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**National Accounts and Economic Statistics**

**USING NATIONAL ACCOUNTS DATA FOR PRODUCTIVITY ANALYSIS**

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## USING NATIONAL ACCOUNTS DATA FOR PRODUCTIVITY ANALYSIS

This paper is submitted to the OECD National Accounts Working Group (NAWG) for decision. Its objective is to promote the use of national accounts data on labour input in order to improve the comparability of the statistical measure of the *level* of labour productivity between OECD countries. The paper first proposes recommendations regarding the transmission to OECD of more comparable data. Then it describes a model questionnaire which will be disseminated to countries to improve the ability of users to make a judgment on the international comparability of these data.

### I. The OECD project on productivity comparisons

1. More and more analysts try to compare productivity between countries. The OECD has and continues to devote numerous studies in this field [1], including a special study on measurement issues [2]. Two variables are under the scrutiny of analysts: (1) labor productivity, (2) multi-factor productivity. The present memo will focus on the first one. Two types of international comparisons of labour productivity can be done: compare labour productivity *growth* or compare labour productivity *levels*. It is easier to compare productivity growth between countries than productivity levels. In particular, the comparison of growth rates does not need to use Purchasing Power Parities (PPPs) while the comparison of levels does (GDP, the numerator of the ratio, has to be deflated by PPPs). PPPs, as many statistics, are affected by a certain degree of incertitude<sup>1</sup>.

2. The present memo will however focus on the problems linked to the comparability of labour productivity *levels*, and, in this context, on the measurement of the denominator of this ratio, which is the measure of labour input. Indeed, the comparison of levels, despite its inherent difficulty, is an unavoidable objective for an international organization such as the OECD. Also other international organizations, such as the European Commission, make a heavy use of the comparison of productivity *levels*. The EU has even set, as an official objective for its member countries, to reach the level of labour productivity of the US in 2010.

3. The OECD disseminates a small database comparing productivity levels, accessible on the OECD Productivity site: <http://www.oecd.org/statistics/productivity>. This database shows for a given year (2002 currently) the decomposition of GDP per capita into various components, including labour productivity, expressed as a percentage of US levels<sup>2</sup>.

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<sup>1</sup> PPPs imply comparing international price levels which is more difficult than comparing price changes. Also, the sample used in PPP compilations is small compared to samples used in standard national price indices. These limitations lead to recommend avoiding using PPP deflated data in time series. The OECD recommends to users willing to have both levels and time series, to use one single year of PPPs and to benchmark the time series using national volume series to this single year in level. This generates data that are analytically better in terms of homogeneity in time (see [3]).

<sup>2</sup> This presentation as US = 100 is standard presentation in the OECD.

**Table 1: extract of OECD productivity level database (3 September 2004)**

	<b>GDP per head of population</b> (as % of US)	<b>GDP per hour worked</b> (as % of US)
	(1)	(7)
Australia	76	77
Austria	80	88
Belgium	78	108
Canada	85	85
Czech Republic	44	40
Denmark	83	94
Finland	75	82
France	77	113
Germany	75	93
Greece	49	65
Hungary	40	50
Iceland	79	70
Ireland	89	105
Italy	75	94
Japan	74	71
Korea	48	42
Luxembourg	141	115
Mexico	26	30
Netherlands	82	102
New Zealand	61	62
Norway	103	125
Poland	29	35
Portugal	50	53
Slovak Republic	36	40
Spain	62	74
Sweden	74	86
Switzerland (1)	82	84
Turkey (1)	17	26
United Kingdom	74	79
United States	100	100
Euro-area	73	92
OEDD-Europe (19)	73	82
G7 countries	86	91
OECD (3)	75	76

Table 1 is an extract of this database. Among many results, it shows that the level of labour productivity (per hour worked) of the Euro-area is estimated as equal to 95% of the US, while Japan is at 72% of the US.

#### *A decomposition of GDP per capita*

*Analysts try to understand the international differences in income produced (GDP per capita) using a decomposition in which labour productivity is one essential contribution. Analysts decompose GDP per capita in five elements:  $GDP/population = (GDP/total\ hours\ worked) * (total\ hours\ worked/persons\ employed) * (persons\ employed/labour\ force) * (labour\ force/working\ age\ population) * (working\ age\ population/population)$ <sup>3</sup>.*

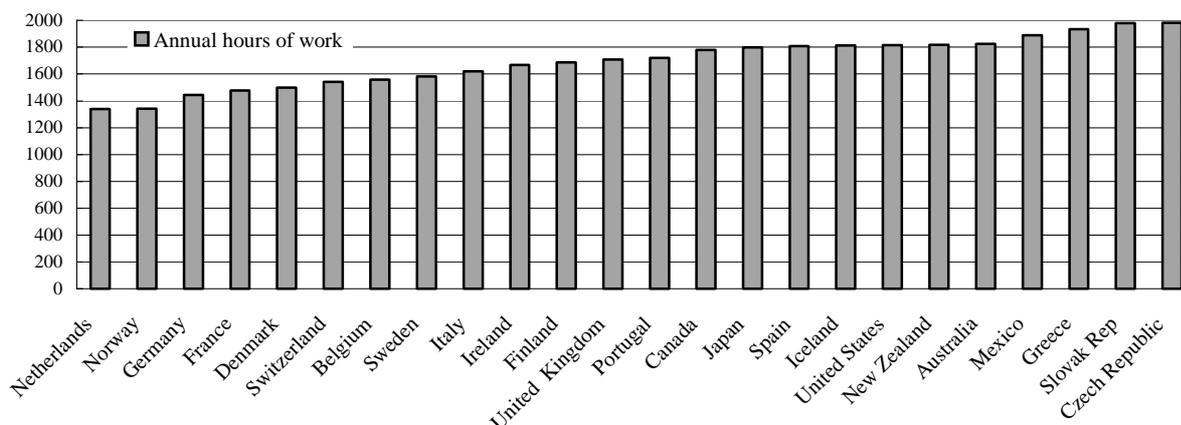
*The first element is labour productivity. The second element is the average number of hours worked per person. The third element is closely related to the unemployment ratio. The fourth element is the labour force participation rate and the final element is a demographic effect. Each of these terms may explain the differences in GDP per capita between countries and are linked with specific policy issues.*

<sup>3</sup> This decomposition omits the transition from the national concept to the domestic concept.

*The focus of the present note is on GDP per hour worked*

4. As seen in table 1 and in the box, the preferred definition of labour productivity is *GDP per hour worked*, rather than *GDP per person*. This focus on GDP per hour work comes from the fact that there is a wide difference between OECD countries regarding the amount of annual hours worked per worker. The average US worker's annual hours is 1800. In the Czech Republic or in the Slovak Republic, annual hours worked reach nearly 2000 per year (+10% compared to the US), while in Germany or France it is only around 1450 (-20%). International comparisons of labour productivity would thus be incomplete if the amount of hours worked was not taken into account.

**Figure 1. Average hours actually worked per person in employment per year, 2002**



Source: Annual hours and Productivity databases.

5. The present memo will therefore focus on the measure of labour input in terms of *total hours worked*. This does not mean that GDP per hour worked is to be considered the ideal definition. First, productivity levels are affected by the composition of the work force. It is for example assumed that the relatively high level of labour productivity reached by some European countries, such as France, can be explained in part by the fact that the labour market excludes low skilled workers (which itself explains the high unemployment). In other words, France has a high labour productivity compared to the US partly because its work force primarily include high skilled workers. International comparisons of labor productivity would gain in using a measure that would take into account this different degree of qualification of the work force. This is still at the stage of research at the OECD.

6. Second, the use of total GDP as the numerator of the ratio is subject to controversy because it includes the non market sector, which is inherently difficult to measure in real terms, as there is, by construction, no price for the services produced by this sector. Recent studies have shown that differences in the statistical methods devised to estimate the real output of the non market sector can bias the results [4, 5]. Pending better comparability of the measurement of the non market sector, it would be more prudent to focus on the labour productivity of the market sector (also called "business sector"). However, it is not so easy in the SNA 93/ESA 95 framework to decompose national accounts data between the market sector and the non market sector. However, some approximation may be made to obtain, in practice, these concepts. The OECD National Accounts Working Group should consider whether it is possible to introduce this decomposition in the standard national accounts tables required at international level, making this international comparison of "business sectors" possible (see recommendation 2).

### *The use of consistent national accounts data*

7. It is natural to consider that, as the numerator of this ratio, GDP, is the result the compilation of national accounts, the measurement of labour productivity is improved by using also a national accounts source to estimate the denominator of the ratio: *total hours worked*.

