

WIOD Socio-Economic Accounts 2016

Sources and Methods

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1. Introduction

This document describes the sources and methods used for estimation of data on capital stocks and employment variables for the 43 countries included in the WIOD 2016 database, called the Socio-Economic Accounts (SEAs). The SEAs contain annual data (2000-2014) for 56 industries on:

- Industry output, intermediate inputs, and value added
- Price deflators for the above mentioned variables
- Volume indices for the above mentioned variables
- Capital stocks in current prices
- Employment
- Compensation of capital and labour

Note that this version of the WIOD Socio Economic Accounts no longer provides information on the educational attainment of the labour force due to a lack of data, mostly for non-EU countries. Table 1 below presents the full set of variables and their description, available in SEA 2016.

Table 1 Variables in the WIOD Socio-economic Accounts (SEA)

Output	Millions of national currency
GO	Gross output by industry at current basic prices
II	Intermediate inputs at current purchasers' prices
VA	Gross value added at current basic prices
Labour input	Employment units
EMP	Number of persons engaged (thousands)
EMPE	Number of employees (thousands)
H_EMPE	Total hours worked by employees (millions)
Compensation	Millions of national currency
COMP	Compensation of employees
LAB	Total labour compensation
CAP	Capital compensation
Capital input	Millions of national currency
K	Nominal capital stock
Indices	2010 = 100
GO_PI	Price levels of gross output
II_PI	Price levels of intermediate inputs
VA_PI	Price levels of gross value added
GO_QI	Gross output, volume indices
II_QI	Intermediate inputs, volume indices
VA_QI	Gross value added, volume indices

In this document the sources and methods for the construction are discussed for each group of variables, excluding the output variables. Detailed information for the first group, the nominal values of Gross Output,

Intermediate Inputs and Value Added, is given in the documentation on the construction of the World Input Output Tables (WIOTs) 2016¹.

Section 2 continues the discussion of the construction of the Labour Input and compensation variables. In section 3 we turn to the construction methods of the capital stocks and in section 4 we discuss the sources for the price indices from which the volume indices are derived. Section 5 presents the frequently used mapping table between the ISIC Revision 3 industries from the SEA 2013 and the ISIC Revision 4 industries from the SEA 2016.

2. Compensation and Labour Input

This section discusses the sources and methods for both the estimation of the labour and capital compensation variables as well as labour input, since for many countries the calculation of total labour compensation (LAB) is based on the employment data. First we start with a general discussion of the sources and methods for European Countries, then we conclude with the country specific information for the Non-EU countries.

Construction methods for EU28 countries and Norway

The source for the compensation and employment data is Eurostat. We take the variables from the ESA 2010 National Accounts for detailed industries (*nama_10_a64* and *nama_10_a64_e*).² We use the same vintage as that used for the construction of the 2016 WIOD. To ensure that output and employment figures are fully consistent, we use a stepwise approach to the construction of the compensation and employment data. For example, to estimate total employment (EMP) we do not rely on the employment figures listed in Eurostat directly, but instead estimate the ratio of VA to EMP from Eurostat and multiply by VA taken from the 2016 WIOD. Note that this method will leave the levels of the variables listed in Eurostat unaffected, unless in the construction of the (international) SUTs minor adjustments have been introduced (see the WIOD 2016 documentation).

In this approach, the order in which the variables are estimated could matter. First, we estimate total employment (EMP) based on the ratio of EMP to VA, as discussed above. Second, we multiply this newly obtained value for EMP with the ratio of employees to total employment from Eurostat to obtain the number of employees (EMPE) consistent with our output data. Third, we estimate the total hours worked by employees (H_EMPE) based on the average annual hours of work for employees derived from Eurostat. Lastly, we estimate the total compensation of employees (COMP) based on the ratio of COMP to VA listed in Eurostat.

Extrapolation and disaggregation

If no (disaggregate) industry data is available in Eurostat (*nama_10_a64* and *nama_10_a64_e*) we rely on the total economy figures from Eurostat instead (*nama_10_ip_ulc* and *nama_10_gdp*). We disaggregate

¹ Sources and Methods for the WIOD 2016 SUT input files can be found in Timmer, M. P., Los, B., Stehrer, R. and de Vries, G. J. (2016), "[An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release](#)", GGDC research memorandum number 162, University of Groningen

² Accessed: 15 January 2016

these figures, as well as the industry detail that is missing from the basic Eurostat tables to completely fill the cells for all years and industries in the SEA.

In the disaggregation we estimate the missing values based on the parent's value, i.e. the first available industry, one level of aggregation above the current industry. For example, in the estimation of total hours worked by employees (H_EMPE), we assume the average hours of work in the parent industry is representative for the average hours of work in the industry for which data is missing. If data for a given industry is unavailable for all years in the sample we directly rely on the level of the parent's average hours of work. If data is missing only for some years, we rely on the growth rate of the average hours of work for the parent instead and link this to the level of the average hours of work that is available for this industry. We then normalize to ensure that total hours of work for the industry and its siblings sum to the total hours of work for the parent. We apply this procedure top-down, starting at the total economy level and working our way down to fill the industries at the lowest level of aggregation in the SEA.

In our workflow, we first estimate the ratios discussed in the previous section for the industries and years for which data is available in Eurostat. We then extrapolate these ratios over time, whenever necessary, based on the total economy data from Eurostat. Lastly, we fill the missing values using the disaggregation procedure discussed in the previous paragraph. The full matrix of ratios, say EMP/VA, can then be used to calculate EMP for all years and industries by multiplying them with VA in the SEA.

Exceptions

In some (exceptional) cases we opted to discard the Eurostat data for specific industries if the resulting ratios looked highly improbable. These exceptions are most likely the result of measurement issues, as it concerns almost exclusively minor industries for smaller economies. For these observations we based the ratios on the parent's ratio instead (see previous section). In practice, we only applied this procedure for the estimation of H_EMPE and only for four countries.

For Finland we discarded the average hours of work data listed in Eurostat for all years for the industry codes A01, A02, and A03. For Cyprus and Malta, we discarded the average hours of work data for all the lowest aggregates for all years.³ For Latvia we discarded all the average hours of work data below the total economy level prior to 2008, to compensate for a clear break - most likely the result of a change in the SNA - that occurs in the Latvian data between the years 2007 and 2008. In addition, we identified some outliers in the Eurostat data which we dropped from the SEA and interpolated instead.⁴

³ i.e. industry codes A01, A02, A03, C16, C17, C18, C19, C22, C23, C24, C25, C29, C30, C31_C32, C33, E36, E37-E39, G45, G46, G47, H49, H50, H51, H52, H53, J58, J59_J60, K64, K65, K66, L68A, L68x, M69_M70, M71, M73, M74_M75, N77, N78, N79, N80-N82, Q86, Q87_Q88, R90-R92, R93, S94, S95, S96

⁴ We identified observations as outliers if the ratio has a z-score below -2.5 or above 2.5, but only if this was the case both across years (holding the industry constant) and industries (holding the year constant) for any given country. For the EMP/VA ratio we identified 0 outliers, for the EMPE/EMP ratio we identified 11 outliers (0.05% of the sample), for the H_EMPE/EMPE ratio we identified 66 outliers (0.27% of the sample), and for the COMP/VA ratio we identified 0 outliers.

