

# Data Sources and Methodology of the 60-Industry Database of the Groningen Growth and Development Centre

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## *Introduction*

The 60-Industry Database of the Groningen Growth and Development Centre provides a comprehensive internationally comparable dataset on industrial performance at a detailed industry level for 26 OECD countries and Taiwan (see table 1). It enables the user to design indicators such as shares of output and employment by industry and to analyse trends in value added and labour productivity. Variables covered include current value added, value added deflators, persons engaged and hours worked for 56 industries for the period 1979-2003.<sup>1</sup>

The 60-Industry Database updates and extends previous work at the Groningen Growth and Development Centre (GGDC) and the National Institute on Economic and Social Research (NIESR) recently described in O'Mahony and van Ark (2003) (downloadable from [http://www.ggdc.net/pub/EU\\_Productivity\\_and\\_Competitiveness.shtml](http://www.ggdc.net/pub/EU_Productivity_and_Competitiveness.shtml)). For most variables and countries, the OECD STructural ANalysis (STAN) database is taken as the point of departure, which in turn is largely based on recent national accounts of individual OECD member states.<sup>2</sup> In some cases, own countries' national accounts data is directly used for reasons of greater detail or more up-to-date figures. The STAN data and those from the national accounts are complemented, updated and backdated as well as further disaggregated by the use of information from industry surveys and historical sources for individual countries to provide a comprehensive data set for the period 1979-2003. In general the method employed was to use national accounts aggregates as control totals and the other data to divide these totals into sub-industries.<sup>3</sup> In a limited number of cases, STAN and national accounts also include working hours per person employed (or per job), but for many countries alternative sources, such as labour force surveys or other labour market statistics, had to be employed to obtain these estimates.

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<sup>1</sup> Series on the number of employees and labour compensation are not available for all countries.

<sup>2</sup> See [http://www.oecd.org/document/15/0,2340,en\\_2649\\_33703\\_1895503\\_119656\\_1\\_1\\_1,00.html](http://www.oecd.org/document/15/0,2340,en_2649_33703_1895503_119656_1_1_1,00.html)

<sup>3</sup> Approximately 50 per cent of individual cells in the 60-Industry Database is directly derived from OECD STAN, whereas the other 50 per cent represents extensions.

### *Country Coverage*

Table 1 provides a list of countries covered in the database. The database covers 26 countries, of which 26 are OECD members as well as Taiwan. All 15 ‘OLD’ EU countries<sup>4</sup> are covered, and aggregate estimates for the EU as a whole are also provided.

**Table 1 List of countries in databases**

Belgium	BE	United Kingdom	UK
Denmark	DK	United States	US
Germany*	DE	Canada	CA
Greece	GR	Australia	AU
Spain	ES	Norway	NO
France	FR	Switzerland	CH
Ireland	IR	Japan	JP
Italy	IT	South Korea	SK
Luxembourg	LU	Taiwan	TA
Netherlands	NL	Czech Republic	CZ
Austria	AT	Hungary	HU
Portugal	PT	Poland	PO
Finland	FI	Slovak Republic	SL
Sweden	SW		

\*separate series are provided for West Germany for 1979-1991  
and for unified Germany from 1991-2003

### *Industry coverage*

Data are provided for 56 industries in total.<sup>5</sup> The industries are classified according to the International Standard Industrial Classification (ISIC) revision 3. This classification is very close to the European NACE rev 1 classification system. Table 2 provides a listing of the industries. The industry division is more detailed than in STAN which allows a focus on industries which are characterised by high ICT-investment shares and/or ICT-goods production. For example, additional entries were included for five of the six ICT producing industries (semiconductors, ISIC 321; communication equipment, 322, fiber optics, 313; radio and TV equipment, 323; and instruments, 331). Separate entries are also included for professional and “other” business services (ISIC 741-743 and 749) and agriculture and forestry (01 and 02).