8. One obvious argument is, for example, that if national accounts adjust GDP for unobserved economy, it is necessary to use, in the denominator, a measure of hours worked which is also adjusted for unobserved economy. Another obvious argument is that GDP is based on a definition of the economic territory which is to be matched in the definition of the denominator. Only national accounts sources can achieve such consistencies.

**Recommendation 1: It is preferable to use national accounts sources for the denominator of the measure of labour productivity, in order to ensure consistency with the numerator.**

**Recommendation 2: It would be useful that standard national accounts tables allow for the calculation, even approximately, of GDP and all other relevant variables for the market sector (also called “business sector”). A definition of the market sector and/or possible approximation should be proposed by the international organizations.**

9. The objective of the present memo is to promote such a use of *national accounts* sources on labour input in the compilation of labour productivity measures. For the moment, the OECD database on productivity results from the combination of national accounts sources and labour statistics sources. The OECD is prepared to move to the exclusive use of national accounts sources. However, in order to achieve this objective, there are three conditions: (1) that complete national accounts data on labour input are compiled and transmitted to the OECD, in particular regarding total hours worked, (2) that they are comprehensive, when compared with labour force statistics, (3) that they are comparable between countries. These three conditions are discussed in the below sections.

## **II. Availability of national accounts data on hours worked**

10. Table 2 shows the current availability of data at the OECD regarding employment and hours worked. In addition, in the second column, it indicates the type of the variable “employment”: number of jobs or number of persons.

11. The table shows clearly that it is currently impossible at the OECD to derive a measure of productivity using uniquely national accounts figures because of the large number of countries that do not transmit the variable “total hours worked” to the OECD. While most countries do report employment data (column 1), only 8 countries out of 30 report total hours (column 3)<sup>4</sup>. This is most unfortunate considering that the SNA 93 itself considers “total hours as the preferred measure of labour inputs for the System” (paragraph 17.11).

12. There are probably three different situations explaining the absence of total hours in the national accounts tables reported to the OECD. The first one is the case of countries (such as France) which do compile these data but do not transmit the corresponding tables to the OECD. It is therefore a technicality for these countries to send these tables. The second one is the case of countries (those with an asterisk in column 3: Belgium, Japan, New Zealand, Poland, USA) which report hours worked but only for employees, and not for self-employed. These countries would need to extend their estimates of hours worked to cover self-employed. Many other countries have implemented such estimates, and it should be

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<sup>4</sup> The table for transmission is the OECD/Eurostat table 0303, which is shown in Appendix 1.

possible for them to use similar methods. The third one is the case of countries that have not yet introduced hours worked in their national accounts. This could be due partly to the absence of sources on hours worked. However, this looks strange considering that nearly all OECD countries report average hours worked under the Labour Force Statistics program of the OECD (see appendix 2).

**Table 2: availability of data on employment and hours worked in the national accounts**

	<b>NA employment</b> Data for 2002 except when signaled	<b>Jobs/ Persons</b>	<b>Total Hours</b> Data for 2002 except when signaled
Australia	9206 (2001/2)	Persons	
Austria	4066	Jobs	
Belgium	4136	Persons	*
Canada	15678	Jobs	27882
Czech Republic	4765**	Persons	
Denmark	2782	Persons	3597
Finland	2359	Persons	4075
France	24887	Persons	
Germany	38671	Persons	55791
Greece	3924	Jobs	8192
Hungary	3870	Persons	7287
Iceland			
Ireland	1766	Persons	
Italy	24009	Persons	
Japan	65299	Jobs	*
Korea	22151	Persons	54605
Luxembourg	288	Persons	
Mexico	40117	Persons	
Netherlands	8349	Persons	
New Zealand	1876		*
Norway	2317	Persons	3145 (2001)
Poland	14590		*
Portugal	4923 (2000)	Persons	
Slovak Republic	2016	Persons	
Spain	16343	Persons	
Sweden	4353		6964 (2001)
Switzerland	4172	Persons	
Turkey			
United Kingdom	29526	Jobs	
United States	147721	Jobs	*

\* total hours are compiled for employees but not for self-employed

\*\* national concept

**Recommendation 3: OECD countries should report systematically total hours worked for employees and self-employed in the format of the OECD/Eurostat**

**Questionnaire, table 0303. Countries unable to transmit these data should explain the reason why there are unable to do so.**

*Abandon the concept of full-time equivalent*

*The current table 0303 requests three measures of labour input: (1) in terms of persons, (2) in terms of full-time equivalent, (3) in terms of hours. The new table 0303, which will be implemented in 2005, abandons the measure in terms of full-time equivalent. This measure of labour input is inferior to the measure in terms of hours, and is not used by productivity analysts. It has been therefore dropped from the new table 0303<sup>5</sup>.*

13. As, for the moment, it is not in a position to use exclusively national accounts data to derive the measure of labour input, the OECD was therefore led to make use of sources originating directly from labour force statistics. At the present stage we generally use a combination of data in terms of employment from the national accounts, and of average hours originating from labour force statistics. The method is described in appendix 3. This allows us to make our own crude estimates of total hours. However, an estimate of total hours made directly by national experts remains preferable. First, it would certainly gain in terms of quality. Second, it is better that national experts control most of the parameters of the calculation of international relative labour productivities, considering the importance of this indicator for policy makers.

*The issue of “jobs” versus “persons”*

14. A full economic analysis of labour productivity implies a decomposition of total hours worked between the variable “employment” and the variable “average hours”. In this context, labour market analysts tend to give priority to the concepts of “persons” and “hours worked per person” rather than to the concepts of “jobs” and “hours worked per jobs”. The first set of concepts considers that a multiple job holder counts for one, while the second counts several units per individual.

15. Column 2 of Table 2 shows which set of concepts are used by countries. Most countries transmit to the OECD data in terms of *persons*<sup>6</sup>. Only 6 countries (Austria, Canada, Greece, Japan, UK, USA) transmit data in terms of *jobs*. It is important to note that the conceptual difference can have significant effects on the data. In the US, the rate of multiple job holders is more than 5%. Thus the variable “employment” expressed in terms of jobs is 5% larger than the one expressed in terms of persons.

16. The SNA seems to give priority to the concept of jobs on the concept of persons. Its paragraph 17.7 even says: “Employment does not enter into the System, but jobs do; a job is like a transaction, while an employed person is not”. Such an anathema on indicators in terms of persons does not appear in the ESA 95, which, in addition, gives more precise definitions of employment.

17. It is true that “jobs” is a variable that has the good property of being additive, while “persons” is not always additive (a multiple job holder should not be counted several times in the context of statistics expressed in terms of persons. In industry statistics a multiple job holder should be affected to his primary

<sup>5</sup> Tables 1 already have already dropped the concept of FTE.

<sup>6</sup> Poland is still a case that needs further clarification: the figure in the table could be Full-Time Equivalent and not persons.

industry). However, and despite the SNA 93, analysts of labour market prefer to use the concepts of persons. As explained in the box of section 1 of the present paper, analysts decompose GDP per capita in four elements:  $\text{GDP/population} = (\text{GDP/total hours worked}) * (\text{total hours worked/persons employed}) * (\text{persons employed/working age population}) * (\text{working age population/population})$ . All these elements use the concept of persons and not the concept of jobs. In this context, the introduction of indicators based on the number of jobs rather than the number of persons complicates unduly the picture.

18. The preference to the use of statistics in terms of jobs or in terms of persons may also simply originate from the source data. Household surveys (such as the European Labour Force Survey in Europe, or the Current Population Survey-CPS-- in the USA) deliver statistics in terms of persons, because persons are interviewed. On the contrary, surveys of employers (such as the Current Employment Survey-CES-in the USA) deliver statistics in terms of jobs, because two employers will report twice the same person who has two jobs. Thus, the use of one or other concept in the national accounts could come from the type of data available in the country. However, our understanding is that most countries have both information, and can therefore pass, with more or less difficulties, from one type of data to the other. Therefore, we can propose the following recommendations.