Derivation of total Labour compensation (LAB)

As a general method for deriving values for total labour compensation (LAB) we assume that self-employed persons in the industry receive the same average wages as employees. When explicit information on Mixed Income (MIXINC) is available from Use tables, we calculate the share of MIXINC in VA, and add it to the share of COMP in VA to derive an upper limit for LAB.⁵ This upper limit is then extended backwards and forwards for years where MIXINC is not available, using the growth of LAB derived using the general method. The final value for LAB is the minimum value of the upper limit and the general method.

⁵ MIXINC is available for Belgium, Czech Republic, Estonia, Hungary, Netherlands, Poland, Romania, and Slovenia from 2010 onwards.

Table 2 industry coverage employment variables for EU28 and Norway

Country		EMP		EMPE		H_EMPE		COMP	
		level	years	level	years	level	years	level	years
AUT	Austria	a64	15	a64	15	a64	15	a64	15
BEL	Belgium	a64	14	a64	15	a21	15	a64	14
BGR	Bulgaria	a64	14	a64	15	a21	15	a64	14
CYP	Cyprus	a64	14	a64	15	a21	15	a64	14
CZE	Czech Republic	a64	15	a64	15	a64	15	a64	15
DEU	Germany	a64	14	a64	14	a21	14	a64	14
DNK	Denmark	a64	15	a64	15	a64	15	a64	15
ESP	Spain	a64	14	a64	14	a64	14	a64	14
EST	Estonia	a64	15	a64	15	a64	15	a64	15
FIN	Finland	a64	15	a64	15	a64	15	a64	15
FRA	France	a64	14	a64	14	a21	14	a64	14
GBR	United Kingdom	a64	15	a64	15	a21	15	a64	15
GRC	Greece	a64	15	a64	15	a64	15	a64	15
HRV	Croatia	a64	7	a64	7	a64	7	a64	14
HUN	Hungary	a64	15	a64	15	a64	5	a64	15
IRL	Ireland	a64	15	a64	15	a64	15	a64	15
ITA	Italy	a64	14	a64	14	a21	15	a64	14
LTU	Lithuania	a64	14	a64	14	a21	14	a64	14
LUX	Luxembourg	a38	15	a38	15	a38	15	a38	15
LVA	Latvia	a64	14	a64	14	a10	7	a64	14
MLT	Malta	a64	15	a64	15	a21	15	a64	15
NLD	Netherlands	a64	15	a64	15	a64	15	a64	15
NOR	Norway	a64	13	a64	13	a64	13	a64	14
POL	Poland	a64	10	a64	15	a64	15	a64	10
PRT	Portugal	a64	14	a64	14	a21	14	a64	14
ROU	Romania	a64	14	a64	14	a64	14	a64	14
SVK	Slovakia	a64	15	a64	15	a64	15	a64	15
SVN	Slovenia	a64	15	a64	15	a64	15	a64	15
SWE	Sweden	a64	14	a64	14	a64	14	a64	14

Notes: the 'level' column indicates the industry coverage used in the construction of the SEA; a64 represents full coverage. The 'years' column shows the number of years for which this industry detail is available; 15 represents full coverage.

Sources: Eurostat, tables *nama_10_a64* and *nama_10_a64_e*, accessed: 15 January 2016

Construction methods for Non-EU countries

For Non-EU countries there is no standard source of information, therefore we discuss the sources for each individual country. Whenever we use the ratio of two variables from the WIOD SEA 2013, we use the mapping table given in section 5 to map ISIC Rev. 3 sectors to the ISIC Rev. 4 industries.

Australia

- EMP, EMPE, H_EMPE are taken from OECD National Accounts (OECD NA), full industry detail is available for these labour input variables.
- Data on VA and COMP are also taken from OECD NA for 18 broad sectors. The COMP/VA ratios at the broad sector level are applied to the detailed industries in their respective aggregates.
- We apply the same method as for the European countries in order to determine total LAB.

Brazil

- COMP is available from the official SUTs for the years 2010-2013 that are used for the estimation of the time series SUTs in WIOD 2016, and is fully consistent with the VA data in the WIOTs.
- Back-casts for COMP to 2000 and extrapolations to 2014 are calculated using the growth of COMP from SUTs. We use the information provided in the annual supply and use tables that directly underlies the national accounts, as published by Brazil's statistical office (IBGE)⁶. We use the detailed SUTs for the years 2010-2014 and extrapolate backwards to 2000 using the less detailed SUTs for the years 2000-2009. The concordance is equal to that underlying the time series SUTs for the 2016 WIOD release.
- The same SUTs also provide information on EMP and VA for the whole period. The ratios have been applied to the VA data from the WIOTs in order to obtain EMP.
- The share of EMPE in EMP are estimated using PNAD microdata.
- H_EMPE is calculated using the average hours worked from the SEA 2013 data.
- IBGE also provides Mixed Income (MIXINC) in the annual SUTs. We use this information in the same way as for the European countries in order to determine the values for total LAB.

Canada

- Information on COMP, VA, EMP, EMPE, and H_EMPE is available from OECD national accounts (OECD NA) for all ISIC Rev. 4 industries.
- COMP and VA are available from 2007 onwards, the ratio of COMP/VA has been extrapolated backwards to 2000 using the ratios from SEA2013.
- From the OECD data we have calculated and applied EMP/VA to the VA from the WIOTs for 2007-2014. Before 2007 we have extrapolated the data for EMP using the growth of the EMP levels from OECD NA.
- From the resulting data for EMP we have applied the ratio EMPE/EMP from OECD NA to calculate EMPE values for each industry.

⁶ https://downloads.ibge.gov.br/downloads_estatisticas.htm

- The employment variables are available for 2000-2013. The ratios of labour input versus VA that are used have been assumed constant at the 2013 levels for 2014.
- We have applied average hours worked from OECD NA for employees to estimate total hours worked by employees for each industry.
- STATCAN provides information on the wages of both employees and the self-employed for 62 NAICS industries which are mapped to 42 ISIC Rev. 4 industries.⁷ For these industries we calculate the ratio of LAB/COMP and apply this to the industry COMP values calculated above in order to estimate total LAB for each in industry.

