

## ANNEX 2: OECD ESTIMATES OF LABOUR PRODUCTIVITY LEVELS

### Introduction

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.* Scarpetta, *et al.*, 2000; OECD, 2003), and has released estimates of productivity on the OECD Internet site, at the following address: [www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity).

Since the release of OECD estimates of productivity growth in the OECD Productivity Database in March 2004 (*see* Annex 1), more attention has turned to the measurement of productivity levels, since these are essential to assess the state of the convergence or divergence of economic performances across countries. Several statistical agencies and international organisations, including Eurostat, the UK Office for National Statistics (ONS), the US Bureau of Labour 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.

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. 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.

This annex 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 annex.

### Output: comparability and data choices

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). All countries in the OECD area have now implemented the 1993 SNA, except Turkey, which implies that its level of GDP is likely to be somewhat understated relative to other OECD countries. However, despite the harmonisation of GDP estimates through the 1993 SNA, there are some differences in estimation methods across countries (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 2008 edition of the SNA. 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. A breakdown between final and intermediate consumers has been implemented in most European countries, although the number of years of historical data that has also been revised varies; nevertheless, there are still a few countries for which the allocation of FISIM has not yet been implemented.

**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). Many of these recommendations have begun to be implemented by some countries but differences in software measurement will nevertheless continue to have an impact on the international 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.

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).

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 the 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.

For two countries, Australia and New Zealand, the OECD's Annual National Accounts provides GDP estimates for fiscal years. This creates an inconsistency with other countries, since comparisons of productivity levels ideally should correspond to the same (calendar) year. However, this problem is considered relatively limited and no adjustment is made.

## Labour input

Comparable measures of labour input are of great importance for international comparisons of productivity levels. The OECD estimates of labour productivity levels are typically based on the same data choices as the OECD estimates of labour productivity growth.<sup>1</sup> Annex 1 therefore provides a more detailed discussion of the measures of labour input used in the calculations of productivity levels.

## Purchasing power parities for international comparisons

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 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). For the current set of comparisons, the most recent PPP benchmark comparison is used as the basis for the estimates.

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 for 2006, as of December 2007

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,

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1. A number of OECD countries include estimates of hours worked in their national accounts. To the extent possible, these estimates are incorporated in the OECD estimates of productivity levels, as presented in Annex Table 2. They are fully incorporated in the OECD estimates of productivity growth and in the data choices for those calculations, as shown in Annex Table 1.

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. Estimates of hours worked are either from the national accounts, or from the OECD Employment Outlook, as shown in Annex 1. To convert GDP to a common currency, the OECD uses current PPPs, which are developed in the OECD-Eurostat PPP programme.

Annex Table 2 presents the data choices and the resulting productivity level estimates for 2006. These estimates still require further work in the following ways:

1. For several OECD countries, the estimates of annual hours worked per person are not yet consistent with the national accounts. Currently, the OECD collects series on hours worked through two data collections, the *OECD Employment Outlook* and the *OECD Annual National Accounts*. On one hand, all OECD countries but one provide data on hours worked for the annual publication *OECD Employment Outlook* and few of these countries supply estimates of annual hours worked that are consistent with the national accounts concepts and coverage. On the other hand, a large number of OECD countries also provide estimates of total hours worked in the framework of the national accounts for inclusion in the OECD's *Annual National Accounts*. Further investigation of these estimates of hours worked is needed.
2. 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.

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.

Table 2. OECD estimates of labour productivity levels for 2006 (as of December 2007)