**Recommendation 4: SNA chapter 17 on “Population and labour inputs” should be amended to give more room to indicators in terms of persons. The ESA 95 chapter 11 on population and labour input could be used as a basis for a redrafting of the SNA.**

**Recommendation 5: The 6 OECD countries that report employment in terms of jobs should either move to statistics in terms of persons, or report, in addition to current data, statistics in terms of persons.**

### III. Comparability with labour force statistics<sup>7</sup>

19. The objective of the present paper is to promote the use of national accounts data for the measure of the denominator of labour productivity. At the same time, as employment is at the centre of preoccupation of all policy makers, statistics on employment are headline indicators in all countries. But these statistics are generally not the national accounts statistics. The increasing use of national accounts data on employment for the sake of international comparisons of labour productivity will therefore inevitably draw the attention to the difference between the two sets of data. These differences should be explained to make the national accounts sources fully convincing.

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<sup>7</sup> This issue of comparability had been raised in an OECD paper of 1998 [8], and more recently in an Eurostat paper of October 2003 [10].

**Table 3: comparison of national accounts employment, and OECD labour force statistics  
(source OECD databases, in 1000)**

	<b>Na employment</b> Data for 2002 except when signaled	<b>Labour force statistics</b> Data for 2002 except when signaled	<b>% difference</b>
Australia	9206 (2001/2)	9,295	-1.0
Austria	4066	3,772	7.8
Belgium	4136	4,012	3.1
Canada	15678	15,466	1.4
Czech Republic	4765	4,796	-0.6
Denmark	2782	2,715	2.5
Finland	2359	2,393	-1.4
France	24887	24,601	1.2
Germany	38671	36,245	6.7
Greece	3924	3,949	-0.6
Hungary	3870	3,871	0.0
Iceland		157	
Ireland	1766	1,750	0.9
Italy	24009	21,922	9.5
Japan	65299	63,300	3.2
Korea	22151	22,169	-0.1
Luxembourg	288	288	0.0
Mexico	40117	39,265	2.2
Netherlands	8349	8,027	4.0
New Zealand	1876	1,885	-0.5
Norway	2317	2,286	1.4
Poland	14590	13,846	5.4
Portugal	4923 (2000)	5,115	
Slovak Republic	2016	2,141	-5.8
Spain	16343	16,260	0.5
Sweden	4353	4,244	2.6
Switzerland	4172	4,180	-0.2
Turkey		20,854	
United Kingdom	29526	28,415	3.9
United States	147721	137,963	7.1

**Table 4: comparison of national accounts implicit annual average hours per worker and OECD labour force statistics average hours per worker (source OECD databases)**

	NA Total Hours Data for 2002 except when signaled	NA Implicit Average hours	Average hours/worker Labour Force statistics	% <i>difference</i>
Canada	27882	1788.4	1731	3.3%
Denmark	3597	1293.0	1462	-11.5%
Finland	4075	1727.4	1727	0%
Germany	55791	1443	1443	0%
Greece	8192	2087.7	1928	8.2%
Hungary	7287	1882.9	1766	6.6%
Korea	54605	2465.1	2410	2.3%
Norway	3145 (2001)	1361.5	1342	1.5%
Sweden	6964 (2001)	1602.8	1581	1.4%

Table 3 illustrates the difference between the two sources regarding the number employed (persons/jobs, depending on country). As can be seen, except for a very small minority of countries, there are significant differences. There are very good reasons to explain these differences. Some of them are already known to us.

20. For example, the difference of 7% between the level of employment measured in the national accounts of the USA and the corresponding labour force statistics is partly explained by the fact that the labour force statistics presented here is in terms of persons while the national accounts data is in terms of jobs<sup>8</sup>. This is also true for Canada, and probably also Austria.

21. On the other hand, the major difference between the two sources for Italy originates most probably from the fact that national accounts are adjusted to reflect for unobserved economy while labour force statistics are not.

22. Table 4 illustrates the same type of difference but for the variable “average annual hours”. By construction, the table is limited to the countries that report hours worked in the framework of national accounts. The column “Implicit national accounts average annual hours” has been compiled by dividing total hours by the number of employed. Significant differences appear, for example, for Denmark, Greece or Hungary.

These differences call for more detailed explanations.

23. Based on a pilot project with two countries (France and Canada), OECD and Eurostat intend to disseminate a common questionnaire trying to analyze these differences. The aim is to have, for each country, and for a given year, a table explaining (and giving figures on) the difference between the two statistics. This table should help users to understand and justify the adjustments made by national accountants. It is also expected that this information will help us verifying the international comparability of national accounts measures of labour input.

<sup>8</sup> OECD Labor Force Statistics for the US are based on the CPS (which measures persons), while national accounts are based on the CES (which measures jobs).

#### IV. From a pilot test to a questionnaire

24. Two countries, France and Canada, have accepted to participate in a pilot-test of explaining in detail the compilation of total hours worked in the framework of national accounts from original labour force statistics. This exercise has been conducted during a specific session of the Paris Group meeting of September 2004 (in Lisbon) [6, 7]. In addition, the USA has drafted a short document explaining the differences between the different sources on hours worked in the US.

##### *Canada*

25. Table 5 shows a simplified bridge table between the original labour force statistics and the national accounts data for Canada. The table distinguishes the two main elements of the compilation of total hours: (1) employment; (2) average annual hours worked. In Canada, the main source of the data for employment is the Labour Force Survey, which gives a number of 14 531 persons in 1999. Canadian national accountants modify it to express it in terms of jobs, which is the preferred SNA concept. This adds nearly 5% to the original data. Then they add an additional 1.1% to take into account territories that are not covered by the Labour Force Survey. Finally, they exclude a population considered as employed in the survey but not considered employed by national accountants (-3.8%).

26. Regarding hours worked, the main source in Canada is also the Labour Force Survey. The definition of hours worked in this survey is considered to match closely the SNA/ILO definition of hours worked (see SNA par. 17.11). Therefore, the only adjustment made by Canada to the survey's results consists in devising a method to extrapolate hours worked as reported in specific weeks of the month to other weeks of the month, taking into account civic and other holidays.

27. Canada does not introduce any specific adjustment regarding the unobserved economy.

28. The table ends with the calculation of total hours and the implicit global average annual hour. This implicit national accounts average annual hours worked is compared to the corresponding OECD Labour Force Statistics. In the case of Canada, the two figures are exactly equal, showing the close coordination between the compilers of the two sets of data.

Table 5: Canada, year 1999

**I. Employment:**

Number of employees and self-employed (official source: Labor Force Survey):	14531	
<i>Adjustment to SNA concept of jobs:</i>		
Addition of multiple job holders:	+708 (+4.9%)	
Inclusion of jobs in aboriginal reserves and military personnel:	+122 (+0.8%)	
Inclusion of jobs in Northern Territories and civil servants working outside Canada):		+47 (+0.3%)
Exclusion of unpaid absentee paid workers:	- 415 (-2.8%)	
Exclusion of self employed with zero hours worked	- 142 (-1.0%)	
Total NA employment in terms of jobs	14851	
(a) Of which employees	13169	
(b) Of which self-employed	1682	

**II Annual hours worked per job**

<i>Employees</i>		
LFS x 52 hours worked(persons)	1735.5	
Adjustments to the SNA class of workers definition (persons) <sup>9</sup>	1827.5	
Adjustments to the number of jobs	1774.6	
Adjustments for LFS reference weeks (civic and other holidays)		
(c) CSNA annual hours worked	1756	
<i>Self-employed</i>		
LFS x 52 hours worked (persons)	1989.1	
Adjustments to the number of jobs and to the SNA concept	1974.4	
Adjustments for LFS reference weeks (civic and other holidays)	1804.0	
(d) CSNA annual hours worked	1784	

**III Unobserved economy** ---**IV Total hours worked**

Employees = (a) * (c)	23 125 384
Self employed = (b) * (d)	3 000 537
Total	26 125 921
Implicit annual hours worked per <u>job</u>	1759
Annual hours OECD Labour force statistics	1759

<sup>9</sup> The hours worked per employee is revised up when we move from the official LFS data to the number of persons as measured by the SNA because the former includes proprietors of incorporated business in its self-employed category while this population is move to the employee category in the SNA classification.