Switzerland

- We use the data on Jobs and hours from Nathani et al. (2016).⁸ Jobs are taken as persons engaged.
- We apply EMP/VA ratios of aggregate sectors using VA from the SUTs, to industries that were missing from the Nathani et al. (2016) data in Utilities, Transportation, Information and Communication, and Business services.
- We used average hours worked derived from the Nathani et al. (2016) data, and multiplied this by the calculated persons engaged.
- We use the ratios of employees over total persons engaged from the German 2013 SEA to calculate employees, and the same was done to estimate hours worked by employees.
- Data is available from Eurostat Structural Business Statistics (SBS) on labour cost, turnover and Value Added at Factor Cost, for detailed industries. The ratio of labour cost over value added at factor cost is taken as the LAB share. These data are available for 2009-2014.
- The data from SBS does not contain information for the following sectors: Agriculture (A), Manufacture of coke and refined petroleum products (C19), Water Transport (H50), Air Transport (H51), Warehousing and support activities for transportation (H52), Financial services (K), Public Administration (O), Education (P), and Human health and social work activities (Q). For these industries the LAB shares of Germany were used.
- For the period 2000-2008 the LAB shares are extended backwards from the 2009 values using the growth in the German shares.
- For the Mining sector (B), we keep the shares constant at the 2009 level for the 2000-2008 period, since the output for this industry remains very stable, which is not the case for the German industry, making the pattern of the German LAB shares for this industry not representative for Switzerland.
- We calculate COMP backwards from total labour compensation by assuming the employees earn the same hourly wage as the self-employed.

⁷ STATCAN table 0380024

⁸ The data for Switzerland has been constructed in close cooperation with from Rütter Soceco AG and we are grateful to Carsten Nathani for advice and help. The underlying data construction work is described in: Nathani, C., Hellmüller, P., Schwehr, T. (2016): Adaptation of Swiss data for the World Input-Output Database. Technical report. Rütter Soceco, Rüschiikon.

China

- Data on productivity (VA/EMP) is taken from the China Statistical Yearbooks (CSY) for three broad sectors. This information is used to estimate total employment for these three sectors in the SEA, by multiplying it by aggregate sector VA from the WIOTs.
- The employment figures are further broken down by industry using the China Industrial Productivity (CIP) database, which provides information on output and labour for 29 industries, which are mapped to the ISIC Rev. 4 industries in WIOD. From the CIP data we estimate productivity levels. The CIP data is only available up to 2010, therefore the productivity levels are extrapolated using the productivity growth of the CSY data by three broad sectors. The resulting time series of productivity are multiplied by VA from the WIOTs, to obtain a first estimate of EMP for detailed ISIC Rev. 4 industries.
- The EMP levels for detailed industries are normalized to the EMP levels derived from the CSY data by the three broad sectors.
- For China no separate information is available on labour input by employees.

LAB shares in VA are derived from labour compensation provided in the input-output tables. Before the first Economic Census in 2004, the income of self-employed and their employees are included in labour compensation (NBS, 2003). While profits related to owners (informal entrepreneurs) should be part of gross operating surplus, we consider the labour compensation in the input-output tables before 2004 closest to the definition of labour compensation in value added. After the economic census, two changes in the income GDP accounting method introduce a break in the labour share time series by industry (Bai and Qian, 2010). First, profits of state-owned and collective-owned farms are included in labour compensation, introducing an upward break in the agricultural labour shares. Second, income of self-employed owners is subsequently included in gross operating surplus.

We use the adjustment factors for these changes at the sector level in Bai and Qian (2010) for the 2007 and 2012 IOT (except for H53, O84, P85, and Q), to arrive at consistent time series that correspond most closely to the definition of labour shares before the 2004 Economic Census. We estimate LAB shares in VA based on the 2002, the 2007 and the 2012 IOT. Years in between are interpolated. 2000-2001 labour shares are equal to 2002 and 2013-2014 labour shares are equal to 2012. The derived LAB shares are multiplied by VA from the WIOTs, converted back to Yuan, to obtain LAB.

Indonesia

- The ratios for COMP/VA, LAB/VA, EMP/VA, EMPE/EMP, and H_EMPE/EMPE are taken from the SEA 2013 data and have been used together with VA from WIOD 2016 to estimate values for COMP, LAB, EMP, EMPE, and H_EMPE.
- The ratios are kept constant after 2009.

India

- The ratios for EMP/VA, LAB/VA, COMP/VA, EMPE/EMP, are taken from India KLEMS.⁹ Data is available for 27 sectors (ISIC Rev. 3), these are mapped to WIOD industries. The same mapping is

⁹ <https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=85>

used as for the external output series in the SUTs. The last available year is 2011. Shares after 2011 are set equal to their 2011 values.

- Average hours worked by employees is taken from SEA 2013, and held constant after 2009.

Japan

- We use Nominal Labour cost and Value Added from the JIP 2015 database to determine LAB.
- Data is available up to 2012, the share of LAB in VA is assumed to be constant afterwards.
- Data for EMP and H_EMP are also taken from JIP 2015.
- EMP/EMPE ratios are taken from OECD STAN, EMP/VA ratios are updated for 2013 and 2014 using the trends in the STAN ratios. Data for some 33 ISIC Rev. 4 sectors are available from STAN, so the ratios of aggregate sectors are applied to detailed industries when STAN data is missing.
- Average hours worked by self-employed is assumed to be the same as for employees.
- COMP is reverse calculated from LAB assuming the self-employed earn the same wages as employees.

Korea

- For Korea there are Use tables available for 2010-2014 for detailed (82) industries, as well as accompanying information on hours worked for both Employees and total persons engaged. The industries are mapped to the industries in the WIOTs.
- LAB values are calculated in the standard way for 2010-2014, by assuming that the self-employed receive the same hourly wages as employees.
- In order to derive estimates for 2000-2009 there are two additional sources that were used: The information from the previous WIOD 2013 release in the old SNA and industry classification and information from OECD for 19 distinguished aggregate sectors. The OECD data is available for 2004-2013.
- For all non-manufacturing sectors the shares are cast back using the growth in the OECD shares. Aggregate industries from OECD are mapped to detailed WIOT industries.
- For the manufacturing industries the shares in 2009 are assumed to match the 2010 shares. From 2009 back to 2000 the growth of the SEA 2013 LAB shares are used to cast back the series.
- For the period 2000-2003 the approach for manufacturing industries is applied to all industries
- For the labour input variables the detailed SUT data from the Bank of Korea for 2010-2014 is taken as a baseline for employment ratios (EMP/VA, EMPE/EMP, H_EMP/EMP, H_EMPE/EMPE). These ratios have been back-cast using data from the Korean Industrial Productivity (KIP) database, which provides data for 2000-2012 for the SEA 2013 industries.
- The resulting ratios have been multiplied by VA from the WIOD SUTs to obtain the levels of employment.
- COMP has been estimated by calculated backwards from LAB for each of the 56 ISIC Rev. 4 WIOD industries.
- The ratios of average hours worked (H_EMP/EMP, H_EMPE/EMPE) for the agricultural sector from the detailed BOK SUTs were implausibly low. Therefore we reverse the procedure for the ratios of the agricultural sector, taking the levels of the KIP data and extending it beyond 2012 using the trend of the BOK SUT ratios.

