity, actual hours worked are the appropriate measure. The national accounts use, without exception, actual annual hours worked as measure. This means that the reported figures include:

- a) hours actually worked during a normal period of work;
- b) hours worked in addition to those worked in a normal period of work, and generally paid at a higher rate (overtime hours);
- c) time spent at the workplace to prepare the place, to repair and maintain, to prepare and clean the work tools, to fill in receipts, invoices, timesheets and reports;
- d) dead or idle times spent at the workplace because, for example, of temporary lack of work, breakdown of equipments and accidents, or the time spent at the workplace without doing any activities and being paid according to a guaranteed employment contract';
- e) time corresponding to short rest periods at the workplace, including coffee breaks.

The hours actually worked do not include:

- a) hours paid but not worked, such as paid public holidays, paid annual leave, sickness or maternity leaves;
- b) meal breaks;
- c) time needed to travel from home to work and vice versa;

Adjustments for hours worked in a year

The adjustments required to obtain national accounts-compatible hours estimates are dependent on the primary sources used. Business surveys mostly describe paid hours or contractual hours, while labour force surveys are reporting actual worked hours. Hence LFS's provide a direct measure of actual hours, whereas countries using business surveys need to make adjustments to take into account unpaid overtime and time paid but not worked. The method to adjust paid hours to actual hours is called the component method. A detailed discussion of the direct and component methods is provided in OECD (1998), and a description of

primary sources presently employed for the national accounts is available from OECD (2004).¹³ Table 2 shows the size these components and accompanying adjustments can have.

Table 2 Magnitude of adjustments for hours

	Holidays & annual leaves	Sickness leaves	Other full-week absences	Other part-week absences	Overtime	Hours on additional jobs
	<i>in % of total weeks in a year</i>				<i>in % of contractual hours</i>	
Austria	14%	5%	6%	1%	4%	1%
Belgium	14%	4%	5%	1%	1%	1%
Czech Republic	12%	4%	4%	1%	2%	1%
Denmark	14%	3%	5%	2%	2%	2%
Spain	13%	2%	3%	1%	0%	1%
Finland	13%	4%	5%	3%	4%	1%
France	13%	4%	4%	1%	2%	1%
Germany	15%	3%	4%	1%	3%	1%
Greece	13%	0%	0%	0%	0%	1%
Hungary	12%	2%	2%	0%	1%	0%
Iceland	12%	4%	5%	3%	4%	4%
Ireland	11%	2%	3%	0%	1%	1%
Italy	15%	2%	3%	1%	0%	0%
Luxembourg	14%	2%	3%	0%	1%	0%
Netherlands	14%	4%	6%	2%	4%	1%
Norway	13%	7%	9%	2%	5%	2%
Poland	12%	2%	2%	1%	1%	3%
Portugal	14%	2%	3%	0%	1%	2%
Slovak Republic	13%	3%	3%	0%	1%	0%
Sweden	13%	7%	8%	3%	4%	2%
Switzerland	12%	2%	3%	2%	8%	1%
United Kingdom	13%	3%	3%	3%	2%	1%

Source: Employment Outlook 2004

Just like in employment, an adjustment for the exhaustiveness of hours measures can be made. If countries find that the sources they use are underestimating the amount of total hours worked, by not taking into account work carried out by illegal workers or the work people carry out for their own account, adjustments are made. Belgium, France and Sweden, for example, adjust their hours figures for the underground economy. Most countries, however, only adjust the employment numbers and assume that these persons do work the same average amount of hours per person working in that industry. Some countries (Denmark, France and Italy) also adjust to palliate the tendency of respondents of labour force surveys to overestimate their hours worked (see also OECD, 1998). Especially persons working longer

¹³ See OECD (1998), Annual Hours of Work: Definitional and Comparability Issues, Working Party on Employment and Unemployment Statistics, OECD, Paris; and OECD (2004a), OECD Measures of Total Hours Worked, The OECD Productivity Database, OECD, Paris.

hours do often not know exactly how much hours they have actually worked, but previous research has shown that those persons usually overestimate the actual hours worked. Other adjustments that have been reported are the addition of hours of persons not covered in the original sources, like conscripts and non-residents. Seasonal adjustments and calendar effect adjustments are only carried out for quarterly estimates.

3. Integration of employment in the national accounts

This chapter provides insight in the construction of employment measures for the national accounts. For this purpose we have added country sheets in Annex 1, which give an overview on a country-by-country basis. These country sheets also contain bridge tables which show how the estimates were transformed from the primary sources into the national accounts estimate. In this chapter we will describe the methods for some broad groups of countries, which are distinguished on the basis of the methodology they used.

3.1 The subdivision of methods for employment by country groups

The choice for a method to construct National Accounts employment fully depends on the choice of the main primary source. All adjustments that have to be made in the process of developing employment figures are dependent on the coverage and contents of the original source. The main source used for employment is therefore the best starting point for the grouping of countries.

Table 3 shows the primary sources that countries use in constructing their employment figures. Labour force surveys (LFS), business surveys (BS) and administrative sources are all used frequently and most countries combine these different sources, taking advantage of the complementary in their strengths and limitations. The sources can be classified into two categories: labour supply sources (LFS, Population Census) surveying persons in the working population, and labour demand sources (business surveys, administrative sources) using information on jobs and persons provided by the firms, establishments and registers.

Table 3 Summary of employment statistics in national accounts

	Units	Employees		Self-employed		Adjustments for:					Most detailed industry classification	Period Covered	
		Main source	Other sources	Main source	Other sources	Stock-flow	Persons-Jobs	Economic territory	Under-ground economy	Other adjustments			
Group 1:													
Australia	Heads	LFS	AS	LFS	AS	x		x				A7	85->
Estonia	Heads/FTE	LFS		LFS		x		x				A17	99->
Hungary	Heads/FTE	LFS		LFS		x		x				A31	95->
Ireland	Heads	LFS	CE, ES	LFS	CE,ES	x		x				A31	98->
Korea	Heads	LFS ?		LFS?								A31 (7)	92->
Lithuania (3)	Heads/FTE	LFS	AS	LFS		x		x				A31	95->
United Kingdom (5)	Jobs/Heads	LFS	ES	LFS		x	x					A31	79->
Group 2:													
Canada	Jobs	LFS	ES	LFS			x	x		x	(l)	A31	97->
Cyprus	Heads	LFS	ES,AS	LFS		x		x				A7	98->
Greece(1)	Jobs/Heads/FTE	LFS	ES,AS	LFS	ES	x	x	x	x	x	(g)	A60	95->
Japan	Jobs	CE,LFS		CE,LFS		x	x	x				A31 (7)	81->
Latvia	Heads	LFS	ES,AS	LFS		x		x				A17	95->
New Zealand (4)	Jobs/Heads	LFS	ES	LFS		x	x	x				A31	00->
Portugal	Heads/FTE	LFS	ES,CE,AS	ES		x	x	x		x	(g)	A31 (7)	95->
Romania	Jobs/Heads	LFS	ES	LFS	ES	x	x	x				A31	99->
United States-BLS (6)	Heads	LFS	ES	LFS	ES				x			>A60	40->
Group 3a:													
Bulgaria	Heads	LFS,ES		LFS		x	x	x		x	(c)	?	?
Finland	Heads	LFS	AS,ES	LFS	AS,ES	x	x	x	x (2)	x	(l)(g)(h)	A60	75->
Norway	Heads/FTE	LFS	ES,AS	LFS			x	x				>A60	92->
Spain	Heads/FTE	ES,LFS	AS	ES		x	x	x	x			A60	95->
Sweden	Heads	LFS	ES,AS	LFS	ES,AS	x		x	x	x	(g)	A31	93->
Group 3b:													
Austria	Jobs/FTE	AS		ES	LFS	x		x		x	(a)(b)	A60	76->
Denmark	Heads	AS	LC,LFS	AS	ES,LFS	x	x	x	x	x	(f)	>A60	70->
France	Heads/FTE	ES	AS,LFS	ES	AS,LFS	x	x	x	x	x	(i)	>A60	90->
Germany	Heads	AS	ES,LFS	AS	ES,LFS	x		x	x		(g)(h)	A60 (7)	70->
Italy	Heads	CE,ES	LFS,AS	CE,ES	LFS,AS	x	x	x	x (2)			A31	70->
Malta	Jobs/Heads	AS,ES	LFS	AS,ES	LFS	x	x	x	x	x	(g)	A7	00->
Netherlands	Heads/FTE	AS	ES,LFS	LFS		x	x					A31 (7)	70->
Poland	Heads/FTE	ES	AS,LFS	ES	AS,LFS	x	x	x				A31 (7)	95->
Slovak Republic	Heads/FTE	ES	LFS,AS	AS	LFS		x	x	x	x	(l)(k)	A31	95->
Slovenia	Heads	AS	LFS	AS	LFS	x		x		x	(c)(l)	A31	95->
Switzerland	Jobs	ES	LFS,AS	ES		x		x				A7	98->
United States-BEA (6)	Jobs	ES	AS,LFS	ES	AS,LFS				x			>A60	56->

Table 3 (continued). Summary of employment statistics in national accounts

	Units	Employees		Self-employed		Adjustments for:					Most detailed industry classification	Period Covered	
		Main sources	Other sources	Main sources	Other sources	Stock-flow	Persons-Jobs	Economic territory	Underground economy	Other adjustments			
Group 4:													
Belgium	Heads	AS		ES		x	x	x	x	x	(c)(l)	A31	95->
Czech Republic	Heads/FTE	ES	AS	ES		x	x	x	x	x	(e)	A31	95->
Iceland	Heads/FTE	AS		AS		x						A7	91->
Luxembourg	Heads	AS,ES		AS,ES		x	x	x	x	x	(j)	A31	95->
Mexico	Jobs	ES	AS	?								A31	88->
Turkey	Heads												

Sources: LFS=labour force surveys, ES=establishment/enterprise surveys, business census, labour cost survey, CE=population census, AS=administrative data (social security employment and tax registers)

Groups: 1) LFS as only source 2) LFS as main source, replaced by other sources for some industries or categories 3) Countries combining labour demand and supply sources with 3a precedence to supply and 3b precedence to demand 4) Countries not using LFS

Main notes:

- (1) The 2000 Revision of the Greek national accounts is not finished yet, but the answers include the revision already.
- (2) Already covered by original sources or implicitly included
- (3) Employment data is at national concept instead of domestic concept
- (4) Industry level data is measured in jobs (based on ES), total economy employment in persons (based on LFS)
- (5) Employment estimates in persons are an interim solution.
- (6) For the US there are two different sources: the BLS constructs employment in persons, while BEA publishes series in jobs.
- (7) Partial coverage (not all the sub-branches are available)

List of other adjustments:

- (a) Adjustments for parental leave
- (b) Adjustments for (small) firms not covered by surveys or censuses
- (c) Adjustments for workers not liable for contributions or allocated under other social security authorities
- (l) Adjustment for students with jobs
- (e) Persons without branch of activity are proportionally distributed across branches
- (f) Figures for public employment are adjusted with other sources, industries are relocated, partnerships' self-employed are relocated to employees.
- (g) Addition of workers younger than 15 years or older than 75
- (h) Addition of prisoners
- (i) Self-employed in the government sector are reclassified to employees
- (j) Employees affiliated to the national social security system but working in fact in branch offices outside the country are excluded
- (k) Addition of member of institutional households

The LFS is used by most countries, if not as a main source then at least as a secondary source or as an instrument to evaluate or check the data from other sources. Although the disadvantages mentioned before, such as the limited coverage at industry level and the lack of consistency with output data can be problematic, the LFS has a number of advantages that makes it almost inevitable not to use it:

- It covers all sectors of the economy, and is frequently the only source with information about self-employed and informal employment.
- It provides information on persons, multiple jobs and hours worked, which makes it the perfect source for converting jobs to persons and vice versa.
- In most countries, the LFS is a continuous survey that covers all weeks of the year, and therefore very useful for constructing quarterly data, as both seasonal trends and levels are measured.
- It uses harmonized concepts (especially within Europe) and therefore provides internationally comparable results both for hours and employment, even though there may be some local differences.
- The LFS provides information on the structure of employment in terms of age, gender, education level, and professional situation.

