

Eurostat/OECD 2018 questionnaire on the methodology underlying labour input data in national accounts

Country: Germany

Date: March 2018

Part I: Methods

1. Employment in persons

Question 1.1: Please describe the architecture of your estimation method for employment in persons. Please include details of differences in methods and data sources that may exist at different points in the time series (e.g. a break in the series) or due to the timing of the estimate (e.g. flash estimate, regular estimate or annual data). Please also provide links to articles that may be relevant.

Germany produces a flash employment estimate (total employment released after some $t+30$ days as part of the monthly ILO Labour market statistics) and regular quarterly releases (quarterly employment figures by industries as part of National Accounts). This means, the monthly employment estimates of the Statistisches Bundesamt distinguishes two different phases that should be considered separately:

The German monthly estimation for employment is based on three different pillars. The main pillar is comprised of source-based expert calculations, carried out on a differentiated basis according to the status in employment, but exclusively at aggregated national level. As these calculations and estimates are based on a still very incomplete data basis, in addition mathematical and statistical forecasting procedures are used which can be carried out in the short term and independently of the inclusion of employment statistics data sources. The results determined independently of each other according to the two methods are subsequently evaluated against the backdrop of general economic performance and amalgamated into a final result. At the same time the monthly results of the Labour Force and further macroeconomic labour market indicators are included. This mix of various methods ensures a high degree of flexibility and utilises potential synergy effects by means of comparisons. Thus the time series analysis and the regression approaches provide important support in estimation of the prevailing trends and seasonal movement in employment. By contrast peculiarities and irregular effects, for example the influence of weather factors or new statutory rules with employment policy-related effects, are taken into account in the expert calculations.

The quarterly employment estimates rely on a benchmark calculation which is extrapolated for the current reporting period.

- The benchmark calculation (i.e. employment level): The benchmark calculation serves to generate very much detailed employment levels (industries for each occupational status) for a “base year”. The employment levels of the “base year” (i.e. the 12 month of the “base year”) are the basis for the monthly extrapolations and backward calculations.

· Extrapolation to current periods (i.e. monthly, quarterly and annual employment trends): The trend extrapolation of the benchmark employment levels by occupational statuses and industries is carried out on the basis of all the data sources available at the time of estimation. The estimation is produced monthly and built up in consistent quarterly and annual estimates too (e.g. quarterly results are the average of the monthly results of the respective quarter). Thereby a high degree to accuracy, reliability and completeness of the results is ensured. The monthly, and derived from it the quarterly, total employment numbers according to the domestic concept was thus determined by addition of the results of computation for individual occupational statuses and industries (bottom-up approach).

The following publication offers a good overview:

Lüken, Stephan (2012): The German Employment Accounts for National Accounts and Labour Market Statistics - Experiences and findings of six decade, Wirtschaft und Statistik 5/12, https://www.destatis.de/EN/Publications/WirtschaftStatistik/TheGermanEmployment_052012.pdf?_blob=publicationFile .

Question 1.2: What is the main original source for employment in the national accounts (e.g. administrative source, labour force survey, business survey, other)? Briefly describe this source, its coverage (including over time, range of businesses/households covered, etc.), its availability and whether it is in terms of jobs and/or persons.

As explained above (question 1.1), levels and the trends are based on a model integrating several sources (in total 60 different sources on persons in employment). The main data sources are:

- Monthly administrative statistics compiled by the Federal Agency for Employment: Employee statistics (“Beschäftigtenstatistik”) and statistics on marginal part-time employees (“Geringfügig Beschäftigte”)
- Business register
- Microcensus (Labour Force Survey)
- The statistics on public service personnel (“Personalstandstatistik”)
- Monthly, quarterly and annual business reports for certain industries

Please specify the sources used for different parts of employment (in particular if sources differ between employees and self-employed, and/or between industries, firms of different size, etc.). If sources differ, please provide a clear distinction when answering the questions that follow.

- a) Employee statistics (“Beschäftigtenstatistik”) and statistics on marginal part-time employment (“Geringfügig Beschäftigte”)

Main sources for employees (persons concept). These administrative sources are based on the monthly reports of employers on their employees contributing to the social insurance system. Employees subject to social insurance cover all employees who are subject to health, pension insurance and / or contributory pay under the employment promotion law or are paid for the contributions to the statutory pension insurance scheme or under the employment promotion law. Trainees, trainees and interns, student trainees and working students as well as persons who are required to work under social insurance obligations to perform legal duties (eg military exercise) are also included in the social security contributions. On the other hand, civil servants, the self-employed, assisting family members, professional and temporary soldiers, as well as military and civilian service providers are not included in the social security contributions.

b) Business Register

The German Business Register is a regularly updated database of enterprises and local units with a taxable turnover from deliveries and output and employees subject to social insurance contributions. Evaluations of business register data on the number of enterprises and local units and their employees, who are subject to social insurance contributions, and their sales (turnover) reveal economic structures in Germany. Since the data are published only on a key date in the year, these represent the benchmark for the calculation of the employee.

c) Microcensus (Labour Force Survey)

Main source for selfemployed persons. The microcensus provides official representative statistics of the population and the labour market in Germany. The Labour Force Survey of the European Union (EU Labour Force Survey) forms an integral part of the microcensus. Since 2005 the Microcensus (Labour Force Survey) is a continuous survey, which provides monthly employment figures for purposes of employment estimations.