Mexico

From the data published by Mexico's statistical office (INEGI) in its productivity report (Mexico KLEMS) we use value added, compensation of employees, hours worked, and persons engaged by industry.¹⁰

Levels of EMP and COMP are calculated through their ratios over VA, and multiplied by VA from the WIOD 2016. It should be noted that compensation as a share in value added is very low for several sectors, in particular agriculture. A large part of informal labour income is included in gross operating surplus. Using previous estimates of the share of employees in total employment (documented in the SEA 2013) we estimate the labour income as:

$$LAB_{cit} = ((COMP_{cit} / EMPE_{cit}) * (EMP_{cit} - EMPE_{cit})) + COMP_{cit}$$

Where LAB is labour income, COMP is compensation of employees, EMP is persons engaged, and EMPE is employees. Subscript c refers to Mexico here, i to each of the 56 industries distinguished and t to year (2000 to 2014). EMP/EMPE ratios from SEA 2013 are applied for the estimation of EMPE and H_EMPE.

Russia

- VA, EMP, H_EMP, and LAB, are directly available from WorldKLEMS v2017, provided by National Research University Higher School of Economics, for 35 ISIC Rev. 3 industries. We use the ratios of these variables over VA, and multiply them with VA from the WIOD 2016. The ISIC Rev. 3 industries are mapped to the 56 ISIC Rev. 4 industries in the SEA according to the mapping table in section 5.
- We apply H_EMP/H_EMPE and EMP/EMPE ratios to calculate employment for employees, using SEA13 data (available up to 2009).
- COMP is inversely derived from LAB, by assuming the average hourly wage rate is the same for employees and self-employed persons.

Turkey

- The ratios for COMP/VA, LAB/VA, EMP/VA, EMPE/EMP, and H_EMPE/EMPE are taken from the SEA 2013 data and have been used together with VA from WIOD 2016 to estimate values for COMP, LAB, EMP, EMPE, and H_EMPE.
- The ratios are kept constant after 2009.

Taiwan

- The base line data for total persons engaged stems from the Taiwanese Statistical Yearbook (TSY) for the year 2000-2014.
- The Chinese Statistical Yearbook (CSY) provides the distribution of labour across 14 broad sectors of the economy. This is used to distribute the total economy values from the TSY.
- To further break down the labour statistics for detailed industries we use data from the Taiwanese Payroll Statistics (TPS), which provides information on total employees, average monthly hours worked and average monthly wages, for 113 industries. Each of these industries has been mapped to the WIOD industries, as well as the 14 broad sectors distinguished by the Chinese Statistical Yearbook. The payroll statistics do not cover *Public Administration and Defense*

¹⁰ See <http://www3.inegi.org.mx/sistemas/tabuladosbasicos/tabniveles.aspx?c=33687>

(O84), or the agricultural sector (A). Furthermore wholesale and retail trade (G) is not further broken down. The same holds for the aggregate of *the Scientific research and development* industry (M72) and the *Other professional, scientific and technical activities; veterinary activities* (M74_M75). The data for A, G and M72+M74_M75 is further broken down using Value Added shares.

- For the available industries from the TPS, we take the total number of employees as given and aggregate them to the 14 broad sectors from CSY. For *Agriculture* (A) and *Education* (P85) we apply the ratio of employees to total persons engaged from SEA 2013 to estimate the number of employees. For *Public Administration and Defense* (O84) we assume that all persons engaged are employees.
- From the calculated Persons Engaged (EMP) and Employees (EMPE) statistics we compute the ratios for the 14 broad sectors. In cases these ratios exceed 100%, the value of EMP is taken for EMPE.
- We calculate the average hours worked by employees from the TPS data on average monthly hours worked by multiplying the data by 12 and then by the respective industries' number of employees and aggregating. Average annual working hours for the agricultural sector are derived from the Man Power Utilization survey. For *Public Administration and Defense* (O84) we assume average working hours to be the same as the average for other services which includes the following sectors:
 - Real estate (L)
 - Business services (M-N)
 - Human health and social work activities (Q)
 - Other service activities (R_S)
 - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use (T)
- In order to estimate the compensation of employees we take the share of COMP in VA from the official SUTs in 2006 and 2011 and linearly interpolate the shares between these years. Before 2006 and after 2011 the COMP shares are held constant.
- Labour compensation (LAB) are estimated in the standard way, by assuming the self-employed persons receive the same average wages as employees.

Note:

The COMP data as a percentage of VA is taken from the SUTs. However, the employment levels are taken from the TSY, while the industry distribution is taken from first the CSY by 14 broad sectors and then from the TPS by detailed industries. This can create a mismatch in the distribution pattern of employees and the compensation of employees, which can result in extreme values for the estimation of LAB, especially when EMPE/EMP ratios are low, as is the case for the agricultural sector. Average wages per employee can also be either over- or underestimated, due to this distribution mismatch. We have chosen for this method since it provides a clear link between COMP and VA from the Taiwanese National Accounts statistics and there is no harmonized source where values for labour input, labour compensation and output are given.

United States

- We take COMP data directly from the BEA USE tables which underlie the time series SUTs in the WIOD 2016. We use the same mapping tables and as such, these values are fully consistent with VA.
- Information on persons engaged and employees and VA is collected from the BEA for detailed NAICS industries, which are mapped to the ISIC Rev. 4 industries. We take the ratio of EMP/VA and EMP/VA from the BEA data and multiply it by VA to estimate EMP for each industry. We apply the BEA EMPE/EMP ratios to the estimated EMP values to obtain EMPE values for the ISIC Rev. 4 industries.
- Reported total persons engaged from the BEA includes FTE employees, rather than persons, therefore total employment numbers have been recalculated.
- Mixed income is available as 'Nonfarm Proprietors' Income by Industry' for 21 aggregate sectors, which was used in the following way:
 - The COMP/VA ratio is calculated as the lower limit and (MIXINC+COMP)/VA as the upper limit for aggregate sectors.
 - The ratio of the upper limit divided by the lower limit, defined as COMP/VA, is computed for the same aggregate sectors.
 - These ratios are applied to the lower limit (COMP/VA) for the detailed 56 ISIC Rev. 4 industries to compute the upper limit for the LAB as a percentage of VA.
 - The final estimation of LAB for each industry is taken as the minimum value of the upper limit times VA and LAB calculated through the standard method where the self-employed are assumed to have equal average annual wages as employees (COMP/EMPE*EMP).
- H_EMPE data is available from the BEA for 16 broad sectors. These have been divided by the BEA data on number of employees, and these ratios have been applied to detailed industries and multiplied by the calculated number of employees in each industry.

3. Capital Input - Construction of capital stock estimates

Depending on country-specific data availability, various methods are employed in constructing the capital stock estimates for WIOD 2016 release. This appendix describes in detail the sources and methods used for each of the 43 countries covered in WIOD 2016. The resulting annual capital stock estimates are classified by 56 ISIC Rev.4 industries. The data are expressed in nominal local currency units over the period 2000-2014. The capital stock series correspond to fixed assets as defined in the guidelines of System of National Accounts 2008 (SNA08), with some exceptions (see table 3 for an overview).