Especially a number of smaller countries (Iceland, Luxembourg, Malta, Slovenia) for which the sample size problems are significant at industry level, have refrained from using LFS as the main source for the national accounts. Luxembourg is the only country not using the LFS at all, which is due to the fact that the economy of Luxembourg is so open that it is very difficult to transform estimates of national employment into domestic employment by traditional methods. Some countries use the LFS in combination with the population census (France, Japan, Italy), where the population census serves as a benchmark to cover the whole population.

Because of the often exhaustive coverage of (sectors of) the total economy, administrative sources like employment and tax registers are a popular source as well. Especially administrative sources that provide data about compensation or income are very useful for employment accounts, due to the clear link with output measures. As administrative sources are primarily set-up for other purposes, countries frequently have to make several adjustments to get the employment in line with the national accounting guidelines. Even if administrative sources cover the whole population, other sources are needed to adjust for the informal economy.

Business surveys practically almost never cover all sectors in the economy, especially the agriculture and government sector are rarely included. Countries therefore always need to use business surveys in combination with other sources. Other reasons to use additional sources to business surveys are the limited coverage of smaller firms, lack of data for self-employed and informal economy are other reasons to use

other sources. There is no harmonized set-up of business surveys, so one should be very careful in using business surveys directly for international comparisons. However, business surveys do have the advantage of matching closely with output measures which are also based on primary sources obtained through firms, and facilitate a breakdown of jobs estimates to industries.

Four country groups

Taking these broad source descriptions as our point of departure we can distinguish the following four country groups:¹⁴

1: Australia, Estonia, Hungary, Ireland, Korea, Lithuania and the United Kingdom

These countries rely entirely on the Labour Force Statistics and only use other sources to make adjustments for conceptual alignment with the National accounting guidelines.

2. Canada, Cyprus, Greece, Japan, Latvia, New Zealand, Portugal, Romania and the United States (BLS).

This group also mainly uses labour force statistics, but combined with other sources for some industries.

3a: Bulgaria, Finland, Norway, Spain and Sweden

3b: Austria, Denmark, France, Germany, Italy, Malta, Netherlands, Poland, Slovak Republic, Slovenia, Switzerland and the United States (BEA)

This group uses a cocktail of sources, among which the labour force survey. An extra split-up has been made to make a subdivision between countries mostly using additional information from labour supply sources (3a) and countries giving precedence to information from labour demand sources (3b).

4. Belgium, Czech Republic, Iceland, Luxembourg and Mexico

Countries in this group hardly use the Labour Force Survey and rely almost entirely on other sources.

Group 1: Completely LFS-based countries (see Table 4)

Australia, Estonia, Hungary, Ireland, Korea, Lithuania and the United Kingdom base their figures completely on the labour force survey. The only (minor) adjustments that they make are corrections for the economic territory to comply with the national accounts requirements. At industry level the LFS figures are therefore used for all industries, administrative sources and business surveys only provide data for the adjustments.

¹⁴ Based on the distinction introduced in Arturo de la Fuente (2006), *Employment: Results of the Questionnaire on sources and methods*, Eurostat C2/CN 603

The labour force survey uses an employment concept that is close to the national concept, as it covers all resident persons employed. However, as the survey is only conducted within the national borders, they do not survey residents living abroad, crews of national fishing boats, staff of embassies or military forces. Persons living in collective households (prisoners, monks, students) are often also not covered, due to the survey methods. Furthermore, the LFS usually excludes persons below 15 years old and also persons above 65 years old. National accounts do not use age limits, but cover everyone who is contributing to the national production.

The scheme below shows the adjustments that are required to get LFS data in line with the domestic concept. One should note, however, that the size of the different groups is highly dependent on the country-specific situation. Non-existing or insignificant groups can lead to the decision not to adjust for these different categories.

LFS employment

- Residents working abroad (commuters)
 - + Non-residents working within the economic territory (commuters, foreign seasonal workers)
 - + Conscripts and Military forces
 - + Crews of ships, aircraft and floating platforms operated by resident units
 - + Staff of embassies and consulates abroad
 - Staff of foreign embassies and consulates and international organizations
 - + Workers outside the age boundaries (persons below 15 years or older than 75)
 - + People living in collective households (Monks, nuns, students, prisoners, disabled)
- = National accounts employment (domestic concept)**

Table 4. Sources, methods and adjustments for Group 1

	Unit	Employees		Self-employed		Persons-Jobs	Adjustments		
		Main source	Other sources	Main source	Other sources		Conscripts	Foreign Embassies	Resident commuters
Australia	Heads	LFS	AS	LFS	AS		x		
Estonia	Heads/FTE	LFS		LFS			x	x	x
Hungary	Heads/FTE	LFS		LFS				x	x
Ireland	Heads	LFS	CE,ES	LFS	CE,ES			x	
Korea	Heads	LFS?		LFS?					
Lithuania	Heads/FTE	LFS	AS	LFS			x		
United Kingdom	Heads/Jobs	LFS	ES	LFS		x	x		

The table above shows that most countries in Group 1 adjust for some of the categories, but most adjustment categories are not taken into consideration. The United Kingdom (which does not make any adjustments), Estonia and Lithuania mention in their response to the OECD/Eurostat questionnaire that they are aware that they are currently not supplying data to the agreed definition. For the United Kingdom this is due to the fact that they have always delivered employment in jobs, and only recently started to build up a structure for headcounts as well. Lithuania delivers data according to the national concept, by adjusting only for conscripts. Conscripts are also added in Australia, Estonia and Lithuania, but not in Hungary, Ireland and the United Kingdom. Staff of foreign embassies is subtracted in three cases (Estonia, Hungary and Ireland), while residents working abroad are only removed for Hungary and Estonia. For Korea it is not clear which adjustments are made, but the (small) gap between LFS and national accounts figures indicates that there is some adjustment taking place. No country is making adjustments for non-residents working within the country, which will especially affect Eastern European countries which have a relatively large outward directed flow of commuting workers to neighbouring countries. None of the countries adjusts for workers outside the age boundaries of 15-64 or for people living in collective households. The LFS of the United Kingdom does cover students and nurses homes.

All countries in group 1 assume that the LFS covers the non-observed economy as well, and none of them makes an adjustment to take the black and grey economy into account.

Group 2: Mainly LFS based countries (see Table 5)

Within this group we can also make a distinction: Canada, Cyprus and New Zealand use the LFS for employment at the aggregate level and make the disaggregation to industries with the help of business surveys. For Canada, the accounts are even built up from a regional level using a detailed industry classification. Because they rely heavily on the LFS, we do include them in group 2 and not in group 3. Greece, Latvia, Portugal and Romania use different sources for a few industries, mostly because the coverage of the LFS is poor in these sectors. Japan uses LFS in combination with the population census for all sectors and the United States BLS estimate is based on the LFS benchmarked on census data.

The adjustments at industry level are the following:

- **Agriculture and Fisheries:** In Greece and Portugal, the LFS is replaced by agricultural statistics and sea fishery surveys. Romania adjusts the LFS figures with Business statistics. The other countries heavily rely on the LFS.
- **Industry (Mining, Manufacturing, Utilities):** Greece, New Zealand and Romania replace the LFS with business surveys for Mining and Manufacturing. The first two countries and Latvia also use business statistics or administrative government information for utilities.

- **Construction, Trade, Transport, Other business services, Education, Health and other community services:** Those are the sectors in which the LFS is assumed to provide more reliable data, and the only countries that use other data are Canada, Cyprus and New Zealand (business statistics). Greece is using government data to supplement the LFS in public transport activities and Romania uses the Consolidated general budget & Declarations on global income for other community services.

- **Financial sectors:** Both Portugal and New Zealand use other data for the finance sector. Greece, Cyprus and Romania combine administrative data and the LFS.

- **Government sector:** Administrative sources replace the LFS for all countries.

- **Other services:** Data for personal households and extra-territorial organizations is not included in business surveys, so all countries rely on the LFS for these sectors.

For self-employed persons the countries in this group mostly rely on the LFS.

Table 5. Sources, methods and adjustments in Group 2

	Unit	Employees		Self-employed		Adjustments					
		Main source	Other sources	Main source	Other sources	Persons-Jobs	Conscripts	Foreign Embassies	Resident commuters	Non-resident commuters	Other adjustments
Canada	Jobs	LFS	CE	LFS		x	x	x			
Cyprus	Heads	LFS	ES, AS	LFS			x			x	x
Greece	Jobs/heads/FTE	LFS	ES, AS	LFS	ES	x	x				x
Japan	Jobs	CE,LFS		CE,LFS		x					x
Latvia	Heads	LFS	ES,AS	LFS			x		x		
New Zealand	Jobs/heads	LFS	ES	LFS		x	x				
Portugal	Heads/FTE	LFS	ES,CE,AS	ES		x	x		x	x	x
Romania	Jobs	LFS	ES	LFS	ES	x		x	x	x	
United States-BLS	Heads	LFS	ES	LFS	ES		incl.			x	

For group 2 we cannot provide a straightforward method of adjusting the original sources, as this is highly dependent on the sources that have been used. One would expect that each country that uses business surveys should at least require a ratio to convert jobs to persons. This is true, except for Latvia and Cyprus. For Cyprus this can mean that the jobs subdivision is applied to the LFS persons in headcounts. Latvia only uses business surveys for a few industries and it is not clear if its business survey provides data in persons or jobs.