<sup>4</sup> ‘OLD’ EU-15 refers to membership of the European Union until 30 April 2004.

<sup>5</sup> Despite the coverage of 56 industries, we have called the database “60-Industry database” as we aim to expand the industry detail a little further in the near future. For example, in due course, “Mining and quarrying” will be divided into “Mining and quarrying of energy producing materials” and “Mining and quarrying except energy producing materials”, “Food products, beverages and tobacco” will be divided into “Food products and beverages” and “Tobacco products”, “Chemicals and chemical products” will be divided into “Chemicals excluding pharmaceuticals” and “Pharmaceuticals”, “Basic metals” will be divided into “Iron and steel” and “Non-ferrous metals”, “Manufacturing nec; recycling” will be divided into “Manufacturing nec” and “Recycling”, “Electricity, gas and water supply” will be divided into “Electricity” and “Gas and water supply”.

**Table 2 Industries in the 60-Industry database**

Industry Name	ISIC rev 3
<b>TOTAL ALL INDUSTRIES</b>	<b>01-99</b>
1 Agriculture	01
2 Forestry	02
3 Fishing	05
4 Mining and quarrying	10-14
5 Food, drink & tobacco	15-16
6 Textiles	17
7 Clothing	18
8 Leather and footwear	19
9 Wood & products of wood and cork	20
10 Pulp, paper & paper products	21
11 Printing & publishing	22
12 Mineral oil refining, coke & nuclear fuel	23
13 Chemicals	24
14 Rubber & plastics	25
15 Non-metallic mineral products	26
16 Basic metals	27
17 Fabricated metal products	28
18 Mechanical engineering	29
19 Office machinery	30
20 <i>Insulated wire</i>	313
21 <i>Other electrical machinery and apparatus nec</i>	31-313
22 <i>Electronic valves and tubes</i>	321
23 <i>Telecommunication equipment</i>	322
24 <i>Radio and television receivers</i>	323
25 <i>Scientific instruments</i>	331
26 <i>Other instruments</i>	33-331
27 Motor vehicles	34
28 <i>Building and repairing of ships and boats</i>	351
29 <i>Aircraft and spacecraft</i>	353
30 <i>Railroad equipment and transport equipment nec</i>	352+359
31 Furniture, miscellaneous manufacturing; recycling	36-37
32 Electricity, gas and water supply	40-41
33 Construction	45
34 Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50
35 Wholesale trade and commission trade, except of motor vehicles and motorcycles	51
36 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52
37 Hotels & catering	55
38 Inland transport	60
39 Water transport	61
40 Air transport	62
41 Supporting and auxiliary transport activities; activities of travel agencies	63
42 Communications	64
43 Financial intermediation, except insurance and pension funding	65
44 Insurance and pension funding, except compulsory social security	66
45 Activities auxiliary to financial intermediation	67
46 Real estate activities	70
47 Renting of machinery and equipment	71
48 Computer and related activities	72
49 Research and development	73
50 <i>Legal, technical and advertising</i>	741-3
51 <i>Other business activities, nec</i>	749
52 Public administration and defence; compulsory social security	75
53 Education	80
54 Health and social work	85
55 Other community, social and personal services	90-93
56 Private households with employed persons	95

### *Variables*

The following variables are covered:

**Value added** is current gross value added measured at producer prices or at basic prices, depending on the valuation used in the national accounts. It represents the contribution of each industry to total GDP. Value added is expressed in national currencies, and the measures are therefore not corrected for differences in purchasing power of the currencies. Value added in Euro-countries before the introduction of the euro are converted to euros with the 1999 official fixed euro conversion rates (see table 3).

**Deflator** is the change in the value added deflator. It can be combined with current value added to derive quantity indices of real value added at industry level.

**Persons engaged** comprises number of workers engaged in production, including employees as well as self-employed, working proprietors and unpaid family workers.