Table 6: France: Year 2001

<b>I. Declared employees:0.0</b>	
Number of persons (Census extrapolated by administrative sources):	22 740
(including employees of "Départements d'Outre Mer" :	434)
<i>From national concept to domestic concept:</i>	
Exclusion of residents working outside the economic territory:	-260 (-1.2%)
Inclusion of non residents working inside the economic territory:	+20 (+0.1%)
Inclusion of general conscription:	+10
Number of declared employees, domestic concept:	22 510
<i>Calculation of theoretical total hours worked</i>	
Number of employees in full-time equivalent	20 857
x Theoretical number of weeks worked during the year	44.31
x Theoretical number of hours per week	36.61
=	
Total number of theoretical hours worked <sup>10</sup>	33 866 000
<i>Adjustments to theoretical number of hours worked</i>	
Adjustment for temporary lay-offs	-14 000 (-0.04%)
Adjustments for strikes	-14 000 (-0.04%)
Adjustments for sickness leaves	-2 140 000 (-6.3%)
Total number of hours worked for employees	31 698 000
<b>II. Self employed</b>	
Number of self-employed (including DOM)	2220
In terms of full-time equivalent	2168
Average annual hours worked (full time, adjusted for « overwork»)	2193
Total number of hours worked for self employed	4 755 000
<b>III Unobserved economy</b>	
Number of unobserved persons (full time equivalent)	376
Average annual hours	1531
Total hours unobserved economy	576 000 (+1.6%)
<b>IV Total economy</b>	
Total number of workers (at full time equivalent)	23400
Total number of hours	37 029 000
Implicit annual hours worked by worker at full time	1582
Implicit annual hours worked by worker (excluding unobserved economy)	1474
OECD estimate (from labour force statistics)	1459
Difference	-1%

<sup>10</sup> The multiplication of the three above figures does not give the exact result, as this multiplication is done at a detailed level of industries.

*France*

29. Table 6 is the corresponding table for France. The table is somewhat more complex than for Canada as the method used in France distinguishes three domains: employees, self-employed, unobserved economy. Specific adjustments are made in each domain.

30. In France, priority is given to the data coming from administrative sources (benchmarked on Census). The Labour Force Survey is used only as a secondary source. The starting headline indicator for Labour Force Statistics on employees is based on Census extrapolated by administrative sources, resulting for the year 2001, in a number of 22 306 (thousands).

31. National accountants then introduce a series of adjustments to adapt this number to the definition of economic territory underlying GDP: inclusion of employees of the “départments d’outre mer” (+1.9%), exclusion of residents working outside the territory (Luxembourg, Germany, Switzerland), inclusion of an estimate of non residents working in the economic territory and of the non professional military (general conscription).

32. Regarding hours worked, the calculation is not directly based on the results of the Labour Force Survey, which is considered too volatile. The method is in four steps: (1) compile a figure for full-time equivalent employees, based on data on amount of partial time from surveys on employers; (2) calculate then a theoretical number of weeks worked, taking into account holidays and annual leaves, and a theoretical number of hours worked per week, based on surveys on employers (known to be biased towards legal hours); (3) derive a theoretical number of hours worked from these two first steps, (4) introduce adjustments to take into account sickness leaves, temporary lay-offs and strikes, and finally obtain an estimate of effective total hours worked for employees.

33. A similar method is used for self-employed. It includes a special adjustment for “overwork” of self-employed. France then makes an explicit estimate of the unobserved economy (+1.6%). Finally France delivers the total number of hours worked: 37 029 000.

*USA*

34. The document presenting the US case is available as appendix 4. For the moment, in the USA, the national accounts (BEA) only publishes estimates of hours worked for employees, and not for self-employed and unpaid family workers. Estimates of hours worked are the product of industry full-time and part-time employees, average weekly hours, 52 (number of weeks in a year), and the ratio of hours worked to hours paid. The BEA includes an estimate of employees not covered by the original labor force statistics monitored by the BLS and corresponding to the adjustment made for underreporting of wages and salaries.

35. For the moment, the situation for US data is the following: the BLS data on hours worked are more comprehensive than the national accounts data, because they include self-employed persons and unpaid family workers, but the BEA data includes an adjustment for underreporting which is not included in BLS data. BLS and BEA staff are discussing the possibilities of developing a measure which would combine those two elements.

*Towards a general questionnaire*

36. Based on this pilot test, OECD and Eurostat have prepared a general questionnaire, to which is attached a table illustrating the main differences for a given year. The two organisations intend to

disseminate this questionnaire to member countries in the autumn of 2004. The questionnaire is presented in the next pages.

**Recommendation 7: national experts are requested to give their opinion on the principle and structure of the questionnaire and the attached table.**

37. The pilot test has shown that one difficulty with the questionnaire is that it focuses on global economy totals while, in practice, countries methods of estimation are based on very detailed (industry \* region) estimates. Nevertheless, it is hoped, that it will be possible for national experts to make an estimation of the different adjustments at the global level. This was possible in the case of France and Canada.

**V. Questionnaire on the bridge table between labour force statistics and national accounts.**

38. The proposed questionnaire is a semi-open questionnaire, which should be used in conjunction with a table including numbers (An Excel version of the table will be attached to the final questionnaire). The objective of the questionnaire/table is to explain in a reasonable detail the differences between (1) original sources on employment and on hours worked, and (2) national accounts figures. Priority should be given to the table containing numbers for a recent year. The table can and should be adapted to the specific situation of the country.

39. The original source should correspond in principle to the OECD Labour Force Statistics sources. If this source is not adapted, another one should be used. In principle, it should be a source made publicly available in the country.

***Questionnaire***

*1. Part on Employment underlying GDP*

Question 1.1: what is the main original source for employment in the national accounts (i.e: administrative source, Labour Force Survey, other)? Describe this source, its coverage, whether it is in terms of jobs or persons. Describe different sources if different sources are needed to evaluate different parts of the employed population, in particular, if necessary, differentiate sources between employees and self-employed.

Question 1.2: describe and evaluate possible adjustments made to pass from the concept of stocks (persons employed at given date) to the concept of flows (persons employed during the year).

Question 1.3: describe and evaluate possible adjustments made to transform the original source to adapt it to the concept of persons (if the original source is in terms of jobs), or conversely adapt it to the concept of jobs (if your country has chosen to publish national accounts data in terms of jobs and if the original source is in terms of persons).

Question 1.4: describe and evaluate adjustments made to this source in terms of coverage of the economic territory. Try to separate and evaluate adjustments for militaries (including specifically conscripted forces, if necessary), other collective households not covered by the main source, residents working outside/inside the economic territory.

Question 1.5: describe and evaluate adjustments made to take into account the unobserved economy.

Question 1.6: describe and evaluate other adjustments (residents working for non resident producer units – which are included in NA but not in labour force statistics--, non residents working with resident producer

units—including in NA but not in labour force statistics--, resident workers living permanently in an institution, resident workers under the age considered in labour force statistics, prisoners at work,...)<sup>11</sup>

*Part on average annual hours worked*

Question 2.1: Do you compile national accounts data in terms of hours worked for the total economy? If not, explain why. If yes, do you transmit this data to the OECD in the format of table 0303 (see attached)? If not, why?

Question 2.2: what is the main original source for hours worked in the national accounts (i.e: administrative source --e.g. official working hours--, Labour Force Survey, other)? Describe this source and its coverage. Describe the ability of this source to reflect the ILO definition of hours worked (see paragraphs 17.11 of the SNA). Describe different sources if different sources are needed to evaluate different parts of the employed population, in particular, if necessary, differentiate sources between employees and self-employed.

Question 2.3: describe the different adjustments made to transform the original source to adapt it to the concept of working hours in terms of national accounts. Try to separate and evaluate adjustments:

- to take into account holidays and annual leaves
- for sickness leaves,
- for strikes and temporary lay-offs
- for paid but not reported overtime
- for unpaid overtime

Question 2.4: describe the estimation of hours made for self-employed? Is a specific adjustment made for unreported overtime for self-employed people? On the contrary, if LFS data is used, do you introduce a downward adjustment to reported actual hours by self-employed?

Question 2.5: if an adjustment is made for the number of employed in relation to the unobserved economy, what assumption is made regarding the hours worked by these persons?

Question 2.6: other adjustments before final figure for national accounts annual average working hours?

*Total hours*

Question 3.1: Describe the method to obtain finally total hours

*Other issues*

Question 4.1: do you use the concept of full-time equivalent in your published data? If not do you use it in your compilation process?

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<sup>11</sup> ESA paragraphs 11.17 to 11.19 describe very precisely what is included and not included in the NA concept of employment.

**Bridge table between labour force statistics and national accounts**

Country: ??????? year  
????

**I. Employment numbers**

(1) Number of persons/jobs from the official Labour Force Statistics ?  
of which employees ?  
of which self-employed ?

**Adjustment made to adapt to NA concepts**

From stock to annual flows (averages) ?  
From jobs/persons concept to jobs/persons concept ?  
Adjustment for economic territory  
    *Military* ?  
    *Other collective households not included in (1)* ?  
    *Territories not covered by (1)* ?  
    *Residents working outside the economic territory (-)* ?  
    *Non residents working inside the economic territory (+)* ?