If we take a look at the territorial adjustments that have been used, the adjustment for conscripts is carried out for all countries except Romania and Greece. Greece is in the middle of a revision of the national accounts and plans to adjust for conscripts in the revised series. Adjustments for residents working abroad are carried out by Latvia, Portugal and Romania. The last two countries also adjust for commuters from the other side of the border. Canada and Romania deduct staff of foreign embassies.

Only Greece is making an adjustment for the unobserved economy. All other countries assume that the LFS figures they use take account of the unobserved economy. Population Censuses are used in Canada and Portugal to gross up the LFS to total population figures, which can also be seen as a way to adjust for the unobserved economy. Greece and Portugal make adjustments for employees below 15 years, Greece and Cyprus also include institutional households and Cyprus includes the crew of ships.

Group 3a: Countries using a cocktail of sources, mainly labour supply (see Table 6)

A number of countries are looking on an industry-by-industry basis to the available sources, and combine these sources in order to come up with the best results. The approaches of these countries differ from countries in the groups described before (with the exception of Canada), because they start at the industry level and take a bottom-up approach. For the countries in group 3a, the national accounts measures still use the LFS as most important source, but in most cases it is not the main source for employees. Business surveys and administrative data can provide more industry detail and have a much higher coverage than LFS. All countries, however, start with data from the LFS and only replace them if other series deliver better data. A thorough comparison of LFS and other data is automatically incorporated in this method of construction.

The adjustments at industry level are the following:

- **Agriculture and Fisheries:** In Bulgaria, the LFS is replaced by a farm structure survey. Finland and Sweden use a combination of LFS, administrative sources and business surveys. Spain uses administrative information for fisheries and hunting. The situation for self-employed persons is similar: here Bulgaria uses the population census for fisheries and Sweden uses administrative sources instead of business surveys.
- **Industry (Mining, Manufacturing, Utilities):** All countries base their employment mainly on business surveys, combined with administrative sources. LFS is mainly used as a secondary source for employees, but for self-employed Bulgaria, Norway and Sweden primarily use the LFS. Spain uses a specific survey for enterprises without employees to estimate the self-employed in manufacturing.
- **Construction, Trade, Transport, Other business services:** Business surveys are the main source for employees. In Finland the LFS is the main source for construction and business services only. For self-employed, LFS is used for construction and business services (Bulgaria, Finland and Norway). Spain gets data for employment in transportation directly from the firms.
- **Financial sectors:** Exhaustive administrative sources of the financial sector are used by Finland and Spain for both employees and self-employed. Bulgaria, Norway and Sweden use a combination of business surveys, register data, wage statistics and LFS. For self-employed the LFS is the most important source.

- **Government sector, Education and Health:** The government sector is fully covered by administrative sources, in some cases in combination with LFS or business surveys. For part of the governmental sectors administrative sources are also the main source, mainly combined with business surveys.

- **Other services and personal households:** These countries are mainly covered by business surveys (Bulgaria, Sweden) for employees, combined with LFS for self-employed. Finland and Spain make use of special administrative sources, while Norway combines LFS with wage statistics.

Table 6. Sources, methods and adjustments in Group 3a

	Unit	Employees		Self-employed		Adjustments					
		Main source	Other sources	Main source	Other sources	Persons-Jobs	Conscripts	Foreign Embassies	Com-muters	Under-ground economy	Other adjust-ments
Bulgaria	Heads	LFS,ES		LFS		x	x		x		
Finland	Heads	LFS	AS,ES	ES		x	x	x		x	
Norway	Heads/FTE	LFS	ES,AS	LFS		x	x				x
Spain	Heads/FTE	ES,LFS	AS	ES		x	x		x	x	
Sweden	Heads	LFS	ES,AS	LFS	ES,AS		x			x	x

Except for Sweden, all countries indicated in their replies to the questionnaires that they have a way to convert jobs to persons or vice versa. In most cases this conversion rate is based on data for multiple job-holding information from the labour force survey.

All countries in group 3a make adjustments to include conscripts (for Spain conscripts are already included in the original source). Finland is the only country adjusting for foreign embassies, while no country has included its own embassies abroad. Especially for the Scandinavian countries mention the number of frontier workers is very low, so there was apparently no reason to make an adjustment for that. Bulgaria (only residents going abroad) and Spain (both inward and outward directed flows) do take commuters into account.

Adjustments for the unobserved economy are made explicitly by Spain and Sweden. Finland does indirectly correct for this factor. Other adjustments within this group are the addition of institutional households (Finland), a correction for workers outside the age boundary (Spain) and the addition of the crew of ocean going ships (Norway).

Group 3b: Countries using a cocktail of sources, mainly labour demand (see Table 7)

This large group of countries is also using a cocktail of sources, but the focus is on demand-based sources like business surveys and administrative sources. Most countries in this group make use of integrated employment registers (based on social security systems or related reporting systems), combined with

earnings statistics (Denmark, Netherlands), household surveys and LFS (Germany, Malta) or several other registers (Slovenia). Austria combines tax records with business surveys, Microcensus and LFS. Poland, the Slovak Republic and the United States-CES mainly use business surveys, combined with LFS and administrative data. Italy takes the population census as starting point and combines that with the business Census, LFS and many other sources. France uses an exhaustive census in combination with administrative sources. The methods used in this group are quite similar in approach to the methods used in group 4, with the main distinction that the LFS still plays an important role for the national accounts estimates of employment, especially for the estimation of self-employed, adjustments to the domestic employment concept and quarterly trends. Another frequent method within this group is the calculation of benchmarks. Italy, Germany and France calculate benchmarks, which are extrapolated on a monthly but sometimes also on an annual basis using other sources.

Because these countries mostly use registers that cover the total economy, adjusted and improved with other sources, it does not make sense to provide an industry split-up for this group. Actually all countries base all industries on the register. Only for agriculture (Austria, Poland, Slovenia, Switzerland, United States), fisheries (Switzerland), primary sector censuses and LFS replace the register data. For Finance (Italy, Malta) and government (Austria, Denmark, France, Poland) exhaustive administrative data is used as complementary source. For staff of personal households, LFS and population censuses also provide extra information.

Table 7. Sources, methods and adjustments in Group 3b

	Unit	Employees		Self-employed		Adjustments					
		Main source	Other sources	Main source	Other sources	Persons-Jobs	Conscripts	Foreign Embassies	Com-muters	Under-ground economy	Other adjustments
Austria	Jobs/FTE	AS		ES	LFS		x	x			
Denmark	Heads	AS	LC,LFS	AS	ES,LFS	x			x	x	
France	Heads/FTE	CE	AS,LFS	CE	AS,LFS	x	-		x	x	
Germany	Heads	AS	ES,LFS	AS	ES,LFS			x	x	x	x
Italy	Heads	CE,ES	LFS,AS	CE,ES	LFS,AS	x	x		x	x	x
Malta	Jobs/Heads	AS,ES	LFS	AS,ES	LFS	x				x	x
Netherlands	Heads/FTE	AS	ES,LFS	LFS		x					
Poland	Heads/FTE	ES	AS,LFS	ES	AS,LFS	x	x				x
Slovak Republic	Heads/FTE	ES	LFS,AS	AS	LFS	x		x	x	x	x
Slovenia	Heads	AS	LFS	AS	LFS			x			x
Switzerland	Jobs	ES	LFS,AS	ES					x		
United States-BEA	Jobs	ES	AS,LFS	ES	AS,LFS					x	

Table 7 gives information about the adjustments that are made to the original register source. As most registers include tax-payers, the concept is already close to the domestic concept we need.

Most countries in this group are able to switch between measures of jobs and heads. As countries like Denmark, France, and the Netherlands all work with time use accounts, FTE measures are often calculated

as a by-product for calculating hours. This also provides a possibility to convert data from persons to jobs. Austria is working on such a calculation, but Switzerland and the United States do not have a way to convert jobs to persons.

Payroll and tax registers normally cover all persons that get paid by firms from the economic territory, so conscripts and embassies abroad are often included. Foreign embassies and commuters working abroad do not get paid from within the country and will not appear in the registers. Dependent on the set-up of the registers, some of the countries need to correct for gaps in their register.

Adjustments for the unobserved economy do not appear in administrative sources by definition. Most countries therefore make special adjustments if there are indications of a significant non-measured economy. Austria, Poland, Netherlands, Slovenia and Switzerland do not correct for the underground economy.

Group 4: Countries hardly making use of the LFS (see Table 8)

Administrative sources are also used as a starting point for the countries making no use of the LFS. Belgium combines registers from several agencies, Luxembourg integrates employment registers with business statistics. Iceland only uses register data, while Czech national accounts are based on business statistics in combination with administrative sources. Mexico only uses business statistics, but only provide data for employees. Now there is data available for self-employed as well in the OECD National Accounts, but it is not clear where this data has been based on.

Again the industry subdivision does not show much variation, as all industries have been based on the main sources. Luxembourg uses social security statistics for self-employed and as complementary source for jobs not covered in the business register. Furthermore the Czech Republic uses specific administrative sources for the government sector. Data for Iceland is completely based on the pay-as-you-earn (PAYE) register.

Table 8. Sources, methods and adjustments in Group 4

	Unit	Employees		Self-employed		Adjustments					
		Main source	Other sources	Main source	Other sources	Persons-Jobs	Conscripts	Foreign Embassies	Commuters	Under-ground economy	Other adjustments
Belgium	Heads	AS		ES		x				x	x
Czech Republic	Heads/FTE	ES	AS	ES		x	x	x	x	x	
Iceland	Heads/FTE	AS		AS							
Luxembourg	Heads	AS,ES		AS,ES		x		x	x	x	
Mexico	Jobs	CE	ES,AS								

For Iceland it is not possible to convert persons to jobs, and for Mexico procedures are not clear. Adjustments for economic territory are only executed by countries based on business surveys, the administrative sources of Belgium and Iceland cover all domestic workers.

Belgium, Czech Republic and Luxembourg make adjustments to cover the underground economy, in the Czech Republic even for different categories of the underground economy. Iceland only adjusts the output data, but not the employment figures. Belgium also adjusts for students with jobs and people not covered by the administrative sources.