Data Availability

Broadly speaking, among the 43 countries that we cover four different groups can be identified during the data construction process in terms of their data availability:

1. Countries for which capital stock data is available in current or constant prices and by detailed ISIC Rev.4 industry classification adhering to the SNA08 definitions.
2. Countries for which capital stock data is available either in current or constant prices, but in a different industry classification than ISIC Rev.4 (e.g. ISIC Rev.3 or country-specific industry classification). These data adhere either to SNA08 or SNA93 definitions.
3. Countries for which no information on capital stocks can be found but gross fixed capital formation (GFCF) data are available at different levels of industry detail. The industry classification and SNA definitions are country dependent in this case.
4. Countries for which no capital stock or GFCF data can be found at the industry level. The only information can be obtained is their aggregate GFCF series at the total economy level from the UN National Accounts database (UNNA), e.g. Indonesia and Turkey.

Estimation Methods

For the first two groups of countries we can use the data directly if industry detail is available for the 56 ISIC Rev.4 industries. When the capital stock data is available at a more aggregate industry level, we split the aggregate sectors using either the value-added shares split method or the so-called hybrid split method, see below for a more detailed explanations. For countries that do not have capital stocks data readily available, an extra step of building up the stock estimates using perpetual inventory method (PIM) is required. We do so by using the capital stocks data provided in the WIOD social economic accounts 2013 release (SEA 2013) as the starting point and we update the SEA 2013 capital stocks based on PIM from 2009 onward up to 2014. This is termed the SEA 2013 updated method which we turn to discuss in more detail below. Note, that in the case of Switzerland and Croatia, for each industry and year, we estimated the capital stock using nominal capital stock to value added ratios (K/VA) from an economically similar country, i.e. Germany and Spain, respectively. Other deviations from the general methodology can be found in the country specific notes.

Value-added shares split method

One of the major hurdles in deriving capital stock estimates for the WIOD 2016 release is that the nominal capital stock or investment data we extract from external sources are frequently available at a more aggregated industry level than the required 56 ISIC Rev.4 industries. As a prime solution to split the

aggregate estimates into more detailed industries we rely on industry valued added shares from the WIOD 2016 release.

For example, when capital stock data is available only for the aggregate agricultural sector as a whole, we split it into three detailed ISIC Rev.4 agricultural industries (i.e. *A01 A02* and *A03*) that are consistent with the WIOD 2016 release. We use the corresponding value-added shares in total agriculture (i.e. $Share_{i,t}^{VA} = \frac{VA_{i,t}}{VA_t}$) as weights and then multiply these weights by the aggregate nominal capital stock ($K_{i,t} = K_t \times Share_{i,t}^{VA}$). Based on this VA share split method, estimates for investments or capital stocks at the 56 detailed ISIC Rev.4 industries can be obtained.

However, a major drawback of this method is that it assumes the same capital intensity for all industries in the aggregate sector that needs to be split. This can be quite problematic for the manufacturing sector where the underlying industries can differ considerably in terms of their capital intensity. For this reason, when only very aggregate data are available (especially in case of the manufacturing sector), we use an additional step to include detailed industry level information on capital intensity from WIOD 2013 in the *hybrid split approach* which we discuss below.

Hybrid split method

In order to take into account the difference in capital intensity across industries, we use capital to value added ratios (K/VA) for the initial year 2000 and multiply the ratio by value added in the ISIC Rev.4 industry. The K/VA ratios are taken from the WIOD 2013 release, for which we map ISIC Rev. 4 industries to ISIC Rev. 3 industries. The concordance that is used is given in the ISIC Rev. 3 – Rev. 4 mapping table at the end of this appendix. For illustration:

$$(K_j)^{Rev4}_{2000} = \left(\frac{K_i}{VA_i} \right)^{Rev3}_{2000} \times (VA_j)^{Rev4}_{2000}$$

where K/VA ratios capture different levels of capital intensity taken from ISIC Rev. 3 industry *i* and applied to ISIC Rev. 4 industry *j*. VA_j denotes ISIC Rev.4 value added from the WIOD 2016 release.

The K/VA ratios are applied only for the initial year 2000. In order to complete the series, we extrapolate forward in time using the growth of capital stocks derived from the *Value-added shares split method*. We take this hybrid approach since the capital stock *K* is relatively stable over time, while value added levels can be quite volatile. Applying the growth of the stocks derived using the *Value-added shares split method* to extrapolate the initial capital stock can reduce the VA volatility, but still takes industry redistributions over time into account in terms of their relative output size. Additionally, it also mitigates the impact of the imperfect mapping between ISIC Rev. 3 and ISIC Rev. 4 industries, since we use the ratios of capital intensities and not the level of ISIC Rev. 3 capital stocks.

SEA 2013 updated method

For countries that do not have any capital stock data available, but do report investment series, we rely on updating the capital stock series from the SEA 2013 release based on the perpetual inventory method (PIM) using the following steps:

1. We convert their SEA 2013 investment series from ISIC Rev.3 (35 industries) to ISIC Rev.4 (56 industries) for the period 2000-2008 using the *Value-added shares split method*.
2. We estimate the 2000-2008 capital stock series from the WIOD 2013 data using the *Hybrid split method*.
3. From the external investment data, we calculate Investment to Value Added ratios (I/VA) at the level at which the data is available.
4. For the investment data by 56 ISIC Rev. 4 industries calculated in the first step, we also calculate the I/VA ratios in 2008 and update these with the growth of the ratios from step 3. We use an industry mapping of the domestic industries to the ISIC Rev. 4 industries that is dependent on the available information for the country. In some cases, only total economy investment and output data are available.
5. The extended I/VA ratios for the 56 ISIC Rev. 4 industries are multiplied by VA series from the WIOD 2016 release to estimate the investment series for all industries.
6. We extend the capital stocks calculated in step 2 using the PIM method for 2009-2014.

Note, the rate of depreciation that we use in PIM is based on the year- and industry-specific geometric depreciation rates for Spain (obtained from the EU KLEMS database December 2016 revision), which are calculated using each assets' nominal capital stock as weights. These rates take into account the differences in the composition of capital assets both across industries and over time. Moreover, in order to apply the PIM-method the data on investments and stocks needs to be denoted in constant base year prices. From the WIOD 2013 data the investment price deflators are available. For countries that have no investment price deflators available from the external source, we use a total economy capital stock deflator calculated from the Penn World Table, which excludes the price movements for Residential Structures.