In addition to its use in calculating self-employment, the microcensus also becomes a plausibility consideration for other occupational positions.

d) Statistics on public service personnel (“Personalstandstatistik”)

The statistics on public service personnel provides yearly data (30 June) on the persons working for public-sector employers, being directly employed by the respective institution as public officials or on the basis of an employment contract. Public-sector employers are the public service and legally independent institutions with a legal form under private law and with predominantly public participation. The public service consists of the public service in the narrow sense, namely the Federation, the Länder, the municipalities/associations of municipalities, special-purpose associations and the Federal Railways Fund, and of the indirectly subordinate public service, namely the Federal Employment Agency, the German Bundesbank, social security agencies and the legally independent institutions under public law.

Question 1.3: Please describe how estimates of annual figures based on higher frequency data (e.g. weekly, monthly, quarterly) are derived. Please also specify, if relevant, how annual figures are derived if survey information is less periodic (e.g. every 5 years)?

The quarterly and annual estimates are built up from monthly estimates (arithmetic means).

Question 1.4: Please describe the adjustments made to pass from jobs to the concept of persons (if the original source is in terms of jobs).

Not applicable; the sources use persons. (In practice double-counting of multiple jobholders may occur in cases where these jobs are performed in different industries, and the multiple job-holder is counted with each job separately in different sources. These cases, respectively the matching of different sources to the persons-in-employment-concept, have been tackled with while building up the benchmark employment levels.

Question 1.5: Please describe the adjustments made to correct for coverage of the economic territory (see ESA §11.17-11.19)? This refers specifically to residents working for non-resident units abroad non-residents working in resident units. If relevant, please also describe adjustments for military (including conscripts, where applicable) and other collective households not covered by your main source.

The total numbers over the inward-bound commuters and outward-bound commuters are based on a model similar to the employment one. For the transition to the national concept, the commuter flows to and from Germany have to be taken account of. Commuters are those employees or self-employed persons who live in Germany and work abroad or who live abroad and work in Germany.

The estimation model for the commuting flows is based on various monthly data sources (Balance of payments statistics of the Deutsche Bundesbank, by statistical institutions of the neighboring countries (statistical offices, social insurance institutions), data figures of the Ministry of Defense (employees of foreign armed forces in Germany), data from the Federal Employment Agency (employees of foreign representations in Germany) and education statistics (German students abroad who also work there, foreign students in employment), Labour Force Survey).

Question 1.6: Which adjustments are made for the unobserved economy (e.g. producers that deliberately do not register, individuals providing their labour that are not required to register, illegal workers, etc.)?

Provided that reliable information was available, explicit adjustments for informal employment activities (i.e. in construction industries and private domestic services) had been made. These adjustments were introduced into the benchmark calculations.

Question 1.7: Which, if any, other adjustments are made (e.g. inclusion of resident workers below the age threshold, prisoners, adjustments made to account for statistical deficiencies in the source data, etc.)?

Employed prisoners and employed persons below the age of 15 are included. Special adjustments are made for helping relatives.

Question 1.8: In cases where Labour Force Survey data have not been used as the main source (even if only for some activities or groups of workers), please explain why. Are LFS data used for adjustments or cross-checking? Are differences monitored?

As explained above the German employment accounts are based on the principle, not to refer only to one source but to take into account all available statistical information on employment. Currently, the monthly employment accounts are based on 60 different statistics. The Labour Force Survey (LFS), respectively the German Microcensus, is integrated into the employment estimates and it is the main source for selfemployed persons. Its advantage is to provide detailed information on both the employment and unemployment situation of the population and its social implications. The first monthly and quarterly employment figures derived from the continuous Microcensus show that progress has been made, but a (smaller than before but nevertheless considerable) underestimation of marginal part-time employment in comparison to other reference statistics still remains. The differences between employment figures of the Microcensus (LFS) compared to other sources and the results of the employment accounts are monitored on a regular basis.

The deviations are mainly due to differences in the methods and procedures used in both statistics, but are partly based on inconsistent definitions. Eventually, the microcensus and the employment accounts differ mainly in the demarcation of workers who have interrupted their work. In terms of methodology, it is significant that the labor force accounts estimate the number of employed persons on the basis of about 60 statistics, while the microcensus as household surveys is based on the respondents' data. Against this background, it can be explained that deviations are found mainly in the area of marginal employment.

Experience has shown that it can be problematic to record smaller (secondary) jobs or activities in the gray area for undeclared work in household surveys. In the employment accounts, therefore, estimates are made for statistically difficult to record areas. Register data are available to the employment account at an early stage, which is why these are used with priority.

2. Hours worked

Question 2.1: Please describe the architecture of your estimation method for hours worked. Please include details of differences in methods and data sources that may exist at different points in the time series (e.g. a break in the series). Please also provide links to articles that may be relevant.