3.2. Assessment of employment in national accounts from users' perspective

This Section has described five different groups of countries which could be distinguished on the basis of the methods used to construct employment data for the national accounts. The first group (group 1) bases its figures completely on the Labour Force Survey. From the users' perspective simplicity of this method is a real advantage as it is easy way to come up with employment figures using a domestic concept. The labour force survey is a continuous survey in those countries, so both quarterly and annual figures are easy to provide and moreover also consistent. The only adjustments that have to be made are from the "national" to the "domestic" concept to account for the principle of economic territory. Unfortunately none of the countries made all the adjustments to convert the LFS to the domestic concept. And it is difficult to judge how much difference these adjustment would make. Clearly they are a bigger issue of concern for smaller than for larger countries. Also the reliance on the labour force survey in terms of exhaustiveness is tricky. Although the LFS follows a well-developed strategy of sampling, it is doubtful if respondents working in the black or the grey sectors of the economy would also adequately report to the survey. One final problem of using LFS, however, is that responses are supplied by respondents without reference to records, they are subject to response error. This need not result in biases, provided the errors are not systematic. And even if there is response bias, the comparability of estimates may not be seriously affected if the extent of bias is relatively uniform across countries. Still there has been some concern about the overreporting of hours, such of those of self-employed and unpaid overtime hours (OECD, 1998). For most countries using LFS measures for the national accounts, employment data at the aggregate level is reasonably reliable. However, the LFS can often not be used for detailed industry classifications, because the sample size of the labour force is often too low especially for smaller countries.

Some of the countries in groups 2 and 3A described in this section, compare the available sources on an industry by industry basis and use the LFS at many occasions. At the aggregate level, these countries construct national accounts figures that probably measure the domestic economy better than in the first

group. An important problem for some of the countries in these groups, however, is that they measure their employment in jobs rather than in persons, so that LFS measures of multiple jobs are needed to adjust to persons.

The alternative is to base the employment measures primarily on business surveys and administrative sources (groups 3B and 4). Although even those statistics may not take all firms (and all employees) into account, their industry disaggregation is usually more reliable. The numbers are often based on register data and cover a large part of the working population. The other positive point of countries using these sources intensively is that they have an independent cross-check available through labour force survey. Differences between these sources can be investigated and adjustments made where necessary.

In principle, business surveys measure jobs rather than persons. In practice, the persons concept in the national accounts should be close to the jobs concept, as persons will be counted twice when working in different industries. Again corrections for multiple jobs are needed when reconciling the jobs or headcounts to a persons count at the aggregate level.

Table 9 provides a comparison of the main results for employment for 26 countries in 2004 derived from the bridge tables (Annex 1) arranged by the country groups as identified in this chapter. It appears that in 19 out of the 26 countries the national accounts adjustment has led to an increase in the number of persons employed. On an unweighted basis the average the increase was 3.9 per cent, but after weighted for the size of employment the increase was even larger at 4.2 per cent. This is due to the relatively large adjustments for some big countries including Japan (5.8%), Germany (9.6%), Italy (7.5) and Spain (4.3%). In the base of Germany the main reason for the adjustment was the adding of 2.9 million people in the unobserved economy. In Japan about 3 million counts were added due to the switch from (LFS) persons to jobs. The causes of the adjustment in Spain are unknown and for Italy about 1 million people were added for “other reasons”.

Table 9 Bridge tables in employment in 2004 (1000 persons or jobs),

	Group 1					Group 2							
	Australia	Estonia	Hungary	Ireland	Lithuania	Canada	Cyprus	Greece	Japan	Latvia	New Zealand	Portugal	Romania
Employment Numbers													
(1) Number of persons from original source (LFS)	9,682.5	596	3,900	1,865	1,436	14,531	334.3	4,083.7	62,978	1,018	1,966.0	5,137	9,222.5
<i>Of which employees</i>									54,710		1,586.9		5,882.5
<i>Of which self-employed</i>									8,880		378.7		3,340.0
Adjustments made to adapt to NA concepts	52.1	-3	-21	5	5	320	18.9	-107	3631	-9	85.5	14	32.6
From stock to annual flows				5			0.5		612				
From persons to jobs						708			3,044		76.9		
Adjustment for economic territory:	52.1	-3	-21	0	5	169	18.4	0	-25	-9	8.6	8	-46.6
<i>Military/conscripts</i>	52.1	3			5	122	9.1			2	8.6	19	
<i>Residents working outside the economic territory</i>		-6					2.9			-11		-17	-69.9
<i>Non Residents working within the economic territory</i>							6.0		-25			6	24.3
<i>Staff of extra-territorial organizations</i>		0				47	0.0						-1
<i>Other</i>							0.4						
Adjustments for the unobserved economy													
Other adjustments						-557						6	79.2
(2) Number of persons in the national accounts framework	9,734.6	593	3,879	1,870	1,441	14,851	353.3	3,976.6	66,610	1,008	2,051.5	5,151	9,255.2
<i>Of which employees</i>						13,169			55,839				5,915.1
<i>Of which self-employed</i>						1,682			10,771				3,340.0
Adjustment in absolute terms (2)-(1)	52.1	-3.0	-21.0	5.0	5.0	320.0	18.9	-107.1	3,632.0	-10.0	85.5	14.0	32.7
Percentage adjustment (2)/(1)	0.5%	-0.5%	-0.5%	0.3%	0.3%	2.2%	5.7%	-2.6%	5.8%	-1.0%	4.3%	0.3%	0.4%

Table 9 (continued). Bridge tables in employment in 2004 (1000 persons or jobs)

	Group 3a					Group 3b						Group 4	
	Bulgaria	Finland	Norway	Spain	Sweden	Austria	Denmark	France	Germany	Italy	Slovak Republic	Czech Republic	Luxembourg
Employment Numbers													
(1) Number of persons from original source	2,923	2,365	2,276	16,630	4,234	4,248	2,719	25,076	35,463	21,771	2,168	4,817.1	196.1
<i>Of which employees</i>						3,195		22,880					
<i>Of which self-employed</i>								2,196					
Adjustments made to adapt to NA concepts	444	2	20	716	103	-103	64	-195	3,405	1,622	-112	33	102.3
From stock to annual flows						0		40		-167			
From persons to jobs													
Adjustment for economic territory:													
<i>Military/conscripts</i>		25	24		14	7.5		-252	480	756	-139		102.4
<i>Residents working outside the economic territory</i>		25			14	21.2		0	342	104			
<i>Non Residents working within the economic territory</i>			24					-267	69	-98	-139		-9.4
<i>Staff of extra-territorial organizations</i>								22	721				111.8
<i>Other</i>						-2.7		-7		-18			
<i>Other</i>						-11			69	47			
Adjustments for the unobserved economy							45		2,895			33	
Other adjustments		-23	-4		89	-110	19	17	13	1,033	27		
(2) Number of persons in the national accounts framework	3,367	2,367	2,296	17,346	4,337	4,145	2,783	24,881	38,868	23,393	2,056	4,850.1	298.4
<i>Of which employees</i>						3,092						3,986.0	
<i>Of which self-employed</i>												864.1	
Adjustment in absolute terms (2)-(1)	444.0	2.0	20.0	716.0	103.0	-102.9	64.0	-195.0	3,405.0	1,622.1	-112.0	33.0	102.3
Percentage adjustment (2)/(1)	15.2%	0.1%	0.9%	4.3%	2.4%	-2.4%	2.4%	-0.8%	9.6%	7.5%	-5.2%	0.7%	52.2%

-For Belgium, Iceland, Korea, Malta, Mexico, Netherlands, Poland, Slovenia, Switzerland, Turkey, United Kingdom and the United States no bridge tables are available.

-All data is for 2004, except for Canada (1999), Italy (2001), Czech Republic, Denmark and Portugal (2002), France, Greece, Romania and Sweden (2003)

.-For Germany the bridge table provides the link between the LFS and the national accounts employment. The actual original source however consists of about 40 different sources.

4. Construction of annual hours worked in the national accounts

The construction of employment figures and annual hours worked in the national accounts are mostly related. If a country mainly relies on the LFS for the employment figures (groups 1 and 2), hours are derived from the same source. Japan is the only exception to this rule. Countries that base their employment figures on a cocktail of sources (group 3) tend to use more sources to obtain their hours estimates, sometimes the same sources as for employment, but quite often also different sources.

Two main streams can be specified in the construction of annual hours worked. The first is to start with the actual hours per week, multiply this figure by the number of weeks in a year and adjust for public holidays falling outside the reference week. The labour force survey provides these direct measures of actual hours figures which are consistent with the ILO guidelines, so the number of adjustments that has to be made is limited. Some establishment surveys provide actual hours as well, but they do not always comply with the ILO guidelines.

A second method is to retrieve contractual hours per week first from establishment surveys or administrative sources and adjust for leave and overtime with information from other sources. In France for example, data by industry on short-time working, days of leave and strikes stems from the Ministry of Labour, the adjustment for sickness stems from Special Insurance Schemes and the Workers Health Security Schemes and days lost to bad weather are retrieved from a support fund to building and public works. This approach is called the component method and is especially used by countries working with labour or time use accounts.

4.1 The subdivision of methods for hours by country groups

In this section the description of the sources will be split up in groups again, where we distinguish between methods described here and the consistency of the sources between hours worked and employment:

- * Group I starts the calculation with actual hours (direct method) and contains all countries that mainly used LFS for their employment and mainly rely on the LFS again for hours worked.
- * Group II includes countries that use consistent set-up in terms of sources for employment and hours but do not rely especially on the LFS. The calculation starts from both from contractual hours and actual hours.
- * Group III contains the countries that use different sources for hours and employment.
- * Group IV consists of the countries using the component method in combination with labour accounts.

Table 10 shows an overview of the countries, subdivided by groups.