Table 3 Overview of Capital Stock construction methods

	Country	Approach	SNA	Main data sources
1	AUS	Hybrid	2008	OECD NA
2	AUT	Directly obtained	2008	EUROSTAT
3	BEL	VA shares	2008	EUROSTAT
4	BGR	SEA 2013 updated	1993	EUROSTAT, EUKLEMS
5	BRA	SEA 2013 updated	1993	UNNA, WIOD SEA2013
6	CAN	VA shares	2008	OECD NA
7	CHE	K/VA ratio of DEU	2008	WIOD 2016
8	CHN	SEA 2013 updated	1993	China statistical yearbook
9	CYP	SEA 2013 updated	1993	EUROSTAT
10	CZE	Directly obtained	2008	EUROSTAT
11	DEU	Directly obtained	2008	OECD NA/STAN, EUROSTAT
12	DNK	Directly obtained	2008	EUROSTAT
13	ESP	VA shares	2008	EU KLEMS
14	EST	Hybrid	2008	EUROSTAT
15	FIN	Directly obtained	2008	EUROSTAT
16	FRA	VA shares	2008	OECD NA, EUROSTAT
17	GBR	Directly obtained	2008	EUROSTAT
18	GRC	Directly obtained	2008	OECD NA, EUROSTAT
19	HRV	K/VA ratio of ESP	2008	WIOD 2016
20	HUN	Hybrid	2008	EUROSTAT
21	IDN	SEA 2013 updated	1993	UNNA, WIOD SEA2013
22	IND	VA shares	1993	World KLEMS
23	IRL	Hybrid	2008	OECD NA
24	ITA	VA shares	2008	EUROSTAT
25	JPN	Directly obtained	1993	REITI JIP database
26	KOR	VA shares	1993	World KLEMS
27	LTU	Hybrid	2008	EUROSTAT
28	LUX	VA shares	2008	EUROSTAT
29	LVA	SEA 2013 updated	1993	EUROSTAT
30	MEX	VA shares	1993	NISG
31	MLT	SEA 2013 updated	1993	EUROSTAT
32	NLD	VA shares	2008	EUROSTAT
33	NOR	VA shares	2008	EUROSTAT
34	POL	Hybrid	2008	EUROSTAT
35	PRT	Hybrid	1993	EUROSTAT
36	ROU	Hybrid	1993	EUROSTAT
37	RUS	Hybrid	1993	World KLEMS
38	SVK	Directly obtained	2008	EUROSTAT
39	SVN	Hybrid	2008	EUROSTAT
40	SWE	VA shares	2008	EUROSTAT
41	TUR	SEA 2013 updated	1993	UNNA, WIOD SEA2013
42	TWN	SEA 2013 updated	1993	National development council
43	USA	Directly obtained	2008	BEA

Country-specific notes

1. *AUS - Australia*

- We obtain SNA08 total capital stocks from OECD national accounts for 20 sectors.
- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by OECD NA.

2. *AUT - Austria*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.

3. *BEL - Belgium*

- SNA08 / ISIC Rev. 4 capital stocks are available at the A38 level from EUROSTAT. Stocks in current prices are split using VA shares.

4. *BRA - Brazil*

- There are no capital stocks data available for Brazil, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We use the investment and Value-Added series from UNNA at the total economy level as external data.

5. *BGR – Bulgaria*

- There are no capital stocks data available for Bulgaria, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investment series for 56 ISIC Rev. 4 industries from EUROSTAT

6. *CAN - Canada*

- Nominal capital stock data are taken from OECD national accounts for 34 ISIC Rev.4 industries for the period 2000-2014.
- We use the Value-Added shares split method to split the 34 OECD industry stocks into 56 WIOD industries.
- Note that there is a discrepancy between the total economy-level stock and the summation of stocks across 34 industries. The difference is attributed to the real estate industry as the reported stock is too low. We assume that these numbers refer to productive stocks only. In addition, for industry C21 it is assumed that the data is grouped within C20, and for industry E, data is grouped within industry D.

7. *CHE - Switzerland*

- No capital stocks or investment data are available for Switzerland.
- We used the German K/VA ratios as a proxy for Swiss capital intensity for all sectors and multiplied them by the VA for Switzerland.

8. *CHN - China*

- There are no capital stocks data available for China, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investment series for 20 industries from the China Statistical Yearbook 2015.

9. *CYP - Cyprus*

- There are no capital stocks data available for Cyprus, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investments for 11 ISIC Rev. 4 broad sectors from EUROSTAT, both in current and constant prices.

10. *CZE - Czech Republic*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.

11. *DEU - Germany*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are available from OECD STAN database for total net assets.

12. *DNK - Denmark*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.

13. *ESP - Spain*

- Capital stocks are taken from EU KLEMS December 2016 revision. The data is in SNA 08 and ISIC Rev. 4 for 34 industries.
- We use VA shares from WIOD 2016 to split those 34 industries into 56 WIOD industries.

14. *EST - Estonia*

- We obtain SNA08 total capital stocks from EUROSTAT for 20 sectors.
- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by EUROSTAT.
- Note, the constant price stocks are calculated by applying implicitly derived stock deflators at the A20 level to the detailed industries.

15. *FIN - Finland*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.

16. *FRA - France*

- Capital stocks data are available at the A38 level from EUROSTAT. Stocks in current prices are split using VA shares.

- Data for 2014 is not available from EUROSTAT. Therefore, we have used data from OECD NA data for 2014.

17. *GBR - United Kingdom*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.

18. *GRC - Greece*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.
- No data available after 2010 from EUROSTAT, however OECD national accounts database does provide provisional estimates. We used these to update the series.

19. *HRV - Croatia*

- No capital stocks data are available for Croatia.
- We used the Spanish K/VA ratios as proxy and multiplied them by the VA for Spain.

20. *HUN - Hungary*

- We obtain SNA08 total capital stocks from EUROSTAT for 20 sectors.
- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by EUROSTAT.

21. *IDN - Indonesia*

- See Brazil. The exact same data source and method are used to estimate capital stocks for Indonesia.

22. *IND - India*

- We obtain real net capital stock data from the World KLEMS database (VA and K_GFCF_04) for the period 1980-2011.
- We extrapolate SEA 2013 VA series using the growth of WIOD 2016 VA data (mapped from ISIC Rev.4 to ISIC Rev.3). Then, we derive the K_GFCF_04/VA ratio for 2011 and keep it constant to extrapolate K_GFCF_04 for 2012, 2013 and 2014.
- Apply K_GFCF_04/VA ratios in 2000 to retrieve initial capital stock and then extrapolate using the growth of stocks obtained from the VA shares split approach.
- Note, although data from World KLEMS is in ISIC Rev.3 it is somewhat more aggregated than the EU EUKLEMS Rev.3 classification (27 vs. 35 industries). As a result, we used the SEA WIOD 2013 release by applying the shares to split those 27 industries into 35 industries. For 2010 and 2011, the share from 2009 is applied.

23. *IRL - Ireland*

- We obtain SNA08 total capital stocks from OECD national accounts for 20 sectors.

- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by OECD NA.

24. *ITA - Italy*

- Capital stocks data are available at the A38 level. Stocks in current prices are split using VA shares.

25. *JPN - Japan*

- Real capital stocks data are available from REITI JIP database for 107 detailed industries over the period 1970-2012.
- Based on the concordance table, data are directly mapped to ISIC Rev.4 classification.
- We extrapolate capital stocks for 2013 and 2014 by holding the K/VA ratio from 2012 constant.
- To convert real capital stocks to nominal terms we use the capital stock deflators from the Penn World Table capital detail file.