The Working Time Measurement Concept (Arbeitszeitrechnung, AZR) of the Institute for Employment Research (IAB) provides the hours worked per employed person and the labour volume. Since 1996, the results of the AZR are part of the quarterly national accounts of the German Federal Statistical Office. Due to the integration of the AZR in the national accounts, the European System of National and Regional Accounts 2010 (ESA 2010) is essential for the calculation of hours worked and the labour volume in the AZR.

The calculation of hours worked and the labour volume within the AZR is based on a differentiated componentwise accounting concept, where calendar effects (e.g. potential working days, adjustments for differences in the calendar), collectively agreed standards (e.g. collectively agreed/customary working hours, annual paid holidays), business cycle influences (e.g. short-time work, paid and unpaid overtime), as well as personal components (e.g. sick leave, part-time work) and other components (e.g. strikes and lock-outs, secondary jobs) are considered. To cover all areas with sufficient information a total of 20 different statistics and surveys are processed in the AZR. Differing sources, periodicities, types of surveys and degrees of coverage are faced by the measurement concept. As some data sources are available only with a substantial publication lag, the AZR uses model-based estimation procedures for some components (e.g. paid overtime, unpaid overtime, working-time accounts).

The calculations of the labour volume in the AZR comprise actual hours worked by all persons in employment who perform a gainful activity within Germany. It includes all hours worked by persons who have several jobs at the same time. Hours paid, but not worked, for example because of annual leave, parental leave, holidays, short-time work or sick leave, are not part of the labour volume. The calculations are separately for dependent employees as well as for the self-employed persons and family workers. The AZR calculates all components broken down into full-time and part-time employment, into West and East Germany and into 38 economic sectors (A*38 breakdown according to the WZ2008 classification of economic branches).

The calculations of hours worked and the labour volume are subject to regular revisions, such as ongoing revisions and major revisions. Due to these major revisions, the AZR provides quarterly consistent time series for the development of hours worked and the labour volume for Germany since 1991.

Detailed information regarding the calculation, method and data sources give the following publications:

Wanger, Susanne; Weigand, Roland; Zapf, Ines (2016): Measuring hours worked in Germany - Contents, data and methodological essentials of the IAB working time measurement concept. In: Journal for Labour Market Research (49): 213-238.

Link: <https://link.springer.com/content/pdf/10.1007%2Fs12651-016-0206-0.pdf>

Wanger, Susanne; Weigand, Roland; Zapf, Ines (2015): *Measuring hours worked in Germany: Contents, data and methodological essentials of the IAB working time measurement concept. IAB-Discussion Paper 21.*

Link: <http://doku.iab.de/discussionpapers/2015/dp2115.pdf>

Weigand, Roland; Wanger, Susanne; Zapf, Ines (2015): *Factor structural time series models for official statistics with an application to hours worked in Germany. IAB-Discussion Paper 22.*

Link: <http://doku.iab.de/discussionpapers/2015/dp2215.pdf>

Wanger, Susanne; Weigand, Roland; Zapf, Ines (2014): *Revision der IAB-Arbeitszeitrechnung 2014 * Grundlagen, methodische Weiterentwicklungen sowie ausgewählte Ergebnisse im Rahmen der Revision der Volkswirtschaftlichen Gesamtrechnungen. In: IAB-Forschungsbericht 09, Nürnberg.*

Link: <http://doku.iab.de/forschungsbericht/2014/fb0914.pdf>

Question 2.2: What is the main original source for hours worked in the national accounts (e.g. administrative source, Labour Force Survey, Business survey)? Briefly describe this source, its coverage and its ability to reflect the definition of hours worked (see ESA §11.27-11.31). In particular, does it capture a ‘usual’ hours, ‘actual’ hours, or some other concept?

Please specify the sources used for different parts of the employed population (in particular if sources differ between employees and self-employed, and/or between industries, firms of different size, etc.). If sources differ, please provide a clear distinction when answering the questions that follow.

The AZR is based on a differentiated componentwise accounting concept. Due to the different components and dimensions to be considered in the AZR, a total of 20 different statistics and surveys are processed (see Question 2.1).

In the following, there is a small excerpt of the most important data sources of the AZR.

- Employment accounts of the Federal Statistical Office
- Employment statistics of the Federal Employment Agency
- Microcensus of the Federal Statistical Office
- IAB Establishment Panel of the Institute for Employment Research
- Statutory Health Insurance Statistics of the Federal Ministry of Health

For more details of the data sources for each component see Question 2.3.

The complete overview of the most important data sources of the AZR is found in Wanger et al. (2016), page 217.

As a result, the calculations of hours worked in the AZR capture ‘actual’ hours worked, and not ‘usual’ hours worked.