Table 10. Summary of hours worked statistics in national accounts

	Hours for Employees		Hours for Self-employed		Adjustments for:									Most detailed industry classification	Period covered	Employment group
	Main source	Other sources	Main source	Other sources	Holidays & annual leaves	Sickness leaves	Strikes & temp. lay-offs	Paid but unreported overtime	Unpaid overtime	Over/under-estimations of self-employed	Exhaustiveness	Other adjustments				
Group I:																
Australia (1)	LFS		n.a.											A1	64-65->	1
Canada	LFS		LFS		-	-	-	-	-					>A60	81->	2
Estonia	LFS		LFS		-	-	-	-	-			x	(d)(e)(f)	A17	00->	1
Greece	LFS		LFS		-	-	-	-	-					A31	95->	2
Hungary	LFS		LFS		-	-	-	-	-			x	(f)(g)	A31	95->	1
Korea	LFS?		LFS?		-	-	-	-	-					A7	92->	1
Lithuania	LFS		LFS		-	-	-	-	-			x	(d)		00->	1
New Zealand (2)	LFS	ES	LFS	ES	-	-	-	-	-					A7	94->	1
Romania	LFS	ES	LFS	ES	-	-	-	-	-					A31	?	2
Group II:																
Bulgaria	LFS,ES		LFS		-	-	-	-	-			x	(d)	?	99->	3a
Cyprus	LFS	ES	LFS		-	-	-	-	-			x	(c)	?	?	2
Finland	LFS	ES	LFS	ES	-	-	-	-	-			x	(d)	A60	75->	3a
Spain	ES,LFS		LFS		-	-	-	-	-					A31	95->	3a
Sweden	LFS,ES	AS	LFS,ES	AS	-	-	-	-	-		x	x	(d)(i)	>A31	93->	3a
Group III:																
Austria	ES,LFS	AS	ES	LFS,AS								x	(a)	A31	94->	3b
Belgium	AS		n.a.		x	x					x	x	(b)	A60	95->	4
Czech Republic	LFS		LFS		-	-	-	-	-					A31	02->	4
Japan	ES	LFS	n.a.		x	x	x	x	x					A7	80->	2
Poland	ES		n.a.		x	x	x							A31	97->	3b
Slovak Republic	ES		LFS		x	x	x	x	x					A60	97->	3b
Switzerland	LFS		LFS		-	x	x	-	-					A60	?	3b
United States	ES		ES	LFS	x	x	x	x						>A60	87->	2/3b
Group IV:																
Denmark	AS	ES	AS	ES	x	x		x		x		x	(a)	>A60	90->	3b
France	ES,CE	LFS, AS	ES,CE	LFS, AS	x	x	x	x		x	x			A40	92->	3b
Germany	AS	ES, LFS	LFS		x	x	x	x						A31 (e)	91->	3b
Italy	ES	LFS, AS	LFS		x	x	x	x	x	x		x	(h)	A31	93->	3b
Luxembourg	AS,ES		AS,ES		x	x	x	x	x					?	?	4
Netherlands	AS	ES	AS	ES	x	x	x	x	x					A31 (e)	87->	3b
Norway	ES,AS	LFS	LFS		x	x	x	x						A60	70->	3a
No hours available																
Iceland, Ireland, Latvia, Malta, Mexico, Portugal, Slovenia, Turkey, United Kingdom																

Sources: LFS=labour force surveys, ES=establishment/enterprise surveys, labour cost survey, CE=(population) census, AS=administrative data (social security employment and tax registers), n.a.=no hours available

Groups: I=LFS as source for both employment and hours, II=Same sources for employment and hours (no LFS), III=different sources hours and employment, IV=Component method

Main notes:

- (1) Only index for total hours worked
- (2) New Zealand only provides weekly hours worked per person for the total economy and hours per job for (some) industries.

List of other adjustments:

- (a) Small correction factor or consistency adjustments
- (b) Seasonal adjustments and corrections for calendar effects
- (c) Addition of persons with 2nd jobs where they work as self-employed
- (d) Addition of hours of conscripts
- (e) Addition of hours of non-residents
- (f) Subtraction of hours of residents working abroad
- (g) Subtraction of persons working in industry Q
- (h) Adjustment to palliate the tendency of business surveys to report paid hours instead of actual hours
- (i) Addition of hours of workers younger than 15 years or older than 65

Group I: LFS based countries: Australia, Canada, Estonia, Greece, Hungary, Korea, Lithuania, New Zealand, Romania

All countries in this group use consistent sources for employment and hours. The LFS is the main source, in sometimes combined with business surveys (New Zealand and Romania).¹⁵ A description of sources by industry is not necessary for these countries, as all industry data is based on LFS data. A complete description of the sources at 1-digit level can be found in Appendix 3.

Actual hours worked in the LFS are defined according the ILO definitions. This means that the figures are actual hours worked, adjusted for holidays and annual leaves, sickness leaves and strikes and temporary lay-offs. Paid but unreported overtime and unpaid overtime are included in this concept as well. The main adjustments that have been made for hours worked are the addition of the hours of the worker categories not covered by the LFS. Those are actually adjustments to total hours worked instead of adjustments to average hours, which may be a reason why some countries have not reported any adjustments.

The addition of hours worked of conscripts (Estonia and Lithuania) and hours worked of non-residents working in the economic territory (Estonia) are explicitly mentioned in the questionnaires. For countries that have added conscripts or non-residents to employment like Australia, Canada, Greece and Romania, one might assume that hours for these workers are added as well, but not reported in the questionnaires. Hours of residents working abroad (Estonia, Hungary) and hours worked by staff of foreign embassies (Hungary) are subtracted. These countries are consistent in adjusting employment and hours. For Korea it is not clear which adjustments have been made, Australia, Canada, Greece, New Zealand and Romania do not report any adjustments.

Adjustments for exhaustiveness have not been made for this group. Indeed none of these countries (except Greece) adjusted their employment to cover the unobserved economy either (except Greece). However it is possible, like for the Netherlands, to make an exhaustiveness correction only for hours. As labour force surveys are filled in by workers themselves, one can usually see an upward bias in actual worked hours, but none of the countries did make adjustments to correct for this overestimation (see OECD, 1998).

Group II: Consistent set-up, not only LFS based: Bulgaria, Cyprus, Finland, Spain and Sweden

These countries were mostly included in group 3a of the employment classification. This means that they use the same cocktail of labour supply driven sources for the hours worked measure. Bulgaria uses the

¹⁵ New Zealand is a somewhat special case as there are only weekly hours worked available for the aggregate economy, derived from the LFS and inconsistent and incomplete weekly hours for some industry from business statistics.

business surveys for hours of persons with a labour contract combined with the LFS for people without a labour contract. Cyprus uses business surveys and LFS for employees and the LFS for self-employed. Finland and Spain use as much as possible the same sources by industry for hours as for employment, but refrain from this principle if hours data is unreliable. This does not necessarily violate the consistency principle, as there is a good reason to choose for other sources here. Sweden also uses exactly the same set-up as for employment. All countries share the dependency on LFS for adjustments and additional information and build up their hours accounts from industry-level.

There is not much information available about the different sources used by industry, but roughly the same sources are used as for employment. For Finland there is detailed information and this shows that LFS is used only as a source for employees in Trade, Hotels and Transport and for a lot of self-employed industries. The main conclusion that can be drawn is that the same sources are used wherever possible and otherwise the LFS fills up the gaps that appear.

The adjustments between actual hours and contractual hours could be made with the ratio from the LFS or from labour cost surveys (Spain). Most business statistics that have been used do however contain data about actual hours, which makes an adjustment unnecessary. The fact that business statistics may underestimate the number of hours, has not been accounted for. Sweden is the only country in this group that makes an adjustment for the hidden economy, based on results from an investigation by the National Audit Bureau.

Other adjustments are the addition of the hours worked of conscripts (Bulgaria, Finland, Sweden), a correction for employees with second jobs where they work as self-employed (Cyprus) and the addition of hours of workers below 15 and above 65 years (Sweden).

Group III: Different sources than for employment: Austria, Belgium, Czech Republic, Japan, Poland, Slovak Republic, Switzerland and the United States

For most countries in this group the sources that are used for employment do not supply reliable estimates of hours worked. Especially those countries that based their employment estimates on administrative data (Austria, Belgium, Switzerland) or population censuses (Japan) face problems if they try to get hours data from the same source. Those administrative sources are mainly constructed for other purposes in which hours worked is not a key variable. The Czech Republic, Slovak Republic and Switzerland were mainly based on business statistics most likely without reliable hours measures, because they use the LFS (Czech Republic, Switzerland) or statistical surveys on labour (Slovak Republic) for hours. Poland has not yet

provided data to OECD or Eurostat on hours, but there is a source covering annual and quarterly hours worked of employees working on the basis of a labour contract. The hours worked figures for the United States (constructed by BEA) are based on a combination of both employment sources.

Three of the countries mentioned above only provide hours estimates for employees. Japan, Belgium and Poland are not able (yet) to provide hours for self-employed. The United States only recently provided hours for self-employed, but there is not much information available about this.

At the industry level there is not much variation in sources: Belgium, the Czech Republic, Poland, Slovak Republic and Switzerland even use the same source for all industries. In some countries, a second source has been used for some industries” Austria (production survey for sectors C-F), Japan and the United States (LFS for agriculture, fishing and government). For self-employed all countries use a single source or a single combination of sources (Slovak Republic) for all industries.

Table 11. Sources, methods and adjustments for group III

	Hours for Employees		Hours for Self-employed		Adjustments for: Paid but						
	Main source	Other sources	Main source	Other sources	Holidays & annual leaves	Sick-ness leaves	Strikes & temp. lay-offs	un-reported overtime	Unpaid overtime	Exhaust-iveness	Other adjust-ments
Austria	ES,LFS	AS	ES,LFS	AS							x
Belgium	AS		n.a.		x	x				x	x
Czech Republic	LFS	AS	LFS		-	-	-	-	-		
Japan	ES	LFS	n.a.		x	x	x	x	x		
Poland	ES		n.a.		x	x	x				
Slovak Republic	ES		LFS		x	x	x	x	x		
Switzerland	LFS		LFS		-	x	x	-	-		
United States	ES		ES	LFS	x	x	x	x			

As these sources do not provide actual hours, adjustments for these countries differ. Only the Czech Republic directly uses actual hours from the LFS. Switzerland also uses the LFS and although these data should reflect the ILO definition of hours worked, they make additional adjustments for certain types of absence in order to obtain adequate estimates. Japan and the Slovak Republic make adjustments for all ILO categories of absence. The United States does not include unpaid overtime and Poland does not include or exclude any overtime. Belgium does not include adjustments for strikes and temporary lay-offs either.

The underground economy is only taken into account in the Belgian national accounts. An adjustment is made to take account for undeclared hours worked, estimated consistently with the adjustments made in

the estimation of value added, wages and employment in the national accounts. Other adjustments are made by Austria and Belgium for respectively consistency and calendar effects.

Group IV: Component methods: Denmark, France, Germany, Italy, Luxembourg, Netherlands and Norway

All countries in this group use rather complicated methods for calculating hours worked in their national accounts. What they also have in common is that the set-up of hours worked is part of a more complete structure of employment, hours and compensation. This often means that they have constructed working time accounts or labour accounts that have been based on various other sources. Because these accounts are also adjusted to fulfil the ESA requirements, these countries follow a two-step strategy in the construction. The country sheets in Annex 1 describe the process of building both the labour accounts and the national accounts figures resulting from that. The calculation of fulltime equivalents is another intermediate step that has been used by some countries (France, Netherlands, Norway).