26. *KOR - Korea*

- Data is taken from the World KLEMS database which contains nominal capital stocks and VA data up to 2012 by 72 ISIC Rev.3 industries.
- The detailed Rev.3 industries are directly mapped to ISIC Rev.4 classification.
- Extrapolate VA using WIOD2016 for 2013 and 2014 (i.e. apply the growth of VA for these two years). Then, apply the K/VA ratio from 2012 to 2013 and 2014 to back out capital stock for the last two years.
- Follow the hybrid approach where initial stocks are based on K/VA ratios which are then extrapolated based on the growth of capital stocks calculated from VA shares split approach.

27. *LTU - Lithuania*

- We obtain SNA08 total capital stocks from EUROSTAT for 20 sectors.
- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by EUROSTAT.

28. *LUX - Luxembourg*

- Capital stocks data are available for 56 industries from EUROSTAT.
- There are inconsistencies for some groups of detailed industries, when comparing their aggregate values to the reported aggregate values. In these cases, stocks in current prices are split using VA shares.

- For the Transport sector *H* we kept the VA shares constant from 2008 onwards in order to split the capital stocks, due to volatile VA shares.

29. *LVA - Latvia*

- There are no capital stocks data available for Latvia, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investment series for 20 broad ISIC Rev. 4 sectors from EUROSTAT, both in current and constant prices.

30. *MEX - Mexico*

- Capital stocks data are directly obtained from the National Institute of Statistics and Geography (NISG) of Mexico. Data are expressed in 2008 constant prices across 68 industries and over the period 1990-2015.
- Based on the concordance table that has also been used for the SUTs, these 68 industries are mapped into 44 ISIC Rev.4 industries. Then, we use the VA shares to split the industries and use the capital stock deflator from the Penn World Tables to convert real capital stock to nominal terms.

31. *MLT - Malta*

- There are no capital stocks data available for Cyprus, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investments for 20 ISIC Rev. 4 broad sectors from EUROSTAT, both in current and constant prices.

32. *NLD - Netherlands*

- Capital stocks data are available at the A38 level. Stocks in current prices are split using VA shares.

33. *NOR - Norway*

- Capital stocks data are available for 53 industries. Stocks in current prices are split using VA shares
- Note, for Norway there is unallocated stocks data of about 30% of the total. It is likely that this is the capital stock of Residential Structures that are excluded from the industry data in order to show only productive capital stocks. This is corroborated by the fact that total reported capital stock of the real estate sector is only 3% whereas it's between 30% and 45% for other countries. Thus, we attribute all unallocated stocks to the real estate sector.

34. *POL - Poland*

- We obtain SNA08 total capital stocks from EUROSTAT for 20 sectors.
- We use capital stock to value added ratios (K/VA) from SEA 2013 for detailed manufacturing sectors to estimate an initial capital stock for year 2000. For all other sectors, we apply VA shares directly to the reported stock levels.
- For the detailed manufacturing industries, we extrapolate the estimated initial stocks using the growth of the stock series obtained by applying VA shares. We then renormalize the total manufacturing level of stocks to those reported by EUROSTAT.

35. *PRT - Portugal*

- There are no capital stocks data available for Portugal, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investments for 56 ISIC Rev. 4 broad sectors from EUROSTAT, both in current and constant prices.

36. *ROU - Romania*

- There are no capital stocks data available for Romania, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investments at the total economy level from EUROSTAT, both in current and constant prices.

37. *RUS - Russia*

- Data based on updated World KLEMS data in SNA93 and ISIC Rev. 3 classification.
- We use K/VA ratios for initial stock estimates in 2000.
- We split the capital stock data using VA shares and then use these time series to extrapolate from the estimated initial capital stocks in 2000.

38. *SVK - Slovakia*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.
- No data available before 2004. To back-cast the series, the growth of the capital stock from the SEA 2013 data is used.

39. *SVN - Slovenia*

- SNA08 / ISIC Rev. 4 capital stocks for 20 industries are directly taken from EUROSTAT.
- We use Hybrid split method for to estimate capital stocks for detailed manufacturing. We normalize the data to ensure that the aggregate stock values for the total manufacturing sectors match the total manufacturing capital stock data from EUROSTAT.
- For all other sectors, we apply the Value-added shares split method.

40. *SWE - Sweden*

- SNA08 / ISIC Rev. 4 capital stocks for 56 industries are directly taken from EUROSTAT.
- Capital stock data for the chemicals and pharmaceuticals industries are split using Value-added shares.

41. *TUR - Turkey*

- See Brazil. The exact same data source and method are used to estimate capital stocks for Turkey.

42. *TWN - Taiwan*

- There are no capital stocks data available for Taiwan, therefore, we update the SEA 2013 capital stocks using the SEA 2013 updated method.
- We take the investment series for 18 industries from the National Development Council.
- We use the Spanish geometric depreciation rates that include Software, but exclude the other IPP assets.

43. USA - United States

- SNA08 capital stocks data are taken from the BEA for 63 detailed NAICS industries.
- For consistency with the output data, we use the BEA data directly and applied the same NAICS- ISIC Rev.4 concordance as we did for the SUTs. We also apply the same output shares for industries that needed to be split. These shares are applied to the net capital stocks data in current and previous years' prices.

4. Price Indices

Price deflators for Gross Output (GO) and Value Added (VA) are taken from statistical sources for detailed industries insofar available. The deflators for Intermediate Inputs (II) are derived implicitly from the nominal values of II and the difference in GO and VA in Previous Years' prices (PYP). In some cases GO deflators may not be available, in which case the GO and II deflator will be the same as the VA deflator (single deflation).

When industry detail is missing for the deflators, the price index of the aggregate sector of which the detailed industry is a part is taken. The table below states for each country the source of the price deflators, the industry level at which this information is available and whether both the VA and GO deflators are available. The availability of the number industries pertains to the industry classification used in the source. For the OECD STAN and OECD National Accounts (OECD NA) databases and EUROSTAT this is the ISIC Revision 4 classification.

When very little information on prices is available we have used a shortcut solution in order to estimate price deflators based on the information in the SEA 2013. For this we have mapped the ISIC rev. 3 sectors to ISIC Rev. 4 industries according the mapping table in section 5. We have extrapolated the price deflators beyond 2009 for both VA and GO using GDP deflators from the UN National Accounts (UN NA) by 7 broad sectors.