Question 2.3: Please describe the adjustments made to transform the original source to adapt it to the concept of working hours as defined in national accounts? Please, describe each adjustment separately. These adjustments might include:

EMPLOYEES

Accounting for part-time and full-time

- To calculate the average actual hours worked and the volume of work, the number of gainfully employed persons is calculated and their structure is considered. The number of gainfully employed persons comprises employees subject to social insurance contributions, marginally employed persons, civil servants, and persons in work opportunities (Personen in Arbeitsgelegenheiten, so-called One-Euro-Jobs) as well as self-employed persons and family workers. The quarterly and annual figures stem from the Employment Accounts. As there is no specific subdivision in the Employment Accounts according to working time, one fundamental element of the AZR is the allocation of employees into part-time or full-time employees. For calculating the part-time rate, different statistics are combined in the AZR.
- The register-based Employment Statistics of the BA is the basis for calculating the number of part-time and full-time employees subject to social insurance contributions. It is based on standardised social security notifications, which include all employees (also those in vocational training) subject to compulsory health insurance, compulsory pension insurance or compulsory insurance in accordance with the German Social Code, Book III (SGB III). With this notification, employers also provide information on whether the employee has a full-time or a part-time job. Part-time employment is defined by contractual hours of work below the company's customary hours. However, the regular weekly working hours of the employees are not submitted. Breaks in the time-series of the Employment Statistics of the BA due to changes in the notification or a modernized data processing have been removed using a structural time-series model.
- Marginally employed persons are a special form of part-time employees. They are not subject to social insurance contributions, but considered as gainfully employed following the labour force concept of the ILO if they performed at least one hour of paid work within the reporting period. Marginal employees are calculated by the Employment Accounts. Here, three groups of marginal employed persons are summarized: marginally gainful employed persons (so-called Mini-Jobs), marginally short-term employed persons and persons in One-Euro-Jobs.
- Since civil servants are not subject to compulsory health and pension insurance, and compulsory insurance in accordance with SGB III, they are not included in Employment Statistics of the BA. Currently, the number of part-time civil servants is taken from the Fachserie 14, Series 6 "Personal des öffentlichen Dienstes" published by the Federal Statistical Office. By adding the regularly part-time employees subject to social insurance contributions, the marginal part-time employees including persons in One-Euro-Jobs and the part-time civil servants we get the number of all part-time employees. Furthermore, persons on parental leave and persons in the release period of partial retirement are considered as part-time employees. These persons are included as employed in the statistics but perform zero hours of work, which is taken into account to avoid an overestimation of the macroeconomic volume of work. The part-time rate represents persons employed part-time as a percentage of all employees.

Accounting for potential working days

- In the calculations of the number of potential working days a five-day week is assumed throughout. This common assumption presumes that employees are given compensatory time off on other days when they work on Saturdays, Sundays, or on public holidays. The number of potential working days therefore results from the number of calendar days minus Saturdays, Sundays, and public holidays. Regional holidays that do not apply throughout Germany are weighted with the number of employees

subject to social insurance contributions within the states (Bundesländer) level to calculate averages. The different numbers of annual working days have a nonnegligible irregular effect on annual hours worked.

Accounting for collectively agreed or customary working hours

- The collectively agreed or customary weekly working hours is the major source of the long-term development of hours worked. Collectively agreed hours worked are collected in the Index of Agreed Earnings and Working Hours Calculation of the Federal Statistical Office. There, the development of collectively agreed income and working hours of employees in Germany is recorded together with indices of agreed earnings. Additionally, information from the Collective Agreement Archive of the Institute of Economic and Social Research (WSI) of the Hans-Böckler Foundation and the Register of Collective Agreements of the Federal Ministry of Labour and Social Affairs are added to cover gaps. Many industries have agreed on labour-related opening clauses and flexible working time regulations in the collective bargaining process, but since the actual use of such numerous variations on the enterprise level is not recorded or evaluated in the statistics, in particular the collectively agreed working hours is regarded as reference level for a certain period.
- These data, however, cover only the weekly hours worked by employees in establishments with collective agreements. Results from the IAB Establishment Panel show that in establishments with collective agreements the weekly working hours are fewer than in those without collective agreements. Collective bargaining coverage decreased over the past years. Thus, the customary working hours in establishments which are not bound by collective agreements gain importance. This must be considered in the AZR since otherwise the component of collectively agreed or customary working hours is estimated too low. Through analyses of the IAB Establishment Panel, a correction factor is estimated for each industry, which compensates for this effect.
- Information on collectively agreed or customary working hours typically refers to full-time employment. Information from the Microcensus is used to obtain the average weekly hours worked by part-time employees. For the different economic sectors, the ratio of hours worked by regular part-time and marginal employees to those of full-time employees is calculated. The results are then applied to the collectively agreed or customary working hours by full-time employees. For One-Euro-Jobs, information on average weekly hours worked are obtained from the BA. Because there is no differentiation according to economic sectors in this statistic, the variation of the working time of One-Euro-Jobbers across economic sectors is assumed to be proportional to that of marginal employees.