Table 12. Starting points and sources of Group IV

	Hours measure used as starting point	Hours for Employees		Hours for Self-employed	
		Main source	Other sources	Main source	Other sources
Denmark	Paid hours	AS	ES	AS	ES
France	Normal weekly hours	ES,CE	LFS,AS	ES,CE	LFS,AS
Germany	Potential working days	AS	ES,LFS	LFS	
Italy	Contractual hours	ES	LFS,AS	LFS	
Luxembourg	Paid hours	AS,ES		AS,ES	
Netherlands	Contractual hours	AS	ES	LFS	
Norway	Contractual hours	AS	ES,LFS	LFS	

The countries in this group do not use actual hours from the LFS as a starting point, because this data is assumed to be highly influenced by measurement errors, such as overestimations of the hours worked by respondents and not representative observations due to low sample sizes. So most countries take a more reliable hours measure like contractual hours or paid hours as starting point and correct this measure for all kinds of absences and overtime. Collective agreements can provide a good starting point at industry level. Denmark and Luxembourg both start at the level of paid hours, while Italy, Netherlands, Norway take the contractual hours as a starting point and the French and German approaches are rather similar to contractual hours. For hours of self-employed there is often not an alternative source, so the actual hours from the LFS are still needed for most countries to come up with complete results. Only Luxembourg

refrains from using LFS, because the administrative sources provide data on hours as well. Denmark uses working time accounts, which make use of LFS data in earlier steps.

At industry level there is not much variation in the sources used. Administrative sources are the most used source for the starting point estimates and adjustments are also made with other administrative sources. Only Italy reports that it uses LFS for employees in agriculture, fishing and personal households, and administrative sources for finance and government. For self-employed the same scarce resources have been used for all industries.

Table 13. Adjustments for Group IV

	Adjustments for:							
	Holidays & annual leaves	Sick-ness leaves	Strikes & temp. lay-offs	Paid but un-reported overtime	Unpaid overtime	Over/under-estimations of self-employed	Exhaust-iveness	Other adjust-ments
Denmark	x	x		x		x		x
France	x	x	x	x		x	x	
Germany	x	x	x	x				
Italy	x	x	x	x	x	x		x
Luxembourg	x	x	x	x	x			
Netherlands	x	x	x	x	x			
Norway	x	x	x	x				

All countries make adjustments for holidays, annual leaves, sickness leaves and paid overtime. Only Denmark does not make an adjustment for strikes or temporary lay-offs. Unpaid overtime is only taken into account in the national accounts of Italy, Luxembourg and the Netherlands. Denmark, France and Italy make adjustments for overestimation or underestimation, which may also include an adjustment for unpaid overtime. France is the only country in this group that adjusts for exhaustiveness. Other adjustments are made by Denmark and Italy for consistency and to correct for the tendency to report paid instead of worked hours in business surveys.

4.2. Assessment of hours in national accounts from users' perspective

The measurement of hours are the Achilles' heel of the integration of labour statistics in the national accounts. More than is the case for employment there are few primary sources constructing hours worked measures. Average hours per person contain the useful property that they will be within a certain range, which makes it easier to detect outliers. A person can never work much more than 3,000 hours in a year and negative hours are impossible as well.

Hours worked which are directly obtained from the labour force survey (group I) can be used at the aggregate level and provide a good chance for international comparability, although problems in the accuracy of reporting have been observed (OECD, 1998). At the industry level, users should be more cautious in using hours worked data on the basis of LFS, but for the countries in group I it is often the only source available.

Some countries in groups II and III use a mix of sources, which are either consistent with the employment sources (group II) or differ from the employment sources (group III). The sources for these countries mostly have a much higher coverage than in group I, as especially hours for larger industries are obtained from business services. One should be careful, however, when using hours for self-employed as these are mainly based on LFS figures. A specific problem in group III is that the estimate of average hours per persons or job may not be consistent with the measure of persons or jobs, so that the quality of the total hours estimate is affected.

The major strength of countries which rely very strongly on business surveys (group IV countries), is the consistency of input and output measures in the national accounts system. Several countries (e.g. Denmark, Netherlands and Norway) build up their employment and hours through a working time account system, that takes into account both the compensation, employment and time use of workers. This ensures a good comparability across input quantities, quality and values and consistency with output measures. The set-up of hours worked according to the component method does not start from a single measure, such as actual hours in the LFS. The components need to be combined and may therefore have an ad-hoc character and lead to overestimates or underestimation in certain aspects. Fortunately, most countries in this group can rely on more than one source, especially for employees. This gives a good opportunity to compare the figures from the labour demand and labour supply side and make corrections if necessary. The reliability problems for hours worked for self-employed exist in the same way as for groups II and III.

Table 14 provides a comparison of the main results for hours worked from the bridge tables for 21 individual countries in 2004 (Annex 1) arranged by the country groups as identified in this chapter. For most countries, the national accounts measure of hours per person comes out lower than the previously used estimates, which are mostly based on labour force surveys.

Table 14 Bridge tables in hours worked in 2004 (average hours in units and total hours in 1000s)

	Group 1							Group 2				
	Australia	Canada	Estonia	Greece	Hungary	Lithuania	New Zealand	Romania	Bulgaria	Finland	Spain	Sweden
B. Average Annual Hours worked per worker												
(3) Main number from original source	1,812		1,996	2,075	1,998	1,809	34,91		1,902	1,660	1,868	1,563
<i>Of which employees</i>		1,736										
<i>Of which self-employed</i>		1,989										
Adjustments made on original source to adapt to NA concepts (in total hours)	0		-7,287	-173,110	-45,774	10,348	0			141,969	-1,284,295	158,360
Annual leaves, holidays and sickness leaves												
Strikes and temporary lay-offs												
Paid but unreported overtime and unpaid overtime												
Unreported overtime or over-estimated actual hours of self-employed												
Adjustments for the unobserved economy												32,620
Other adjustments:	0		-7,287		-45,774	10,348	0	3		141,969		125,740
<i>Hours of conscripts (in total hours)</i>		1,828	5,706			10,348		-31		74,900		22,500
<i>Hours of Residents working abroad (in total hours)</i>		1,775	-12,993									103,240
<i>Hours of Activity Q</i>		1,974	0							67,069		
<i>Maternity leave</i>		1,804						34				
Additional calculations												
(4) National Accounts annual average hours per worker	1,812	1,759	1,994	2,087	1,997	1,810	34,91	1,878	1,689	1,719	1,722	1,562
<i>Of which employees</i>		1,756						2,028				
<i>Of which self-employed</i>		1,784						1,602				
C. Total Annual hours worked												
(2) * (4) =	17,640,670	26,125,921	1,182,558	8,298,543	7,744,908	2,608,387	71,617	363,097	5,688,207	4,068,200	29,868,313	6,775,010

Table 14 (continued). Bridge tables in hours worked in 2004 (average hours in units and total hours in 1000s)

	Group 3			Group 4					
	Austria	Czech Republic	Slovak Republic	Denmark	France	Germany	Italy	Luxembourg	Norway
B. Average Annual Hours worked per worker									
(3) Main number from original source	n.a.	1,994	2,003	1,567	38,621,000	1,824	1,905		1,503
<i>Of which employees</i>					33,866,000				
<i>Of which self-employed</i>					4,755,000				
Adjustments made on original source to adapt to NA concepts (in total hours)				69,100					
Annual leaves, holidays and sickness leaves					-2,140,000				
Strikes and temporary lay-offs					-28,000				
Paid but unreported overtime and unpaid overtime									
Unreported overtime or over-estimated actual hours of self-employed					Incl. above				
Adjustments for the unobserved economy					576,000				
Other adjustments:									
<i>Hours of conscripts (in total hours)</i>									
<i>Hours of persons outside age range</i>									
<i>Other</i>									
Additional calculations									
(4) National Accounts annual average hours per worker		1,957	1,738	1,556	n.a.	1,440	1,866	1,625	1,358
<i>Of which employees</i>	1,636								
<i>Of which self-employed</i>									
C. Total Annual hours worked									
(2) * (4) =	6,781,444	9,487,020	3,572,300	4,329,700	n.a.	55,962,000	43,641,177	484,762	3,118,500
Pro Memoria:									
LFS Employment	3,744	4,846			24,631			186	
LFS Average Annual hours worked per person	1,844	1,994						1,726	
LFS Total Hours worked	6,905,537	9,351,854						321,076	

- For Iceland, Ireland, Latvia, Malta, Mexico, Portugal, Slovenia, Turkey and the United Kingdom no hours measures are available in the national accounts.
- For Belgium, Cyprus, Japan, Korea, Netherlands, Poland, Switzerland and the United States no bridge tables for hours are available
- All data is for 2004, except for Canada (1999), France and Italy (2001), Czech Republic, Denmark and Portugal (2002), Greece, Romania and Sweden (2003).
- Canada provides adjustments in average hours and Romania makes adjustments in jobs. All data for New Zealand relates to weekly hours and data for France describes total hours.

5. The use of national accounts-based labour input for productivity research

The integration of labour input in the national accounts serves a range of applications in research and policy making. These include economic modelling, labour market research and policy evaluation in the area of social policies. Another main application of national accounts-based of employment and hours is the application in productivity analysis. The main requirement for time series and – even more so – for level analysis of productivity is the consistency between numerator (output, value added, GDP) and denominator (employment and hours) in the equation.

Traditionally much of the productivity research used a rather hybrid set of sources for productivity. For international comparisons, the labour force survey was an obvious candidate due to its wide availability and relatively strong international harmonization.¹⁶ However, at industry level LFS measures are not the obvious source, and most studies rely on the most detailed source available for individual countries, which often is a business survey (such as enterprise-based employment statistics) or a hybrid of LFS and business surveys. In the latter case business surveys are often used to disaggregate the sectoral labour input numbers to specific industries.¹⁷ Working hours has turned out to be a major problem for productivity research, as many countries have had only very limited information on actual hours, in particular at the industry level.

Hence national accounts-based measures of labour input are an obvious source to be used more intensively for productivity research. Because of the explicit integration in the national accounts it strongly supports the consistency of the output and input measures. Indeed, the OECD Productivity Database has already largely switched to the use of national accounts-based labour input.¹⁸ However, given the large differences across countries, a careful judgement from the perspective of the user is required before jumping to use these national accounts series. The Total Economy Database of The Conference Board and the Groningen Growth and Development Centre is still largely relying on LFS, but is making a switch to national accounts-based labour input if the series are sufficient transparent and clear. The issue is also explicitly addressed in the framework of the EU KLEMS project, which aims to construct a productivity database on European countries and some major other countries around the world (www.euklems.net and O'Mahony and Timmer, 2006). The default option for EU KLEMS is to work on the basis of national accounts figures on labour quantity. However, as there are substantial inconsistencies across countries in terms of their preferred sources and concepts of employment and working hours, adjustments to the national accounts figures will need to be considered to improve international comparability.