Adjustment for unobserved economy ?

Other adjustments ?

(2) Number of persons/jobs in the national accounts framework ?

**II. Average Annual Hours worked**

(3) Main original number from Labour Force Statistics ?

Adjustments made on original source  
    To take into account annual leaves and holidays ?  
    For sickness leaves ?  
    For strikes and temporary lay-offs ?  
    For paid but unreported overtime ?  
    For unpaid overtime ?

Other adjustments ?

(4) National Accounts annual average hours ?

**III. Total hours worked**

(2) \* (4) = ?

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Appendix 1

Table 0303 of OECD/Eurostat questionnaire

Table 0303

Questionnaire "SNA 93 / ESA 95"

Labour input<sup>(1)</sup>

country:

year:

unit	employ.			FTE			hours worked		
	total	employees	self-employed	total	employees	self-employed	total	employees	self-employed
	ETO	EEM	ESE	ETO	EEM	ESE	ETO	EEM	ESE
code of industries	TSD PER			TSD FTE			TSD HRS		
	1=2+3	2	3	4=5+6	5	6	7=8+9	8	9
AYA									
AYB									
AYC									
AYCA									
AYCB									
AYD									
AYDA									
AYDB									
AYDC									
AYDD									
AYDE									
AYDF									
AYDG									
AYDH									
AYDI									
AYDJ									
AYDK									
AYDL									
AYDM									
AYDN									
AYE									
AYF									
AYG									
AYH									
AYI									
AYJ									
AYK									
AYL									
AYM									
AYN									
AYO									
AYP									
AYQ									
TA31									

**Appendix 2**

Annual hours worked as published in the OECD employment outlook

See table F in

**<http://www.oecd.org/dataoecd/42/55/32494755.pdf>**

## Appendix 3

### INTERNATIONAL COMPARISONS OF LABOUR PRODUCTIVITY LEVELS - THE OECD APPROACH TO ESTIMATION

Dirk Pilat<sup>12</sup>

#### Introduction

1. International comparisons of productivity growth can give useful insights in the growth process, but should ideally be complemented with international comparisons of income and productivity levels. An examination of income and productivity levels may give insights into the possible scope for further gains, and also places a country's growth experience in the perspective of its current level of income and productivity. OECD has published estimates of labour productivity levels in various studies (*e.g.* Englander and Gurney, 1994; Pilat, 1997; Scarpetta, *et al.*, 2000; OECD, 2003), but has not yet produced official estimates of labour productivity levels. A table with estimates of productivity has been made available at the OECD Internet site on productivity, however, at: [www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity)

2. With the release of OECD estimates of productivity growth in the OECD Productivity Database in March 2004, attention has turned to the measurement of official OECD estimates of productivity levels, since these serve as a yardstick of economic performance in many OECD countries. Several statistical agencies and international organisations, including Eurostat, the UK Office of National Statistics, the US Bureau of Labor Statistics, and the International Labour Organisation, now release estimates of labour productivity levels, as do some academic institutions, such as the Groningen Growth and Development Centre, and some private institutions, such as the Conference Board. In several instances, notably in the case of Eurostat and the ONS, estimates of labour productivity levels serve as official yardsticks of economic performance and are used to measure progress with regards to explicit policy targets.

3. Given the importance attached to labour productivity levels, it is unfortunate that there is still considerable variation in the currently available estimates. Primarily, this seems due to differences in the choice of basic data and methodology. Indeed, much of the differences can be brought back to how different organisations select and combine information on the three components of labour productivity levels at the economy-wide level. These components are gross domestic product, labour input and a conversion factor for total GDP (typically a purchasing power parity or PPP) that is needed to translate output in national currency units to a common currency.

4. This note briefly discusses some of the main measurement issues for these components, as well as the different data choices that can be made. It focuses on the current OECD approach to measuring labour productivity levels, but also refers to other possible approaches, where appropriate. The discussion focuses on comparisons of labour productivity at the economy-wide level; the estimation of productivity levels for individual industries raises additional measurement issues that go beyond the scope of this paper.<sup>13</sup>

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<sup>12</sup> This note reflects work in several parts of the OECD, notably in the context of national accounts, labour statistics, purchasing power parities as well as productivity statistics and analysis.

<sup>13</sup> A forthcoming OECD reader discusses these issues in greater detail.

**Output: comparability and data choices**

5. Most comparisons of labour productivity levels focus on GDP as the measure of output. Other measures of aggregate output, such as GNP or national income, have also been used in a few studies, but are not considered here. The measurement and definition of economic output is treated systematically across countries in the 1993 System of National Accounts (SNA 93). Most countries in the OECD area have now implemented the 1993 SNA, Turkey being the only exception, which implies that its level of GDP is likely to be somewhat understated relative to other OECD countries. Despite the harmonisation of GDP estimates through the 1993 SNA, there are some differences in estimation methods across countries, however (Ahmad, *et al.*, 2003). These typically have only a small effect on growth rates, but may be substantially more important for comparisons of output and productivity levels. Some of the main differences that are known to affect GDP levels are the following (Ahmad, *et al.*, 2003):

- ***Expenditure on military equipment.*** The coverage of government investment in the US National Income and Product Accounts (NIPA) is more extensive than that recommended by the SNA, since it includes expenditures on military equipment (aircraft, ships, missiles) that are not considered assets by the SNA. The national accounts in most other OECD countries strictly follow the SNA in this matter. As the amount of public investment affects GDP, this results in a statistical difference in the measurement of GDP. Convergence on this issue is expected in the next edition of the SNA, in 2008. In the meantime, the OECD publishes data in its Annual National Accounts Database for the United States which adjust for this difference.
- ***Financial Intermediation Services.*** Most banking services are not explicitly charged. Thus, in the SNA, the implicit production of banks is estimated using the difference between interests received and paid. All OECD member countries have estimated this part of bank production, known as “Financial Intermediation Service Indirectly Measured” or “FISIM”. While it is relatively straightforward to recognise and estimate FISIM, the key problem is breaking it down between final consumers (households) and intermediate consumers (business and government). Only the first part has an overall impact on GDP. In the United States, Canada and Australia, such a breakdown has been estimated in the national accounts for some time, in accordance with the SNA. In Europe and Japan, the implementation of a breakdown between final and intermediate consumers has been delayed. The recent comprehensive revision of the US accounts has significantly reduced the difference in GDP levels linked to this factor to just over 1% of GDP, roughly halving the impact on growth. The EU member states and Japan have announced that they will implement the allocation of FISIM in their accounts, starting in 2005. Preliminary estimates suggest that European GDP levels would increase by approximately 1.3%, an amount close to the impact in the United States. This methodological difference should thus be mostly eliminated in 2005, but does affect current comparisons of GDP and productivity levels.
- ***Software investment.*** Another significant issue in the comparability of GDP concerns the measurement of software. The 1993 SNA recommended that software expenditures be treated as investment as long as the acquisition satisfied conventional asset requirements. This change added nearly 2% to GDP for the United States, around 0.7% for Italy and France, and about 0.5% for the United Kingdom. Doubts on the comparability of these data were raised when comparing “investment ratios”, which are defined as the share of software expenditures that are recorded as investment to total expenditures in software. These ratios range from under 4% in the United Kingdom to over 70% in Spain (Lequiller, *et al.*, 2003; Ahmad, 2003). *A priori*, one would expect that these are roughly the same across OECD countries. An OECD-Eurostat Task Force confirmed that differences in estimation procedures contributed significantly to the differences in software capitalisation rates, and a set of recommendations describing a harmonised method for

estimating software were formulated (Lequiller, *et al*, 2003; Ahmad, 2003). Most of these recommendations will be implemented by countries, but this will only happen gradually. Differences in software measurement will therefore continue to have an impact on the comparability of GDP levels for some time to come.

- ***The informal economy.*** Another factor that may influence the comparability of GDP across countries is size of the non-observed economy. In principle, GDP estimates in the national accounts take account of this part of the economy. In practice, questions can be raised about the extent to which official estimates have full coverage of economic activities that are included in GDP according to the SNA, or to which extent there some under-reporting is involved. Large differences in coverage could substantially affect comparisons of productivity levels.