Accounting for holidays and annual leave

- The main data source is the Collective Agreement Archive of the Institute of Economic and Social Research reporting the collectively agreed annual paid holiday leave of employees. It distinguishes basic and actual total leave. Basic and actual total leave are weighted on a 40/60 basis, being a plausible proportion according to evaluations on basis of the German Socio Economic Panel Study (GSOEP).
- The Collective Agreement Archive additionally provides information on special leave which is customary in some economic sectors.
- The quarterly distribution of the annual holiday leave is estimated with the help of the Monthly Tourism Survey of the Federal Statistical Office.
- Times of maternity leave are also considered, the data basis is the Birth Statistic of the Federal Statistical Office.
- Special effects of additional leave for heavy or hazardous work, school holidays for teachers, and additional leave for the severely handicapped, are also taken into account. Calculations indicate an average of about one day per year on average per employee.

Accounting for sickness leave

- The main data source is the Statutory Health Insurance Statistics of the Federal Ministry of Health recording the monthly sick leave ratio. It comprises employees that reported unfit for work at the first of each month. Periods of short-term incapacity for work lasting up to three days, which are under-recorded in this series, are possibly offset by non-compulsorily insured persons (employees not covered by the agreed pay scale, civil servants, and marginal part-time employees) with typically lower levels of lost working hours. Cases in which people resume work while still certified unfit for work by a physician have a similar effect.
- As the reference of the sick leave statistics is the first day of each month, the time-series to sick leave are adjusted using usual weekday and holiday effects and modifying the series to fit the seasonal patterns reported by two major statutory health insurers (AOK, BKK). Here, statistical state space methods are used.
- As the monthly sick leave statistics are not broken down into economic sectors, the annual health reports of the two major statutory health insurers (AOK, BKK) are used to compute the sectorspecific figures in a top-down approach.

Accounting for paid but unreported overtime

- The main data sources are the GSOEP and the Microcensus containing information about paid and unpaid overtime hours.
- One major additional data source is the Ifo Business Survey. Additionally, other labour market and economic indicators are used (e.g. GDP, industrial production index) to tackle the publication lag of GSOEP and Microcensus at the current edge.
- The data of the Structure of the Earnings Survey of the Federal Statistical Office are used to calculate overtime hours separately for industries, West/East Germany and full-time/part-time.
- To combine the different data sources and to calculate quarterly figures for paid and unpaid overtime structural time series models are used.
- For further information of the applied structural time series model see Weigand et al. (2015)

Accounting for unpaid overtime

- See section above for paid overtime

Accounting for working time accounts

- See section above for paid overtime

Accounting for short time work

- The main data source is the Statistics on Short-Time Work of Businesses and Short-Time Workers of the Federal Employment Agency. It provides sufficiently deep economic and temporal breakdowns for short-time work and can be directly converted into volumes of hours lost.
- Until 2006, a “bad weather-component” was also part of the AZR. The number of lost hours and the affected employees due to bad weather were recorded to the extent that the BA paid benefits until 2006. The loss of working hours through bad weather was by definition only possible in the construction sector. In 2007 the bad weather compensation (Winterbauförderung) was replaced by the seasonal short time working allowance (see above). Therefore the time-series on working hours lost due to bad weather end in 2006 and are captured in line with the total short time working allowance component from 2007 on.

Accounting for strikes and temporary lay-offs

- The main data source is the Strike Statistics of the Federal Employment Agency. It provides sufficiently deep economic and temporal breakdowns for the strikes and lockouts and can be directly converted into volumes of hours lost.
- Labour disputes are only shown if they are lasting longer than one day and at least 10 employees are involved or generating a loss of more than 100 working days. All other disputes are classified as small claims and are listed for information only. As far as they are reported they are also considered in the calculation.

Accounting for differences in the calendar

- In the components discussed so far, the changing number of working days leads to a proportional change in the volume of work. This would result in an excessively volatile productivity development caused by calendar-effects. Therefore, working time elasticities specific to economic branches are needed to approximate the correlation between a change of number of working days and a change of labour volume. These working-time elasticities should measure by how many hours the annual hours worked change when more or less working days are available, and hence the latter are not included in annual hours worked one-to-one. As suitable data for estimating these effects are not available, we take the elasticities to correspond to working days elasticities of production calculated by the German Bundesbank. These elasticities indicate the percentage by which the production increases if the potential working hours are extended by one per cent due to (the fraction of) an additional working day. The estimated working day effect reflects the difference of production carried out at a normal work day and the production carried out at a weekend day.
- For determining the compensatory hours due to the elasticities being smaller than one, we first calculate the long-term working time, which is the product of the average of potential working days by quarters over the last 20 years and the collectively agreed working time in the given year. By subtracting the collectively agreed working hours of the year from these long-term annual hours we obtain a deviation in hours from the long-term average. These additional or reduced hours compared to the long-term average are not fully taken into account in the annual hours worked, but only a fraction given by the working days elasticities. The remaining hours are the compensatory hours taken into account within the component “adjustment for differences in the calendar”. This procedure is carried out sector-specific and for full- and part-time employees separately.