¹⁶ See, for example, Maddison, 1995; see also The Conference Board and GGDC Total Economy Database at www.ggdc.net/dseries/totecon.shtml.

¹⁷ See, for example, O'Mahony and van Ark; and the GGDC/NIESR 60-industry database at www.ggdc.net/dseries/60-industry.shtml.

¹⁸ See Lequiller (2005) and http://www.oecd.org/topicstatsportal/0,2647,en_2825_30453906_1_1_1_1_1.00.html

In this section we discuss some key criteria that should be used in making a judgement on switching to the national accounts. We then look at the alternative approaches for three country cases showing how much the choice for a particular labour input series matters for the analysis.

5.1 Criteria for judgement on usefulness of national accounts-based labour for productivity analysis

There are a number of criteria that may be applied in making a judgement about the usefulness of national accounts-based labour for productivity analysis. These are:

- 1) consistency between employment and output measures
- 2) link with measures of labour compensation
- 3) consistency between hours and employment
- 4) link with other labour market indicators
- 5) potential use for growth and levels measures of productivity

ad 1) Consistency between employment and output measures

This key requirement for productivity analysis is probably the most crucial and offers potentially the greatest advantage when switching to national accounts-based labour input. It appears that for the employment measures, countries in group 3 and 4 (see Section 2), i.e. those that use a mix of business surveys, LFS and (in group 4) working time accounts, are more likely to satisfy this criterion than countries that are more exclusively based on LFS-type measures. This is because business surveys are also an important primary input for the output measure in the national accounts. There is also a much greater chance of disaggregating business survey-related measures of employment to industry level in a satisfactory way to match output. Hence, here the preference goes to use national accounts-based measures for countries groups in 3 and 4.

ad 2) Link with measures of labour compensation

A second main reason to use national-accounts based labour input concerns the link to labour compensation, in addition to the link to output. Labour compensation is a crucial ingredient to obtain weight for the various inputs in a growth accounting system (such as KLEMS), and it also required to compute weights for labour categories (age, gender, skills). Furthermore labour compensation is needed for the measurement of unit labour costs. Again, from the perspective of productivity analysis, the countries in groups 3 and 4 (see Section 2) are the most preferred because labour compensation is often obtained from similar sources, in particular at the industry level.

ad 3) Consistency between hours and employment and link with other labour market indicators

The ultimate measure of labour input for productivity research is total hours worked. In particular, this is the most useful concept for industry level analysis as the distinction between jobs and persons is then no

complicating factor. However, this requires an absolute consistency between measures of employment (jobs or headcounts) and measures of hours (hours per job or hours per person). The country groups which guarantee the greatest consistency in this respect are either those in groups I and (to a lesser extent) group II, which are largely LFS based or at least use sources that are consistent between employment and hours, or the countries in group IV which use business survey and working time accounts (see Section 3). The countries in group IV are probably the most preferable as they would also guarantee consistency with output. The latter also provide a good way of building up a measure of actual working hours and use other sources as a check on the reliability of the estimates. This strengthens the confidence one might have in these measures.

Ad 4) Link with other labour market indicators

The relatively strong preference for the use of business survey and working time accounts for measurement of labour input in a national accounts framework sacrifices another requirement for productivity analysis, which concerns the “quality components” of labour. In a growth accounts framework, there is a need for a decomposition of aggregate labour input quantity (total hours) into subgroups arranged by age group, gender and skill level. The gender distribution can often be obtained from both LFS and business surveys, but age is usually only available from LFS. Skill distribution can be obtained from the LFS when it refers to an occupational distribution, but for growth accounts the preference is more often for educational attainment. Even when available from LFS, educational attainment is difficult to compare across countries and often requires alternative sources (e.g. educational statistics or administrative sources). On the whole, however, countries in groups 1 and 2 (see Section 2), and those that provide consistent measures of employment and hours (groups I and II in Section 3) are most likely to satisfy this criterion. A practical solution which is often adopted in KLEMS-related analysis, is to clearly separate the labour quantity and quality measurement. The labour shares in terms of quality (as derived from LFS and alternative sources) may then be applied to the labour quantity measures as obtained from the national accounts (see O’Mahony and Timmer, 2006).

ad 5) Potential use for growth and levels measures of productivity

Finally, whereas national accounts are often primarily used for the analysis of growth and trends, relative levels of output, input and productivity are at least as important in an international comparative productivity framework. In particular when combined with industry-specific purchasing power parities (PPPs), level estimates are important but need to be consistently measured with growth rates. In practice, growth rates of labour input may not differ all that much between different sources. But levels can differ hugely, depending on whether one uses a domestic or national employment concept, whether adjustments are made for the unobserved economy, and whether hours reflect actual, paid or contractual hours. Also the consistency between output and employment (see ad 1) is more crucial for level than for growth performance. Generally measures of labour input from the LFS may be more comparable in terms of levels

at the aggregate level. However, differences in sample size may affect comparability. In particular, when going down to the level of industries, business surveys may provide a more reliable measure of labour input that can be used for level comparisons.

In sum, there seems to be a greater usefulness for national accounts-based measures of labour input when these are based on business surveys, and in particular when these are used in combination with working time accounts. The national accounts measures of labour input for countries like Denmark, Germany, France, the Netherlands, Italy and Luxembourg all most clearly fit within this category. Measures for the UK are still not very satisfactory, although the basis for measurement of labour input in the national accounts has recently begun to change. For the United States, there are alternative sources from BEA (which are primarily based on the Current Population Survey) and BLS (which uses the Current Employment Survey as the base). Although BLS indicates a preference for CES-based numbers for productivity analysis, there have been dissenting voices (e.g. Baldwin et al.,2005). In particular, for the U.S. the differences between the alternative sources are quite large, especially in the light of comparisons of productivity levels.

5.2 Three cases of alternative labour input sources for productivity analysis

“The proof is in the pudding” as the saying goes. In the compilation of the Total Economy Database of The Conference Board and the Groningen Growth and Development Centre (GGDC), series of aggregate GDP, employment and hours are published and updated every 6 months (see <http://www.ggdc.net/dseries/totecon.html>). In this database continuous attention is paid to the consistency of output and labour input measures for the analysis of productivity.

Below we show three cases on how the switch from LFS-based estimates to national accounts can affect the growth rates of labour productivity for three countries. Differences do not only appear in levels, but growth rates are also heavily affected by the choice for the sources for employment and hours.

Table 15a. Growth rates of employment, hours and productivity according to different labour input sources

		Germany		Netherlands		Luxembourg	
Employment	LFS	-0.8	0.0	1.8	1.7	3.0	3.7
	NA	-0.7	0.4	2.0	1.5	3.1	3.6
Average hours	LFS	-0.3	-0.6	-1.3	0.1	-0.2	-0.8
	NA	-0.3	-0.7	n.a.	-0.3	n.a.	-0.2
Total hours	LFS	-1.2	-0.6	0.7	1.9	2.8	2.9
	NA	-0.9	0.3	n.a.	1.1	n.a.	3.4
Labour productivity (per hour basis)	LFS	2.6	-2.0	2.0	0.9	2.3	2.1
	NA	2.4	1.7	n.a.	1.6	n.a.	1.7

Table 15b. Levels of employment, hours and productivity for three countries

		Germany		Netherlands		Luxembourg	
Employment	LFS	37601	38868	7155	8157	216	298
	NA	27176	36113	6887	7997	216	301
Average hours	LFS	1529	1440	1450	1407	2038	1997
	NA	1520	1443	1344	1357	1678	1556
Total hours	LFS	57503	55962	10377	11476	440	595
	NA	55002	52093	9255	10852	362	468
Labour productivity (per hour basis)	LFS	37.42	43.64	42.12	48.46	38.88	45.09
	NA	29.12	46.88	47.22	51.24	47.29	57.29

Note: The original LFS measures for Germany differ from those reported in tables 9 and 14, because the original

Sources: GGDC Total Economy Database, Eurostat New Cronos Database, OECD Labour Force Survey and OECD Employment Outlook.

6. Concluding remarks and areas for further research.

This paper has shed some light on the construction of employment and hours worked in the national accounts. The joint survey of Eurostat and OECD to obtain information on countries' practices in this respect has been very useful to assess the production process of these estimates. The bridge tables in Annex 1 are meant to contribute further to the understanding of the dazzling amount of adjustments for all kinds of issues and the variation between countries in the use of these adjustments.

From a users' viewpoint the integration of employment and hours in the national accounts is a very important step in establishing a consistent measurement framework that supports academic research and policy analysis. A growing number of countries have included the labour accounts as an integral part of the national accounts, while others are at least adjusting labour input figures to make them as consistent as possible. The fact that a lot of countries are now calculating productivity figures themselves also contributes to the incentive to achieve consistency. For a number of countries the information that has been gathered in this report will provide a justification to use this data for analytical purposes, such as productivity analysis. However, the lack of clearness or caveats in data construction methods may also raises doubts which hamper the use of this data.

Finally, it may be useful to conclude with a number of recommendations that may support the use of national accounts-based integrated labour input measures. Firstly, adequate documentation on the integration process is absolutely crucial. The complexity of the integration process may lead NSIs to decide not to bother the user, but in practice – given the alternative estimates around – it will only increase confusion and distrust of the user. In addition to bridge tables, such as those introduced in this paper, NSIs

may provide web-based links to basic sources that have been used to construct the estimates. This enables users to reconstruct estimates and consider alternatives, as well as test the impact on the results of their own analysis. Secondly, it is important that the estimates are worked back over time and at least include an overlapping year with the old series for the previous year. Breaks in the series complicate research and analysis hugely, so that one or more overlapping years allows the user to understand the impact of the new series. The practice of overlapping years may not always be most desirable from the perspective of “statistical purity”, but in practice it will increase rather than reduce the users’ confidence in the series. Thirdly, international cooperation is important. Even though countries have their own traditions when it comes to labour market statistics, and all sources surely cannot be fully harmonized, it is important to seek a range of common methods in making the adjustments. The grouping of the countries in this paper according to basic sources and methodology is meant to contribute to the establishment of a range of common methodologies and the establishment of a meta database structure. Finally, an important vehicle to support the analytical use of labour market statistics within the framework of the national accounts, is the integration in micro database structures. Again there are limitations to how easily LFS numbers and business survey numbers can be coupled at a personal level (as is the case, for example, for Denmark), and for some countries this may not be feasible from a legal perspective. But one can investigate alternatives to make links between micro datasets on labour accounts and business surveys, which support integration and reallocation between categories within the framework of the national accounts.