**Hours** refers to average annual hours worked per employee or per person engaged.

**Value added volume indices** (1995 =100) (for more details see below in text on “aggregation”),

**Value added per person employed** and **value added per hour worked** are volume indices (1995 =100) and are imputed from the variables reported above.

**Table 3: 1999 Euro conversion rates (national currency/Euro)**

Austria	13.76	Ireland	0.79
Belgium	40.34	Italy	1936.27
Finland	5.95	Luxemburg	40.34
France	6.56	Netherlands	2.20
Germany	1.96	Portugal	200.48
Greece	340.75	Spain	166.39

### *Sources*

The construction of the 60-Industry Database was done in a two-step procedure to ensure national accounts compatibility. For most countries the basic point of departure is the STAN database. STAN provides data which is generally based on the latest official national accounts data of individual OECD member states. Due to changes in industrial classifications and the introduction of the new 1993 System of National Accounts (SNA) and the 1995 European System of Accounts (ESA), official series often lack industry detail, especially for the period before the 1990s. In some cases, STAN goes beyond the official published data and provides data at more detailed levels based on additional sources, but important gaps still remain.

For a number of countries data were directly obtained from the national accounts instead of from the OECD STAN database. For some countries there is no or only limited OECD STAN

data (i.e. Ireland, Taiwan), whereas for a few other countries national accounts data was more up-to-date than the OECD STAN data.

As a second step the STAN or national accounts data were complemented with information from detailed industry and services statistics and additional (historical) national accounts data for individual countries. Use was made of international statistics such as the *OECD Structural Statistics for Industry and Services*, the *OECD Services Statistics on Value Added and Employment*, *Eurostat Structural Business Statistics* and the *Eurostat Labour Force Survey*. Furthermore national sources have been used including national accounts and economic census and survey material. The spreadsheets associated with each of the country files provide a full account of the sources used for each country, each year and each variable.

#### *Filling procedure*

In case of missing data there are basically two procedures for estimating value added, employment and compensation data by industry: (1) applying shares from additional data to higher level aggregates or (2) applying higher-level growth rates to more detailed levels. The first is most useful when for a particular sub-sector there is no data available for any year. In that case, the share of the sub-sector in some higher level aggregate is derived from additional secondary data sources and applied to the aggregate in the basic source. In case data is available in the basic source for some years, secondary data shares are used for missing years provided they correspond closely to the basic source. If not, growth rates from secondary data are applied to the original basic data for missing years. To maintain national accounts compatibility a normalisation procedure is used so that subsectors add to the corresponding higher-level industry aggregates provided in the basic source. If there is a summation discrepancy, the subsectors absorb the residual. Each sub-sector does so in proportion to its weight in the parent industry. This procedure ensures that output and employment measures are national accounts compatible and, importantly, have the same economy-wide coverage.<sup>6</sup>

For series on hours worked per person and deflators for value added, gaps in the basic source (STAN or national accounts data) are filled in a simpler way. If no additional data could be found, higher level aggregates have been used. For example, in case no separate figure on hours worked per person for sub-sector 351 could be found, the figure for 35 (when available) is used instead. The same was done for deflators where necessary.

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<sup>6</sup> Often additional data is taken from surveys. Sampling coverage and definitions in survey data can differ within and across countries.

The source descriptions in each of the country files provide a detailed account of the filling procedures used for each country, year and variable.

#### *Alternative deflators for ICT production*

At present there are only a few countries that have an adequate system in place for measuring prices of computers and semiconductors which take into account the fast increase in quality of these goods. To achieve international comparability, harmonised US deflators are applied for two ICT-producing manufacturing industries (ISIC 30 and 321) in all countries. For Australia and Canada official deflators have been used, because they take into account quality change in a way that is comparable with the US methodology. US value added deflators are corrected for differences in overall inflation between each country and the US. Inflation is measured as the change in the deflator of all industries, excluding the ICT-producing manufacturing industries.<sup>7</sup> The construction of the US deflator has been described in large detail in the sources and methods for the United States. While this procedure does not exactly replicate the BEA procedure, it serves as a good approximation since the aggregate deflators are close to the original value added deflator from the national accounts.