Table 4 Availability price deflators

	Country	Source	Available industries	Deflators available
1	AUS	OECD NA	21	VA
2	AUT	OECD STAN	56	VA, GO
3	BEL	OECD STAN	56	VA, GO
4	BGR	EUROSTAT	56	VA
5	BRA	SEA 13, updated with UN NA	35	VA, GO
6	CAN**	STATCAN (CANSIM 383-0032), updated to 2014 with UN NA	51	VA, GO
7	CHE	OECD STAN	42	VA, GO
8	CHN	CIP, updated with UN NA after 2010	37	VA, GO
9	CYP	EUROSTAT	56	VA
10	CZE	OECD STAN	56	VA, GO
11	DEU	OECD STAN	56	VA, GO
12	DNK	OECD STAN	56	VA, GO
13	ESP	OECD STAN	56	VA
14	EST*	EUROSTAT	56	VA, GO
15	FIN	OECD STAN	56	VA, GO
16	FRA	OECD STAN	56	VA, GO
17	GBR	EUROSTAT	56	VA
18	GRC	OECD STAN	56	VA, GO
19	HRV	EUROSTAT, prior to 2007 only VA deflators	53	VA, GO
20	HUN*	EUROSTAT	56	VA, GO
21	IDN	SEA 13, updated with UN NA	35	VA
22	IND	India KLEMS, extrapolated after 2011 with UN NA	27	VA, GO
23	IRL	EUROSTAT	21	VA
24	ITA	OECD STAN	56	VA, GO
25	JPN	JIP database, extended with UN NA after 2012	108	VA, GO
26	KOR	KIP database, extended with UN NA after 2012	32	VA, GO
27	LTU	EUROSTAT	56	VA
28	LUX	OECD STAN	32	VA, GO
29	LVA	OECD STAN	56	VA, GO
30	MEX	OECD STAN, prior to 2003 only aggregate sector level data	29	VA, GO
31	MLT	No information available, we used Greek deflators		
32	NLD	OECD STAN	56	VA, GO
33	NOR	OECD STAN	56	VA, GO
34	POL	EUROSTAT, deflators prior to 2003 back-cast using STAN	56	VA
35	PRT	OECD STAN	56	VA, GO
36	ROU	EUROSTAT	56	VA, GO
37	RUS	Russia KLEMS	35	VA, GO
38	SVK	OECD STAN	54	VA, GO
39	SVN	OECD STAN	56	VA, GO
40	SWE	OECD STAN	50	VA, GO
41	TUR	SEA 13, updated with UN NA	35	VA, GO
42	TWN	National Statistics Republic of China (Taiwan)	51	VA
43	USA	BEA	42	VA, GO

*We received GO deflators directly from Monika Schwarzappel of the The Vienna Institute for International Economic Studies (WIIW)

**We use CANISM deflators from productivity accounts for 2000-2013 from CANSIM table 383-0032. NAICS sectors are mapped to ISIC Rev. 4 sectors. The productivity accounts pertain to the market economy, so for the government sector we used the GDP deflator from the UN NA for broad sector J-P (Other service activities). For 2014 the deflators are updated using UN NA as well.

5. ISIC Rev. 3 – Rev. 4 mapping

Rev. 3 code	Rev.3 description	Rev. 4 code	Rev. 4 description
AtB	Agriculture, Hunting, Forestry and Fishing	A01	Crop and animal production, hunting and related service activities
AtB	Agriculture, Hunting, Forestry and Fishing	A02	Forestry and logging
AtB	Agriculture, Hunting, Forestry and Fishing	A03	Fishing and aquaculture
C	Mining and Quarrying	B	Mining and quarrying
15t16	Food , Beverages And Tobacco	C10-C12	Manufacture of food products, beverages and tobacco products
17t19	Textiles and Textile, Leather, Leather And Footwear	C13-C15	Manufacture of textiles, wearing apparel and leather products
20	Wood and Of Wood and Cork	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21t22	Pulp, Paper, Paper , Printing And Publishing	C17	Manufacture of paper and paper products
21t22	Pulp, Paper, Paper , Printing And Publishing	C18	Printing and reproduction of recorded media
23	Coke, Refined Petroleum And Nuclear Fuel	C19	Manufacture of coke and refined petroleum products
24	Chemicals and Chemical	C20	Manufacture of chemicals and chemical products
24	Chemicals and Chemical	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
25	Rubber and Plastics	C22	Manufacture of rubber and plastic products
26	Other Non-Metallic Mineral	C23	Manufacture of other non-metallic mineral products
27t28	Basic Metals and Fabricated Metal	C24	Manufacture of basic metals
27t28	Basic Metals and Fabricated Metal	C25	Manufacture of fabricated metal products, except machinery and equipment
30t33	Electrical and Optical Equipment	C26	Manufacture of computer, electronic and optical products
30t33	Electrical and Optical Equipment	C27	Manufacture of electrical equipment
29	Machinery, nec.	C28	Manufacture of machinery and equipment n.e.c.
34t35	Transport Equipment	C29	Manufacture of motor vehicles, trailers and semi-trailers
34t35	Transport Equipment	C30	Manufacture of other transport equipment
36t37	Manufacturing nec; Recycling	C31_C32	Manufacture of furniture; other manufacturing
36t37	Manufacturing nec; Recycling	C33	Repair and installation of machinery and equipment
E	Electricity, Gas and Water Supply	D35	Electricity, gas, steam and air conditioning supply
E	Electricity, Gas and Water Supply	E36	Water collection, treatment and supply

E	Electricity, Gas and Water Supply	E37-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
F	Construction	F	Construction
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	G46	Wholesale trade, except of motor vehicles and motorcycles
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	G47	Retail trade, except of motor vehicles and motorcycles
60	Other Inland Transport	H49	Land transport and transport via pipelines
61	Other Water Transport	H50	Water transport
62	Other Air Transport	H51	Air transport
63	Other Supporting and Auxiliary Transport Activities; Activities Of Travel Agencies	H52	Warehousing and support activities for transportation
64	Post and Telecommunications	H53	Postal and courier activities
H	Hotels and Restaurants	I	Accommodation and food service activities
21t22	Pulp, Paper, Paper, Printing and Publishing	J58	Publishing activities
21t22	Pulp, Paper, Paper , Printing And Publishing	J59_J60	Motion picture, video and television program production, sound recording and music publishing activities; programming and broadcasting activities
64	Post and Telecommunications	J61	Telecommunications
71t74	Renting Of M&Eq And Other Business Activities	J62_J63	Computer programming, consultancy and related activities; information service activities
J	Financial Intermediation	K64	Financial service activities, except insurance and pension funding
J	Financial Intermediation	K65	Insurance, reinsurance and pension funding, except compulsory social security
J	Financial Intermediation	K66	Activities auxiliary to financial services and insurance activities
70	Real Estate Activities	L68	Real estate activities
71t74	Renting Of M&Eq And Other Business Activities	M69_M70	Legal and accounting activities; activities of head offices; management consultancy activities
71t74	Renting Of M&Eq And Other Business Activities	M71	Architectural and engineering activities; technical testing and analysis
71t74	Renting Of M&Eq And Other Business Activities	M72	Scientific research and development
71t74	Renting Of M&Eq And Other Business Activities	M73	Advertising and market research
71t74	Renting Of M&Eq And Other Business Activities	M74_M75	Other professional, scientific and technical activities; veterinary activities
71t74	Renting Of M&Eq And Other Business Activities	N	Administrative and support service activities
L	Public Admin and Defense; Compulsory Social Security	O84	Public administration and defense; compulsory social security
M	Education	P85	Education
N	Health and Social Work	Q	Human health and social work activities
O	Other Community, Social and Personal Services	R_S	Other service activities
P	Private Households with Employed Persons	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
Q		U	Activities of extraterritorial organizations and bodies