Accounting for secondary jobs

- Besides the time worked by employees at their main (or only) job also the volume of work from second or third jobs is taken into account. Up to 2003, the only source for the number of employees and average hours worked in secondary jobs was the Microcensus. Since then, it is also possible to use the sector-specific BA statistics on secondary employment of employees subject to social insurance contributions. These additional information in the Employment Statistics of the BA are the result of legal changes regarding secondary employment.
- Since the Employment Statistics of the BA provide no information on the duration or length of working hours, we use basic information from the Microcensus to obtain the average weekly hours worked by employees in the side job. The ratio of the average number of hours worked by side employees to the average number of hours worked by full-time employees is calculated for each industry.
- The calculations of the AZR include adjustments for the number of persons in the unobserved economy, especially secondary jobs in private households are underreported. We make adjustments for the undercoverage of side-jobs in official statistics, therefore we include an adjustment factor based on Employment Accounts of the Federal Statistical Office and Employment Statistics of the Federal Employment Agency.

SELF-EMPLOYED

- In addition to the hours worked by dependent employees, the hours worked by self-employed and unpaid family workers are considered in the measurement concept. Since patterns of hours worked by self-employed persons themselves and their unpaid family members differ fundamentally, both groups are treated separately in the AZR. The calculations of hours worked differ methodologically from those for employees because a large part of the components of hours worked are not relevant here.
- The most important source for average hours worked of self-employed and unpaid family workers is the Microcensus, collecting the hours (normally) worked per calendar week. It is assumed that the hours worked are distributed evenly over the whole year. The only exception is the agriculture and forestry sector, where working hours outside the high season is presumed to be lower. Thus, we use a 30 % lower working time for the first and fourth quarter.
- According to the GSOEP, self-employed persons only take two thirds of the number of holidays as compared to employees, which we use to estimate the holiday leave for self-employed persons of each specific industry. For the seasonal distribution of leave, we assume that there is no difference between self-employed persons and employees. For the former, also the extent of sick leave is substantially lower than for employees. However, there are considerable variations in the results of sick leave days for self-employed persons. The statistics of statutory health insurance companies indicate that the number of sick leave days is between one third and one half of those of employees, while the Employment Surveys of the Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA) indicate values between one third and two thirds. On the basis of these analyses we assume half the sick leave rate of employees. Based on results of the Microcensus, the labour volume performed by persons who are self-employed in a second activity is also considered here.

⇒ For further information regarding the adjustments see Wanger et al. (2016).

Question 2.4: Is a specific adjustment made to account for under- or over-reporting in the source data? Please specify if these adjustments are made for employees and/or self-employed workers.

- See Question 2.3 -

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

- See Question 2.3, Adjustments for Secondary Jobs -

Question 2.6: Which other adjustments, if any, are made?

- See Question 2.3 -

Question 2.7: If necessary, please describe any additional calculations needed to derive total hours worked and average hours worked from the sources and adjustments specified above. This includes, but is not limited to, adjustments made to align the coverage of hours worked with that of employment in persons (i.e. the coverage produced by the process followed in section 1).

- In addition to the componentwise accounting model and the data sources summarized above, model-based statistical methods used to extract information from the data inputs constitutes the third key building block of AZR. Affecting several modules of the AZR such as secondary jobs, sick leave, paid

and unpaid overtime and flows on working time accounts, model-based statistical techniques are an elementary feature of the AZR as a whole.

- Recently, state space methods have become a valuable tool in official statistics. The state space approach combines assumptions on the dynamics of the underlying series with a suitable model for the measurements by observed data. Corresponding filtering and smoothing algorithms produce estimates of the underlying time series, which borrow strength from several data sources, related variables and from its own past.
- During the recent revision of the AZR, state space models have been installed as a major methodological innovation. For the most part, univariate or multivariate structural time series models, with separately modelled trend, seasonal, cyclical and irregular components, are used as dynamic specification. Since that revision, the application of such models, for example, helps to face the publication delay of secondary jobs, allows us to treat missing data periods and statistical breaks in the part-time ratio of regularly employed persons, and enables us to construct quarterly sick leave estimates from official data available for reference dates and additional sources; see Wanger et al. (2014) for more details on the specific models for each component. The most comprehensive use of state space models in the AZR is for the business cycle related components overtime hours and net flows on working-time accounts. There, Weigand et al. (2015) propose and implement a model in which the information of several primary surveys, but also additional business cycle and labour market indicators are exploited. This is made possible by using a factor structure in the statistical model.
- For each use case of state space methods in the AZR, the final estimates are forced to match the corresponding survey or administrative data source where available. Hence, no spurious fluctuations are induced, but rather data gaps at the current edge or within the series are filled.

Part II: Other work in this area

3. Differences between national accounts and Labour Force Survey estimates

Question 3.1: To what extent do you consider your Labour Force Survey an accurate tool for the measurement of employment and hours worked? Please describe any issues or shortcomings of which you may be aware.

Employment – see question 1.8.

Hours worked: Since the calculation of hours worked and the labour volume within the componentwise accounting concept of the AZR is demanding, different approaches for the measurement of working hours are used by other data producers. E. g., Eurofound calculates a collectively agreed yearly working time on the basis of collective agreements for all EU member states for the purpose of cross-country comparisons (Cabrita 2014).