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Appendix 1: Country sheets (country sheets and bridge tables will be provided later)

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Appendix 2 Sources used for Employment by industry

Employees	Group 1							Group 2									
	AUS	EST	HUN	IRL	KOR	LTU	GBR	CAN	CYP	GRC	JPN	LTV	NZL	PRT	ROM	USA-BLS	
A Agriculture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,AS	ES	LFS,CE	LFS	LFS	ES	LFS,ES	LFS,ES	
B Fishing	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,AS	ES	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
C Mining	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	ES	LFS,CE	LFS	ES	LFS	ES	LFS,ES	
D Manufacturing	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS,ES	LFS,CE	LFS	ES	LFS	ES	LFS,ES	
E Energy, gas, water	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS,AS	LFS,CE	ES	ES	LFS	LFS	LFS,ES	
F Construction	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
G Trade	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
H Hotels and Restaurants	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
I Transport and communication	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS,AS,ES	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
J Finance	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS,AS	LFS,CE	LFS	ES	AS	LFS,AS	LFS,ES	
K Other Business Services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS,AS	LFS,ES	
L Government	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	AS	LFS,CE	ES	ES	AS	AS	LFS,ES	
<i>of which Military/conscripts</i>	AS	LFS			?	AS		AS	LFS,ES	AS	LFS,CE	AS	AS	ES	AS	LFS,ES	
M Education	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
N Health	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	LFS	LFS,ES	
O Other Community services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	ES	LFS	AS	LFS,ES	
P Personal Households	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
Self-employed																	
A Agriculture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS	LFS,CE	LFS	LFS	ES	LFS	LFS,ES	
B Fishing	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,AS	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
C Mining	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
D Manufacture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
E Energy, gas, water	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
F Construction	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
G Trade	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
H Hotels and Restaurants	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
I Transport and communication	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
J Finance	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	AS	LFS,AS	LFS,ES	
K Other Business Services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
L Government	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	AS	AS	LFS,ES	
M Education	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
N Health	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	
O Other Community services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES	LFS,ES	LFS	LFS,CE	LFS	LFS	LFS	LFS,AS	LFS,ES	
P Personal Households	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,CE	LFS	LFS	LFS	LFS	LFS,ES	

Appendix 2 Sources used for Employment by industry (continued)

Employees	Group 3a					Group 3b (1)					
	BUL	FIN	NOR	ESP	SWE	AUT	DNK	FRA	GER	ITA	MLT
A Agriculture	ES	LFS,AS	LFS	LFS,ES	LFS,ES	AS	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
B Fishing	ES,LFS	ES	LFS	AS	LFS,ES	AS	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
C Mining	ES,LFS	ES,AS,LFS	ES,AS	ES	ES,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
D Manufacturing	ES,LFS	ES,AS,LFS	ES,AS	ES	ES,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
E Energy, gas, water	ES,LFS	ES,AS,LFS	LFS,ES	ES,AS,LFS	ES,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
F Construction	ES,LFS	LFS	ES,AS	ES,LFS	ES,LFS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
G Trade	ES,LFS	AS,LFS	ES,AS	AS	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
H Hotels and Restaurants	ES,LFS	AS,LFS	ES,AS	ES	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
I Transport and communication	ES,LFS	ES,AS,LFS	ES,AS	ES	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
J Finance	ES,LFS	AS	ES,AS	AS	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	AS	AS
K Other Business Services	ES,LFS	LFS	ES,AS	ES	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
L Government	ES,LFS	AS	AS	AS	LFS,ES	ES,AS	AS	AS	AS,ES,LFS	ES,CE,LFS	AS
<i>of which Military/conscripts</i>	AS	AS	LFS,ES	AS	LFS,ES	AS	AS	AS	AS,ES,LFS	AS	AS
M Education	ES,LFS	LFS,AS	AS	AS	LFS,ES	ES,AS	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
N Health	ES,LFS	LFS,AS	AS	AS	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
O Other Community services	ES,LFS	LFS,AS	LFS,ES	AS	LFS,ES	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
P Personal Households	LFS	AS	LFS,ES	ES	LFS,ES	AS	AS,ES,LFS	ES	AS,ES,LFS	CE,LFS	AS,LFS
Self-employed											
A Agriculture	ES	LFS,AS	LFS	LFS,ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
B Fishing	CE	ES	LFS	AS	LFS,AS	AS	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
C Mining	CE	ES,AS,LFS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
D Manufacture	LFS	ES,AS,LFS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
E Energy, gas, water	CE	ES,AS,LFS	LFS	ES,AS,LFS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
F Construction	LFS	LFS	LFS	ES,LFS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
G Trade	LFS	AS,LFS	LFS	AS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
H Hotels and Restaurants	LFS	AS,LFS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
I Transport and communication	LFS	ES,AS,LFS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
J Finance	LFS	AS	LFS	AS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS
K Other Business Services	LFS	LFS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
L Government	ES,LFS	AS	LFS	AS	LFS,AS	ES,AS	AS	AS	AS,ES,LFS	ES,CE,LFS	AS
M Education	ES,LFS	LFS,AS	LFS	AS	LFS,AS	ES,AS	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
N Health	ES,LFS	LFS,AS	LFS	AS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
O Other Community services	ES,LFS	LFS,AS	LFS	AS	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS
P Personal Households	LFS	AS	LFS	ES	LFS,AS	ES	AS,ES,LFS	ES	AS,ES,LFS	ES,CE,LFS	AS,LFS

Appendix 2 Sources used for Employment by industry (continued)

Employees	Group 3b (2)						Group 4				
	NLD	POL	SVK	SVN	CHE	USA-BEA	BEL	CZE	ISL	LUX	MEX
A Agriculture	AS,ES,LFS	ES,LFS	ES,LFS,AS	LFS	ES	ES	AS	ES	AS	AS	ES
B Fishing	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES	AS,ES	AS	ES	AS	AS,ES	ES
C Mining	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
D Manufacturing	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
E Energy, gas, water	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
F Construction	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
G Trade	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
H Hotels and Restaurants	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
I Transport and communication	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
J Finance	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
K Other Business Services	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS	ES
L Government	AS,ES,LFS	ES,AS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	AS	AS	AS,ES	ES
<i>of which Military/conscripts</i>	AS,ES,LFS	ES	ES,LFS,AS	AS	ES,AS	AS,ES	AS	AS	AS	AS,ES	ES
M Education	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
N Health	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
O Other Community services	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	ES
P Personal Households	AS,ES,LFS	ES,LFS	ES,LFS,AS	AS	LFS	LFS	AS	ES	AS	AS,ES	ES
Self-employed											
A Agriculture	LFS,ES	ES	ES,LFS,AS	LFS	ES	ES	AS	ES	AS	AS	
B Fishing	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
C Mining	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
D Manufacture	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
E Energy, gas, water	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
F Construction	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
G Trade	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
H Hotels and Restaurants	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
I Transport and communication	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
J Finance	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
K Other Business Services	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
L Government	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	AS	AS	AS,ES	
M Education	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
N Health	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
O Other Community services	LFS,ES	ES,LFS	ES,LFS,AS	AS	ES,AS	AS,ES	AS	ES	AS	AS,ES	
P Personal Households	LFS,ES	ES,LFS	ES,LFS,AS	AS	LFS	LFS	AS	ES	AS	AS,ES	

Sources: LFS=labour force surveys, ES=establishment/enterprise surveys, business census, labour cost survey, CE=population census, AS=administrative data (social security employment and tax registers)

Appendix 3 Sources used for Hours worked by industry

Employees	Group I									Group II				
	AUS	CAN	EST	GRC	HUN	KOR	LTU	NZL	ROM	BUL	CYP	FIN	ESP	SWE
A Agriculture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	LFS,ES	ES,LFS	LFS,ES,AS
B Fishing	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES,LFS	ES,LFS	LFS,AS	ES,LFS	LFS,ES,AS
C Mining	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	ES,LFS	ES,LFS	LFS,ES,AS
D Manufacture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	ES,LFS	ES,LFS	LFS,ES,AS
E Energy, gas, water	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	ES,LFS	ES,LFS	LFS,ES,AS
F Construction	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
G Trade	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
H Hotels and Restaurants	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
I Transport and communication	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
J Finance	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	AS	ES,LFS	LFS,ES,AS
K Other Business Services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
L Government	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS,AS	ES,LFS	LFS,ES,AS
M Education	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
N Health	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
O Other Community services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
P Personal Households	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES,LFS	ES,LFS	LFS	ES,LFS	LFS,ES,AS
Self-employed														
A Agriculture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	LFS	LFS,ES	LFS	LFS,ES,AS
B Fishing	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	ES	LFS	LFS,ES,AS
C Mining	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
D Manufacture	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
E Energy, gas, water	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
F Construction	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
G Trade	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
H Hotels and Restaurants	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
I Transport and communication	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
J Finance	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	AS	LFS	LFS,ES,AS
K Other Business Services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
L Government	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,AS	LFS	LFS,ES,AS
M Education	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
N Health	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
O Other Community services	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS
P Personal Households	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS	LFS,ES,AS

Appendix 3 Sources used for Hours worked by industry (continued)

Employees	Group III								Group IV						
	AUT	BEL	CZE	JPN	POL	SVK	CHE	USA-BEA	DNK	FRA	GER	ITA	LUX	NLD	NOR
A Agriculture	LFS,ES	AS	LFS	LFS	ES	ES	LFS	LFS	ES,AS	ES	AS	LFS	AS,ES	AS	AS
B Fishing	LFS,ES	AS	LFS	LFS	ES	ES	LFS	LFS	ES,AS	ES	AS	LFS	AS,ES	AS	AS
C Mining	ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
D Manufacture	ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
E Energy, gas, water	ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
F Construction	ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
G Trade	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
H Hotels and Restaurants	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
I Transport and communication	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
J Finance	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	AS	AS,ES	AS	AS
K Other Business Services	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
L Government	LFS,ES	AS	LFS	LFS	ES	ES	LFS	AS,LFS	ES,AS	ES	AS	AS	AS,ES	AS	AS
M Education	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
N Health	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
O Other Community services	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	ES	AS,ES	AS	AS
P Personal Households	LFS,ES	AS	LFS	ES	ES	ES	LFS	ES	ES,AS	ES	AS	LFS	AS,ES	AS	AS
Self-employed															
A Agriculture	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
B Fishing	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
C Mining	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
D Manufacture	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
E Energy, gas, water	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
F Construction	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
G Trade	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
H Hotels and Restaurants	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
I Transport and communication	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
J Finance	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
K Other Business Services	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
L Government	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
M Education	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
N Health	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
O Other Community services	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS
P Personal Households	LFS		LFS			ES,LFS	LFS	LFS	ES,AS	ES	LFS	LFS	AS,ES	LFS	LFS

Sources: LFS=labour force surveys, ES=establishment/enterprise surveys, business census, labour cost survey, CE=population census, AS=administrative data (social security employment and tax registers)