	GDP, million national currency units, based on ANA	PPP for total GDP, 2006	GDP, million USD	Employment (1000 persons) <sup>1</sup>	OECD source for employment <sup>2</sup>	Annual average hours worked, corresponding to employment estimates <sup>3</sup>	OECD source for average hours worked <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 <sup>4</sup>	1,038,652	1.41	735,330	10,226	ANA / LFS	1,728	ABS	17,675	41.6	83
Austria	257,897	0.87	295,624	4,228	ANA	1,659	ANA	7,014	42.1	84
Belgium	316,622	0.90	353,479	4,278	ANA	1,571	EMO	6,721	52.6	104
Canada	1,442,463	1.20	1,197,776	16,758	ANA / LFS	1,736	ANA / EMO	29,094	41.2	82
Czech Republic	3,231,576	14.30	225,958	5,082	ANA	1,997	EMO	10,148	22.3	44
Denmark	1,642,215	8.58	191,474	2,822	ANA	1,584	ANA	4,471	42.8	85
Finland	167,062	0.97	172,399	2,441	ANA	1,716	ANA	4,189	41.2	82
France	1,791,953	0.91	1,962,072	25,278	ANA	1,555	ANA / EMO	39,297	49.9	99
Germany	2,322,200	0.88	2,631,598	39,088	ANA	1,433	ANA	56,001	47.0	93
Greece	213,985	0.70	303,605	4,700	ANA / LFS	2,052	ANA / EMO	9,645	31.5	62
Hungary	23,757,230	129.94	182,834	3,905	ANA	1,989	ANA	7,768	23.5	47
Iceland	1,141,747	104.94	10,880	170	ANA	1,794	EMO / EO	304	35.8	71
Ireland	174,343	1.01	172,820	2,042	ANA	1,640	EMO	3,350	51.6	102
Italy	1,475,401	0.87	1,699,152	24,754	ANA	1,800	ANA	44,568	38.1	76
Japan	507,754,500	124.46	4,079,511	64,179	ANA / LFS	1,784	EMO	114,520	35.6	71
Korea	847,876,400	762.02	1,112,668	23,131	ANA	2,357	ANA	54,522	20.4	41
Luxembourg	33,852	0.92	36,936	319	ANA	1,604	EMO	512	72.2	143
Mexico	9,149,911	7.22	1,267,894	42,198	ANA	1,883	EMO	79,467	16.0	32
Netherlands	534,324	0.89	597,232	8,383	ANA	1,391	EMO	11,661	51.2	102
New Zealand <sup>4</sup>	163,416	1.52	107,318	2,126	LFS	1,787	EMO	3,798	28.3	56
Norway	2,147,986	8.89	241,714	2,419	ANA	1,407	ANA	3,403	71.0	141
Poland	1,057,855	1.89	558,298	14,594	ANA	1,985	EMO	28,969	19.3	38
Portugal	155,131	0.70	220,514	5,154	ANA / LFS	1,758	EMO	9,060	24.3	48
Slovak Republic	1,636,263	17.26	94,797	2,132	ANA	1,749	ANA	3,729	25.4	50
Spain	980,954	0.76	1,294,828	19,848	ANA	1,656	ANA / EO	32,869	39.4	78
Sweden	2,899,653	9.16	316,657	4,423	ANA	1,601	ANA	7,083	44.7	89
Switzerland	486,178	1.70	285,280	4,291	ANA	1,651	ANA / EO	7,084	40.3	80
Turkey <sup>5</sup>	576,322	0.90	639,693	22,830	LFS	1,918	GGDC	43,788	14.6	29
United Kingdom	1,301,914	0.65	1,996,983	28,960	ONS	1,669	EMO	48,326	41.3	82
United States	13,132,900	1.00	13,132,900	152,621	BLS	1,708	BLS	260,631	50.4	100
OECD			36,118,223	543,380		1748		949,664	38.0	75
G7			26,699,992	351,638		1685		592,437	45.1	89
North America			15,598,570	211,577		1745		369,191	42.3	84
OECD-Europe <sup>6</sup>			13,845,133	209,311		1654		346,169	40.0	79
EU15			12,245,374	176,719		1611		284,765	43.0	85
EU19 <sup>7</sup>			13,307,260	202,431		1657		335,378	39.7	79
Euro-zone <sup>8</sup>			9,740,259	140,514		1600		224,885	43.3	86

1. The employment estimates for Austria, Canada, Greece, Japan, United Kingdom and United States refer to jobs.

2. ABS = Australian Bureau of Statistics; ANA = OECD Annual National Accounts; LFS = OECD Labour Force Statistics; EMO = OECD Employment Outlook; ONS = UK Office for National Statistics; GGDC = Groningen Growth and Development Centre; BLS = US Bureau of Labor Statistics.

3. The estimates of annual hours worked for Austria, Canada, Greece, Japan, United Kingdom and United States refer to hours worked per job. Data for France, Greece, Italy and Switzerland are estimates.

4. GDP estimates refer to fiscal years.

5. GDP for Turkey is based on the 1968 System of National Accounts.

6. Does not include Turkey.

7. All EU members that are also OECD member countries.

8. Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.

Source: OECD Productivity Database, December 2007.