As another alternative, measurements of hours worked and volume of work can be derived directly from survey interviews. For most of the establishment surveys, however, the findings are limited to particular groups of persons or companies, questions relate to paid hours rather than actual hours worked, or interviews take place only infrequently. Also in household interviews, e. g., labour force surveys, the questions to record hours actually worked and not worked, respectively, are not sufficient to yield a solid overall figure. Besides typical problems with household surveys such as proxy interviewing or memory errors, questions on “hours actually worked last week” or similar questioning may induce a systematic bias due to underreported occurrence of components such as holidays or sick leave which cause interviews not to take place. Likewise, multiple jobholding is underreported by survey participants as was found by Steward (2014) for U.S. data. Fleck (2009), who also discusses several other shortcomings of surveys

when measuring hours worked, shows that, all in all, the hours worked series estimated directly from labour force surveys provide higher measures as compared to other concepts.

In contrast to direct survey estimates, our comprehensive measurement concept contributes to a precise estimation of the overall and industry-specific volume of work since full coverage statistics are used where available to reduce the impact of survey errors and biases. Additionally, early available official numbers such as the sick leave ratio reported by health insurers replace survey results published with a substantial time lag, and thus contribute to the timeliness of reliable estimates. By using inputs such as employment by industries and person groups directly from other contributors to the national accounts, the accounting system becomes more consistent and reliable as compared to a concept where representativeness of household surveys is relied on. Most obviously, the AZR improves upon survey questions on “hours worked last week” as the impact of the different components of working time can be separately assessed. This allows the user to analyse the influence of the components, while the contribution and relevance of these numerous different developments can still be presented in an overall figure, such as the annual change of average hours worked.

Cabrita, Jorge.: Developments in collectively agreed working time 2013 (2014).
<http://eurofound.europa.eu/observatories/eurwork/comparative-information/developments-in-collectively-agreed-working-time-2013> . Accessed 29 April 2015.

Fleck, Susan E. (2009): International comparisons of hours worked: an assessment of the statistics. In: Monthly Lab. Rev., 132. Jg., S. 3.

Stewart, Jay (2014): The importance and challenges of measuring work hours. IZA World of Labor. doi: 10.15185/izawol.95

Question 3.2: If the Labour Force Survey is not the primary source of data used to derive your estimates of employment in persons hours worked: Are you able to quantify, even approximately, what the difference would be between your current national accounts estimates and those you would obtain if you did use the Labour Force Survey data as your primary source?

See bridge table – and question 1.8.

Question 3.2.1: Where differences between these estimates exist, can you provide a brief assessment of the source of these differences?

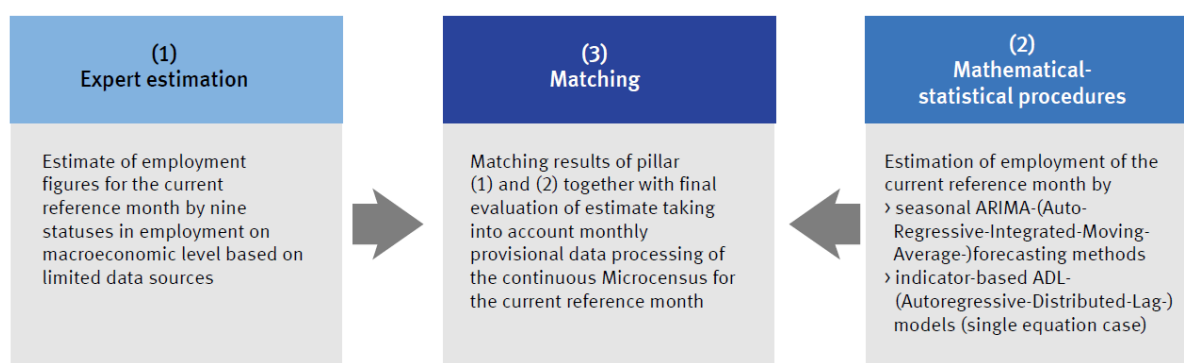
See bridge table – and question 1.8.

4. Flash estimates of employment in persons

Question 4.1: Are you currently producing flash estimates of employment (t+30 or t+45)? If so, please describe briefly the methodology, coverage and sources. If you are not producing a flash estimate, do you Description of estimation process

Germany already publishes data after 30 days of employment (=t+30). The German monthly flash estimation for employment is based on three different pillars (see question 1.1). The main pillar is comprised of source-based expert calculations, carried out on a differentiated basis according to the status

in employment, but exclusively at aggregated national level. As these calculations and estimates are based on a still very incomplete data basis, in addition mathematical and statistical forecasting procedures are used which can be carried out in the short term and independently of the inclusion of employment statistics data sources. The results determined independently of each other according to the two methods are subsequently evaluated against the backdrop of general economic performance and amalgamated into a final result. At the same time the monthly results of the Labour Force and further macroeconomic labour market indicators are included. This mix of various methods ensures a high degree of flexibility and utilises potential synergy effects by means of comparisons. Thus the time series analysis and the regression approaches provide important support in estimation of the prevailing trends and seasonal movement in employment. By contrast peculiarities and irregular effects, for example the influence of weather factors or new statutory rules with employment policy-related effects, are taken into account in the expert calculations.