6. It is not clear, *a priori*, how large the impact of these, and possible other, differences is on GDP levels. What is clear, however, is that there is a margin of uncertainty associated with the comparability of levels of GDP across countries. Consequently, there is also a range of uncertainty associated with estimates of productivity levels; small differences between countries (of a few percentage points) will obviously fall within this range of uncertainty. This is important in interpreting estimates of productivity levels; countries within a small range of income and productivity levels may not have income and productivity differences that are statistically or economically significant (Schreyer and Koechlin, 2002; Van Ark, 2004).

7. The data choices for GDP are fairly uniform across different sources. In the OECD estimates of productivity levels, data on GDP are derived from OECD's *Annual National Accounts* (ANA). The data from ANA are based on OECD's annual national accounts questionnaire to OECD member countries. The data resulting from this questionnaire may differ somewhat from national sources and are more comparable across countries than those derived from OECD's quarterly national accounts (or the *OECD Economic Outlook* database), thanks to some small methodological adjustments that are made. For example, the US GDP estimates are adjusted for expenditure on military equipment, as discussed above. However, the differences with other OECD sources, such as the *Quarterly National Accounts* and the *Economic Outlook* database, are minor for most countries.

8. For two countries, Australia and New Zealand, the OECD's Annual National Accounts provide GDP estimates for fiscal years. Since comparisons of productivity levels ideally have to correspond to the same (calendar) year, OECD currently derives GDP data for these countries from the OECD Quarterly National Accounts, as this source also provides data for calendar years.

## **Labour input: comparability and data choices**

### ***Employment***

9. Equally important for international comparisons of productivity levels are comparable measures of labour input. In most comparisons of labour productivity levels, labour input is measured along only two dimensions: the number of persons employed and the total number of hours worked of all persons employed.<sup>14</sup>

10. Basic data for employment can be derived from several sources, including administrative records, labour force surveys and establishment or enterprise-based surveys. Labour force surveys are typically conducted to provide reliable information about personal characteristics of the labour force, such as

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<sup>14</sup> A possible third dimension concerns labour composition. This dimension is currently not considered in the OECD approach.

educational attainment, age, or the occurrence of multiple job holding, as well as information about the jobs (*e.g.* hours at work, industry, occupation and type of contract). Compared with most other statistical sources on employment, labour force surveys are quite well standardised across OECD countries as most countries collect their numbers on the basis of agreed guidelines, and therefore they pose few problems for international comparisons. In addition, labour force surveys have fairly comprehensive coverage of the economy. However, they are based on a national concept, which implies that they exclude non-resident workers (commuters) that are quite important for some OECD countries. Moreover, they may have lower and upper age thresholds and may exclude institutional households. Despite these shortcomings, labour force surveys are often an important source of information for comparisons of productivity levels for the aggregate economy.

11. The main difficulty with employment estimates from labour force surveys is that the data are not necessarily consistent in coverage with other data needed, notably GDP and hours worked. Labour force surveys are mostly defined within geographic boundaries, whereas, for example, national accounts are defined within economic boundaries. This implies, for example, that a country's military bases and diplomatic premises on foreign soil are part of its economic territory, and that the residence of an enterprise is determined according to its "centre of economic interest".

12. A second major source of employment data is therefore the national accounts. Following the introduction of SNA 1993/ESA 1995 many countries now provide data on employment in the framework of the national accounts. In principle, national accounts information on employment is preferable over labour force surveys, due to the conceptual issues discussed above and since the national accounts are likely to integrate a wider range of basic source data on employment.

13. In practice, however, the concepts and actual compilation of the national accounts estimates of employment are not yet as well standardised as labour force surveys. One issue is conceptual; most European countries provide data on persons employed in their national accounts, as is also the case with the labour force surveys. In several other OECD countries, including Austria, Canada, Greece, Japan, the United Kingdom and the United States, the national accounts data on employment refers to the number of jobs, which is closer to the concept used in establishment or enterprise statistics. This conceptual difference can be quite important for the resulting estimate of employment, notably in countries with a high rate of multiple job-holding, such as the United States.

14. Previous OECD estimates of productivity levels have primarily used the labour force surveys as the preferred source of employment data for productivity comparisons at the aggregate level (see Scarpetta, *et al.*, 2000; OECD, 2003). This was driven by two motivations: 1) the degree of international harmonisation of labour force surveys as regards estimates of employment; 2) the link between employment estimates of labour force surveys and other population and workforce characteristics, such as working-age population and labour force. This link allows estimates of GDP per hour worked to be combined with estimates of GDP per capita, GDP per person of working-age and GDP per person in the labour force.

15. Recently, OECD has decided to move to the national accounts as the preferred source of employment data. This methodological change was driven by three motivations:

- (1) *Consistency between GDP and employment.* Employment estimates from the national accounts are likely to be more consistent with GDP estimates than employment estimates from labour force surveys, since the employment estimates may incorporate information from other sources of employment. For example, in several countries, *e.g.* Italy, GDP includes an adjustment for the informal economy. This adjustment is also reflected in the employment estimate in the national accounts. The employment number in the labour force survey is

substantially lower; using this number for comparisons of productivity levels would lead to an upward bias in the Italian level of labour productivity.

- (2) *Conceptual*. The national accounts are more appropriate from a conceptual point of view, since they use economic boundaries instead of national boundaries.
- (3) *Link to OECD estimates of productivity growth*. The OECD estimates of productivity growth are also closely linked to the national accounts.

16. Despite this change in the source of employment data for OECD estimates of productivity levels, it is important to be cognisant of the statistical problems that are still associated with national accounts information on employment. The first important limitation is that only ten OECD countries currently include data on total hours worked in the framework of national accounts. These are: Canada, Denmark, Finland, France, Germany, Greece, Hungary, Korea, Norway and Sweden. The inclusion of such data is quite new and requires further investigation before they can be used for international comparisons. This investigation is under way. Currently, the OECD uses data on hours worked that are collected for the *OECD Employment Outlook* from a variety of sources, including labour force surveys, and combines these with employment figures from national accounts to derive an estimate of total hours worked (see below). In several cases, these estimates of hours worked are consistent with the national accounts (OECD, 2004). A second problem is that little is known about how countries currently integrate different sources of employment information in the national accounts. It is not clear whether this is done in a harmonised way across countries. Third, some countries supply data on persons employed, others on jobs or full-time equivalents.

17. Work is currently underway in several organisations, including the OECD and Eurostat, to examine and improve the employment measures that are included in the national accounts. This work will hopefully reduce some of the uncertainties that are associated with employment estimates in the national accounts, and the adjustments that countries make in integrating different sources of employment information.

### ***Hours worked***

18. Estimates of levels of GDP per hour worked require estimates of total hours worked that are consistent across countries. As discussed above, this consistency is currently achieved by matching the hours worked per person that are collected by the OECD for its annual *OECD Employment Outlook* with the national accounts measure of employment for each individual country. Estimates of average hours actually worked per year per person in employment are currently available on an annual basis for 27 OECD countries (see OECD (2004), Statistical Annex Table F). The OECD Productivity Database includes, in addition, hours of work per employee for Hungary and Korea. These estimates are available from National Statistical Offices for 20 countries, 7 of which are fully consistent with National Accounts concepts and coverage.

19. To develop these estimates, countries use the best available data sources for different categories of workers, industries and components of variation from usual or normal working time (e.g. public holidays, annual leave, overtime, absences from work due to illness and to maternity, etc.). For example, in 2 countries (Japan and United States) actual hours are derived from establishment surveys for regular or production/non-supervisory workers in employee jobs and from labour force surveys (LFS) for non-regular or managers/non-supervisory employees, self-employed, farm workers and employees in the public sector. In 3 other countries (France, Germany and Switzerland), the measurement of annual working time relies on a component method based on standard working hours minus hours not worked due to absences plus hours worked overtime. Standard working hours are derived from an establishment survey (hours offered), an

administrative source (contractual hours) and the labour force survey (normal hours), respectively. The coverage of workers is extended using standard hours reported in labour force surveys or other sources as hours worked overtime. Vacation time is either derived from establishment-survey data on paid leave or the number of days of statutory leave entitlements. Hours lost due to sickness are estimated from the number of days not worked from social security registers and/or health surveys.

20. On the other hand, the national estimates for 12 more countries (i.e. Australia, Canada, Czech Republic, Finland, Iceland, Mexico, New Zealand, Poland, Slovak Republic, Spain, Sweden and United Kingdom) rely mainly on labour force survey results. Annual working hours are derived using a direct method annualising actual weekly hours worked, which cover all weeks of the year in the case of continuous surveys. But, for labour force surveys with fixed monthly reference weeks, this method results in averaging hours worked during 12 weeks in the year and, therefore, necessitates adjustments for special events, such as public holidays falling outside the reference week (i.e. Canada and Finland). Finally, estimates of annual working time for 8 other EU member states (Austria, Belgium, Denmark, Greece, Ireland, Italy, the Netherlands and Portugal) are derived by the OECD Secretariat by applying a variant of the component method to the results of the Spring European Labour Force Survey (ELFS).