#### *Aggregation*

Some countries at present still use fixed-weight (Laspeyres) indices to calculate aggregate value added at constant prices. This can lead to serious substitution bias if the structure of the economy is changing over time. For example, when fixed weights are used the price decline for computers will be overstated because of the relatively large weight in the base year compared to successive years (Landefeld and Grimm, 2000). To correct for this problem, chain-weighted indices like chained Laspeyres or chained Fisher, or Törnqvist indexes are needed.

In (re)calculating real value added aggregates for industry groups and for the aggregate economy chain-weighted (Törnqvist) deflators for value added were used. For industry  $i$  this is done in the following way. Let  $P_i^V$  the deflator for value added in industry  $i$  and  $P^V$  the aggregate deflator, then the change of the deflator in period  $t$  is given by:

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<sup>7</sup> This procedure is based on Schreyer (2000, 2002).

$$\Delta \ln P^{V,t} = \sum_i \bar{s}_i^{V,t} \Delta \ln P_i^{V,t} \quad (5)$$

The price change in industry  $i$  is weighted by the average share of industry  $i$  in total value added over the two periods defined as:

$$\bar{s}_i^{V,t} = \frac{1}{2} \left( \frac{P_i^{V,t} V_i^t}{\sum_i P_i^{V,t} V_i^t} + \frac{P_i^{V,t-1} V_i^{t-1}}{\sum_i P_i^{V,t-1} V_i^{t-1}} \right). \quad (6)$$

Finally, real aggregate value added growth is calculated as the growth rate of aggregate current value added<sup>9</sup> minus the growth rate of the deflator as follows:

$$\Delta \ln V^t = \Delta \ln V^t P^{V,t} - \Delta \ln P^{V,t} \quad (7)$$

It should also be stressed that the use of Törnqvist aggregation diverts from simply adding up value added estimates at constant prices from the lowest industry level to higher aggregates. In particular when underlying industries show strongly different growth rates (such as ICT-producing industries relative to non-ICT industries), a summed result may deviate from a Törnqvist weighted result. Hence intermediate aggregates, such as a series for say total manufacturing, can only be obtained by again applying the Törnqvist aggregation procedure.

#### *European Union Aggregation*

In order to arrive at totals for the European Union, current price measures in national currencies are converted into euro's using sector specific purchasing power parities (PPPs).<sup>10</sup> The PPPs for all countries in this database stem from the Multilateral 1997 Industry-of-origin PPP set, which has been described in more detail in Timmer, Ypma and van Ark (2006, forthcoming)<sup>11</sup>. These publications provide extensive analysis of the development of the Unit Value Ratios. The industry PPPs were all converted to a 1997 basis, and then applied to obtain value added shares by industry and by country in the total EU aggregate for the whole period 1979-2003. These were then used to Törnqvist aggregate the deflators for individual industries to an EU aggregate.

<sup>9</sup> Aggregate current value added is the sum of industry current value added .

<sup>10</sup> See van Ark and Timmer (2003) for a discussion of approaches to obtain sector-specific PPPs. See also the discussion on the Productivity and Unit Labour Cost Database in O'Mahony and B. van Ark (2003), chapter 7.

<sup>11</sup> Timmer, M.P., G.Ypma and B. van Ark (2006), Industry-of-origin PPPs for the Total Economy: A New Benchmark for 1997, GGDC Research Memorandum GD-82 (forthcoming)

### *German unification*

In order to deal with German unification in 1990 two data sets have been constructed: one for Western Germany (covering the period 1979-1991) and one for unified Germany (covering the period 1991-2003). Growth rates for Western Germany are linked to 1991 data for unified Germany.

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