Use of modelling

Different models are used: Usually the time series of employment show trend characteristics, random walk processes and seasonal and non-seasonal patterns. The use of ARIMA model is therefore recommended. The Germany flash estimation for employment is using ARIMA model selections which are based on the Box-Jenkins procedure. On the other hand, sudden changes in the economy are difficult to accurately capture by time series analysis. Therefore, the use of regression analyses is also recommended. Earlier indicators related to employment are needed. Germany uses ADL models, utilising data on unemployment, new orders, production index in manufacturing industry and business survey results.

In German national accounts, seasonal and calendar adjustment (i.e. adjusting the original, unadjusted figures for seasonal and calendar variations) are based on the internationally most popular Census X-12-ARIMA method (in partnership-based co-operation with the Deutsche Bundesbank).

Question 4.2: Please provide information on the quality of the estimates (e.g. revision analysis).

Regular revisions refer to minor corrections for individual quarters or years. They are performed in the course of current calculations and can generally occur during any release date. Such revisions are performed to include into the system current information that differs significantly from the data bases available before. In this way, data users are supplied with the best possible results for analyses and forecasts.

Usually, the data for the quarters of the current year are checked at every quarterly release date, while data for the last four years, including the relevant quarters, are revised only once a year (in August). In this context flash estimation are only slightly worse than the results published on a later date (such as $t + 45$ or $t + 75$). Initial results have a deviation below 0.2% (root mean square error) starting from the first quarter

of 2008 (as of 1st quarter 2018).

Major and fundamental revisions of national accounts take place approximately every five years (latest revisions in 2014, 2011, 2005 and 1999).

Reasons for comprehensive revisions may be the following:

- introducing new concepts, definitions or classifications into the accounting system;
- integrating new statistical bases for the calculation that have not been applied yet;
- applying new calculation methods;
- modernising the presentation and, where required, introducing new terms;
- enhancing international comparability.

The most recent major revision of national accounts took place in 2014 when the new “European System of National and Regional Accounts” (ESA 2010) was implemented throughout Europe.

5. Other data produced (Optional)

Question 5.1: Do you have plans in the near future to improve or expand the content of national accounts labour input data (e.g. improved alignment with national accounts concepts, extension of the time series, increased industry detail, etc.)?

Hours worked:

The calculations of hours worked and the labour volume in the AZR are integrated in the national accounts. Therefore, the calculations of the AZR are subject to regular revisions, the next revision takes place in 2019. This revision is used to improve certain calculations within the AZR, e.g. the calculations for overtime and parental leave, and to include new data sources within the AZR, e.g. for the calculations of short-time work or secondary jobs.

Question 5.2: Do you produce labour input data other than that already discussed, for example quality adjusted labour input or labour input in terms of full-time equivalents? If so, please provide details and/or links to these data.

The calculations in the AZR also comprise information about full-time equivalents.

Within the AZR the number of full-time equivalents refers to the collectively agreed/ customary working hours. The number of full-time equivalents is obtained by dividing the collectively agreed/ customary labour volume of all persons in employment through the number of working hours, which are on average collectively agreed/ customary worked in a full-time working place. However, the results of full-time equivalents are not published regularly.

For further information see Asef et al. (2011):

Asef, Dominik; Wanger, Susanne; Zapf, Ines (2011): Statistische Messung des Arbeitseinsatzes. In: Wirtschaft und Statistik (11): 1058-1064.

Link:

https://www.destatis.de/DE/Publikationen/WirtschaftStatistik/Arbeitsmarkt/StatistischeMessung122011.pdf;jsessionid=C938A9EE457DE3D69695F42D4319E059.InternetLive2?_blob=publicationFile

Question 5.3: Do you produce productivity statistics (e.g. labour productivity for the total economy, further breakdowns of labour productivity, capital productivity, multi-factor productivity, etc.)? If so, please provide details and/or links with regards to these data.

The German Federal Statistical Office publishes data on productivity on a quarterly basis and in the annual publications. These can be accessed on the webpage at: <https://www.destatis.de/EN/Publications/Specialized/Nationalaccounts/NationalAccounts.html>. The Federal Statistical Office publishes information on labor and capital productivity in various specialist series, such as the annual Fachserie 18, Reihe 1.4 (for example, Tables 2.1.15 and 2.2.26), and in other publications, such as the STATmagazin. Some additional information you are able to find under: https://www.destatis.de/DE/PresseService/Presse/Pressekonferenzen/2018/BIP2017/Pressebrochure_BIP_2017.pdf?_blob=publicationFile (in German language, chapter 4, Die Messung der Arbeitsproduktivität und das „Produktivitäts-Paradoxon“).

Question 5.4: If there is any other work that you produce currently, or are looking to produce in the future, in the areas of labour input or productivity, please use the space below to inform us about this work.