21. Two other considerations should be kept in mind. First, annual working-time measures are reported either on a job or on a worker basis. To harmonise the presentation, annual hours worked measures can be converted between the two measurement units by using the share of multiple job holders in total employment, which is available in labour force surveys, albeit no further distinction is possible between second and more jobs.<sup>15</sup> This difference is particularly important in matching annual working time estimates to employment estimates. Some countries provide employment estimates in the national accounts on the basis of jobs; for these countries, including the United States, it is important to ensure that the measure of annual working-time per person that is used reflects jobs instead of workers.

22. Second, given the variety of data sources, of hours worked concepts retained in data sources, and of measurement methodologies (direct measures or component methods<sup>16</sup>) to produce estimates of annual working time, the quality and comparability of annual hours worked estimates are constantly questioned, and are subject to at least two probing issues:

- Labour force survey-based estimates are suspected of over-reporting hours worked compared to work hours reported in time-use surveys, in particular for those working long hours, like managers and professionals.
- Employer survey-based estimates do not account for unpaid overtime hours and are sometimes suspected of under-reporting hours worked, with consequences on productivity levels and growth.

23. The comparability of measures of hours worked across OECD countries thus remains an issue, and work is currently underway, notably through the Paris Group, the UN city group on Labour and Compensation, to further improve the available measures of hours worked.

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<sup>15</sup>. For example, the BLS-Office of Productivity and Technology (OPT) estimates of annual hours of work for the United States are reported on a (per) job basis and are later converted by the OECD Secretariat to a per worker basis by multiplying the job-based annual hours of work by (1 + CPS based share of multiple jobholders in total employment).

<sup>16</sup>. However, both methods can be summarised by the following identity: Annual hours per worker = Standard weekly hours worked x Number of weeks actually worked over the year = Weekly hours actually worked x 52 weeks, considering weekly reference period for reporting hours worked.

### **Purchasing power parities for international comparisons**

24. The comparison of income and productivity across countries also requires purchasing power parity (PPP) data for GDP. Exchange rates are not suitable for the conversion of GDP to a common currency, since they do not reflect international price differences, and since they are heavily influenced by short-term fluctuations. The estimates used by the OECD are derived from its joint programme with Eurostat and refer to current-price PPPs (Schreyer and Koechlin, 2002). The OECD does not recommend the use of PPP-adjusted estimates of GDP in time series, because of the difficulty to obtain PPPs that are consistent over time. This is why only **one year** of productivity **level** comparisons is included in the OECD Productivity Database. Users interested in adding a time dimension to this one year level comparison should use the corresponding database on productivity growth, which gives appropriate indices of productivity growth for individual OECD countries over a long time period.

### **OECD estimates of labour productivity levels**

25. Clearly, data for international comparisons of income and productivity are not perfect and some choices between different sources have to be made. In the OECD approach, GDP is derived from the OECD ANA database, which incorporates the latest comparative information on GDP from OECD member countries. Data on employment for most countries are also from the OECD national accounts as these should have a better correspondence to the estimates of GDP. For a limited number of countries, no appropriate employment estimates are currently available from the national accounts, in which case employment is derived from the OECD Labour Force Statistics. To convert GDP to a common currency, the OECD uses current PPPs, which are developed in the OECD-Eurostat PPP programme.

26. Table 1 presents the resulting productivity level estimates for 2002. In 2002, France, Ireland, Belgium, the Netherlands, Norway and Luxembourg had levels of GDP per hour worked that were higher or comparable to the United States.

## OECD estimates of labour productivity for 2002, 3 September 2004

	GDP, national currency units	Source for GDP	PPP for total GDP, 2002	GDP, million USD	Employment (1000 persons) <sup>1</sup>	Source for employment	Annual average hours worked, OECD Employment Outlook <sup>2</sup>	Total hours worked (million hours)	GDP per hour worked, USD	GDP per hour worked, USA=100
	(1)		(2)	(3)	(4)		(5)	(6)	(7)	(8)
Australia	736,589	QNA	1.36	542,498	9,295	LFS	1824	16,954	32.0	77
Austria	218,333	ANA	0.939	232,509	4,067	ANA	1567	6,372	36.5	88
Belgium	260,011	ANA	0.908	286,311	4,136	ANA	1547	6,398	44.7	108
Canada	1,140,428	ANA	1.19	954,370	15,673	ANA	1731	27,130	35.2	85
Czech Republic	2,275,609	ANA	14.77	154,116	4,765	ANA	1980	9,435	16.3	40
Denmark	1,360,710	ANA	8.66	157,147	2,782	ANA	1462	4,067	38.6	94
Finland	139,803	ANA	1.01	137,799	2,360	ANA	1727	4,075	33.8	82
France	1,526,821	ANA	0.913	1,673,068	24,887	ANA	1437	35,763	46.8	113
Germany	2,107,300	ANA	0.987	2,134,566	38,696	ANA	1443	55,838	38.2	93
Greece	141,334	ANA	0.700	201,881	3,925	ANA	1928	7,567	26.7	65
Hungary	16,740,421	ANA	118.63	141,119	3,871	ANA	1766	6,835	20.6	50
Iceland	778,466	ANA	95.39	8,161	157	LFS	1812	284	28.7	70
Ireland	129,344	ANA	1.01	127,599	1,766	ANA	1666	2,943	43.4	105
Italy	1,260,428	ANA	0.848	1,486,100	24,009	ANA	1599	38,390	38.7	94
Japan	498,102,000	ANA	146	3,421,937	65,299	ANA	1798	117,418	29.1	71
Korea	684,263,469	ANA	736	930,102	22,151	ANA	2410	53,384	17.4	42
Luxembourg	22,506	ANA	1.02	22,039	288	ANA	1613	464	47.5	115
Mexico	6,256,382	ANA	6.65	941,362	40,117	ANA	1888	75,741	12.4	30
Netherlands	444,649	ANA	0.949	468,434	8,349	ANA	1338	11,171	41.9	102
New Zealand	127,815	QNA	1.46	87,719	1,885	LFS	1816	3,423	25.6	62
Norway	1,522,176	ANA	9.44	161,206	2,317	ANA	1342	3,110	51.8	125
Poland	781,112	ANA	1.88	414,813	14,590	ANA	1958	28,567	14.5	35
Portugal	129,557	ANA	0.677	191,231	5,115	LFS	1697	8,680	22.0	53
Slovak Republic	1,096,384	ANA	16.63	65,916	2,016	ANA	1979	3,989	16.5	40
Spain	696,208	ANA	0.766	908,464	16,343	ANA	1813	29,629	30.7	74
Sweden	2,347,400	ANA	9.65	243,342	4,353	ANA	1581	6,882	35.4	86
Switzerland	427,787	ANA	1.91	223,782	4,172	ANA	1555	6,487	34.5	84
Turkey	277,574,057	ANA	618281	448,945	21,854	LFS	1930	42,178	10.6	26
United Kingdom	1,043,306	ANA	0.630	1,655,369	29,864	ANA	1692	50,530	32.8	79
United States	10,429	ANA	1.00	10,429,000	147,721	ANA	1709	252,455	41.3	100
OECD				28,850,907	526,820		1,739	916,161	31.5	76
G7				21,754,411	346,149		1,668	577,524	37.7	91
North America				12,324,732	203,511		1,746	355,326	34.7	84
OECD-Europe (3)				11,094,974	202,826		1,615	327,477	33.9	82
EU-19 (4)				10,701,824	196,180		1,619	317,596	33.7	82
Euro-zone (5)				7,870,001	133,940		1,548	207,291	38.0	92

Notes: (1) Employment estimates for Austria, Canada, Greece, Japan, the United Kingdom and the United States refer to jobs.

(2) The estimate of annual hours worked for the United States refers to hours worked per job.

(3) Excluding Turkey.

(4) All EU members that are also OECD member countries.

(5) Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.

Source: OECD estimates.

27. These estimates still require further work in the following ways:

- (1) For a number of countries (Austria, Canada, Greece, Japan, United Kingdom and the United States), the employment estimate in the national accounts reflects jobs instead of persons employed. This problem can be addressed in two ways, namely by a) applying a corresponding estimate of hours per job to generate a suitable estimate of total hours worked (this is currently the procedure used for the United States); or b) developing estimates of persons employed for the national accounts for all countries, that can be used in combination with estimates of annual hours worked per person.
- (2) The estimates of annual hours worked per person for several OECD countries are not yet consistent with the national accounts. Data on hours worked currently reach the OECD through two data collections. First, 29 OECD countries currently provide data on hours worked to the annual data collection for the *OECD Employment Outlook*; 7 of these countries provide the OECD with estimates of annual hours worked that are consistent with national accounts concepts and coverage. Secondly, ten countries provide estimates of total

hours worked in the framework of the national accounts for inclusion in OECD's Annual National Accounts. Further investigation of these estimates of hours worked is needed, which is planned for the next meeting of the Paris Club.

- (3) The employment estimates that are currently incorporated in the national accounts are not necessarily consistent across countries or with the corresponding estimate of GDP. Addressing this problem will require further statistical work, notably in the OECD National Accounts meeting of October 2004.
- (4) For analytical purposes, it is important that estimates of GDP per hour worked are combined with estimates of GDP per capita and estimates of GDP per person in the labour force and GDP per person of working age. The national accounts currently often do not include the necessary information on working-age population and labour force, and such data have commonly been derived from labour force statistics. The OECD's change in method towards the national accounts as the main source of employment information requires that the link between labour force statistics (i.e. national concepts) and national accounts estimates of productivity (i.e. domestic concepts) is addressed.

28. Finally, it is important to reiterate once more that the basic information for comparisons of productivity levels across countries will require further work to enhance international comparability. This is both the case for GDP estimates, as discussed above, and also for estimates of labour input. In the mean time, comparisons of productivity levels should be interpreted with care and small differences between countries should be considered as falling in a margin of uncertainty, which may not be statistically or economically significant.

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## Appendix 4

### U.S. HOURS WORKED DATA

August 2004

#### Introduction:

1. The primary source of most official labor data in the United States is the Bureau of Labor Statistics (BLS). BLS collects data and prepares estimates of employment, unemployment, average weekly hours, average hourly earnings, hours worked, and many other measures of labor force activity. The Bureau of Economic Analysis (BEA) prepares a limited number of measures of labor force activity (including hours worked by full-time and part-time employees) that are consistent with wage and salary estimates presented in the U.S. national income and product accounts (NIPAs). This paper will describe the derivation of hours worked by BLS and BEA and the differences between the two measures.

#### BLS Hours Worked:

2. BLS collects data on labor hours in two monthly surveys - the Current Employment Statistics survey (CES) of establishments and the Current Population Survey (CPS) of households.<sup>17</sup> The CES collects data on employment for all employees and earnings and hours **paid** for production and nonsupervisory workers from a sample of nonfarm business establishments. The CES employment data are based on jobs rather than persons. The CES sample includes about 160,000 business and government agencies representing approximately 400,000 establishments. The CES data are benchmarked annually. The benchmark levels are primarily based on administrative records of employees covered by state unemployment insurance tax records. The CPS, the U.S. labor force survey, collects information on employment, hours **worked**, and demographics for all persons, including employees, proprietors, and unpaid family workers. The CPS sample includes approximately 60,000 households. Data from the survey are used to construct the official measure of unemployment. There is no direct benchmark for the CPS employment data. Adjustments to the underlying population base are made annually using intercensal estimates and every ten years using the decennial census.

3. The BLS constructs a quarterly measure of hours worked for all persons for use in measuring major sector productivity. The primary source of hours information for the productivity program is the monthly establishment survey, the CES. However, for measuring productivity, estimates of hours worked are preferable to estimates of hours paid. Thus, the CES data are converted to an hours worked basis using a ratio of hours worked to hours paid. Information from the Employment Cost Index (ECI) of the BLS National Compensation Survey program is used for 2001 forward to link to the annual Hours at Work Survey (HWS), which was terminated after 2000, and is used for years prior to 2001. The ratios of hours at work to hours paid are currently constructed from the ECI data as the ratio of the value of paid work to the sum of the value of paid leave and paid work.<sup>18</sup>

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<sup>17</sup> See BLS website for a detailed discussion of these surveys, [www.bls.gov](http://www.bls.gov).

<sup>18</sup> Following collection of data for 2000, the hours-at-work survey was discontinued. BLS has since investigated alternative sources for these estimates. The Employment Cost Index (ECI) of the BLS National Compensation Survey is designed to measure the hourly cost of wages and benefits for a set of occupations within establishments. One portion of the hourly costs is the value of paid leave. To determine the value of paid leave, information on work schedules, overtime hours, leave plans, paid holidays and actual sick leave are collected. While the ECI data were not designed for this purpose, ratios of hours at work to hours paid can be constructed from the ECI data as the ratio of the value of paid work to the sum of the value of paid leave and paid work. These ratios are empirically very similar to the hours-at-work survey ratios, are timelier and provide quarterly

4. For measuring the hours worked of all persons, the CES data also must be appended to incorporate the hours of nonproduction and supervisory workers, as well as data on employees of farms, proprietors, and unpaid family workers that are not available from the CES. BLS introduced a new method of constructing estimates of hours for nonproduction and supervisory workers in the August 10, 2004 Productivity and Costs News Release.<sup>19</sup> In this new method, data from the CPS are used to construct a ratio of the average hours worked by nonproduction and supervisory workers relative to the average hours worked by production and nonsupervisory workers. This ratio is then used with the CES information to arrive at a measure of total hours worked. The historical time series have been revised to incorporate this change. Data on employees of farms, proprietors, and unpaid family workers are taken directly from the CPS. Government enterprise hours are developed from BEA estimates of government enterprise employment and CPS data on average weekly hours.

#### **BEA Hours Worked by Full-Time and Part-Time Employees:**

5. BEA publishes annual estimates of hours worked by full-time and part-time (FTPT) employees by industry sector. The estimates for hours worked are the product of industry FTPT employment, average weekly hours, the number of weeks in a year (52), and the ratio of hours worked to hours paid.

6. The principal source of nonfarm industry employment data is tabulations of employees covered by state unemployment insurance from BLS. BEA also includes estimates of employees not covered by state unemployment insurance. The noncovered employment is comprised of two elements: (1) presumed noncovered employment from BLS; and (2) an estimate of employment associated with the underreporting of wages and salaries by some nonfarm sole proprietorships, partnerships, and small corporations and the nonfiling of tax returns by some sole proprietorships and partnerships (with employees). Employment estimates for private households are derived from the CPS. Farm employment estimates are derived from tabulations from the U.S. Department of Agriculture.

7. Most nonfarm average weekly hours estimates are from the BLS CES program, which provides monthly survey data on the average weekly hours of production and nonsupervisory workers in nonagricultural establishments. Estimates from the CPS are used for agricultural and private household average weekly hours.

8. The average weekly hours measured by the CES program are hours paid rather than hours worked. Estimates from the BLS hour-at-work survey are used to convert the hours paid of nonagricultural workers to an hours-at-work basis for 2000 and before. This survey was discontinued after the collection of data for 2000. For 2001 forward, BEA has used the BLS ratios of hours worked to hours paid derived from the ECI to convert the hours estimates.

9. Note that BEA hours worked estimates are for full-time and part-time workers only. The hours worked by self-employed persons and unpaid family workers are **not** included. The primary use of BEA hours data is to calculate average hourly wages or average hourly compensation.

#### **BEA versus BLS Hours Worked:**

10. The BLS measure of total hours worked (including all sectors) is a more comprehensive measure than the BEA measure of hours worked. The BLS measure includes self-employed persons and unpaid

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information on changes in the ratios. These estimates have been used by BLS to derive hours worked for 2001 forward.

<sup>19</sup> An article discussing these new measures and the effects of this change was published in the April 2004 issue of the *Monthly Labor Review*.

family workers. However, it does not include an estimate of the hours worked for the employment associated with the underreporting or nonreporting of wages and salaries. The BEA hours worked measure is only for FTPT employees and excludes self-employed persons and unpaid family workers. However, the BEA measure includes an estimate for the hours worked from the employment associated with underreporting or nonreporting of wages and salaries.

11. Perhaps the most complete hours worked measure for calculating the productivity of the entire U.S. economy would be a combination of BLS total hours worked (including all sectors) plus the BEA measure of the hours worked from the employment associated with the underreporting or nonreporting of wages and salaries. BEA and BLS staff are currently discussing the possibilities of developing such a measure.

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