Notes on time series

Estimates of confidence intervals

Sample surveys are usually connected with sampling and non-sampling errors. The latter are a result, for instance, of administrative drop-outs of dwellings out of the sample, intentional non-response or errors produced by filling in the questionnaire. With these errors, one cannot determine a deviation of estimate without rather wide knowledge of the basic sample. On the other hand, the sampling errors, which arise by applying characteristics of the sample to the basic sample, can be interpreted by means of confidence intervals. The confidence intervals are intervals determined around the estimate in such a way that the actual value of the estimated characteristic falls right within this interval. Constructed most frequently for estimates are the confidence intervals of 95% (by multiplying the respective quantile of the standard normal distribution and the standard deviation) - i.e. an interval, in which the actual value of the estimated characteristic can be found with 95% probability.

The theory of sample surveys distinguishes between the two most frequent type of aggregates: **basic aggregates** and **partial aggregates**. The former are some primary aggregates (employment, unemployment ...) for a basic sample (men, women, persons at working age, men aged 20–24, ...). The latter includes some sub-aggregates in a basic aggregate. For instance, the breakdown of the CZ-NACE in the group of employed persons refers to sub-aggregates. The aggregates by age groups are not sub-aggregates - they are basic aggregates in the population aged 15–19, 20–24, etc.

The confidence intervals in **Annex Tables I** and **II** are calculated for the average size of a sample in 2011. For computing the confidence interval of aggregates for other years or quarters and partial aggregates for areas and regions it is necessary to use the following formulas and table **III**.

a) For the **basic aggregate**

95% C.I. of estimate Y = $y \pm 1{,}96 \cdot s_y, where\ \dot{s}_y = N \cdot \sqrt{(1-f) \cdot \frac{\frac{y}{N} \cdot (1-\frac{y}{N})}{f \cdot N}}$,

where N is the size of the basic sample
y is the estimate of aggregate Y in the basic sample
f is the respective relative size of sample

b) For the **partial aggregate**

where N is replaced by the estimate of basic aggregate y
y is replaced with the partial aggregate y_A

the following formula is used:

95% C.I. of partial estimate $Y_A = y_A \mp 1{,}96 \cdot s_{y_A}, where\ \dot{s}_{y_A} = y \cdot \sqrt{(1-f) \cdot \frac{\frac{y_A}{y} \cdot (1-\frac{y_A}{y})}{f \cdot y}}$

Making the calculations, we should bear in mind that although the aggregates are published in thousands, units should be used in the formula. Both formulas are simplified approximations of precise formulas, but the deviations between the approximations and the precise formulas are not statistically significant. However, the formula for partial aggregates may produce inaccurate results for small estimates of the basic aggregate.

Generally in the whole publication, the annual averages lower than 3000 persons and quarterly sums lower than 4500 persons are considered as data with very low reliability. In real terms it means that their relative standard error (i.e. coefficient of variation) is higher than 20%. Annual data lower than 500 persons and quarterly data lower than 750 persons are not published, as their relative standard error is higher than 50%. Instead of them there is a dot in the tables and for cases where the existence was not identified at all there is a slash in the tables.

Use of annex tables

Tab I Estimates of 95% confidence interval of the basic estimates for population aged 15+ (thousand)

Variants:
- 1a for quarterly estimates in total
- 1b for quarterly estimates for men and women
- 2a for annual estimates in total
- 2b for annual estimates for men and women

The table is designed to establish an approximate 95 % confidence interval of **basic estimates** for the basic sample of 15+ population in **the whole country and all its regions**. For example, if we want to know the confidence of the estimate of the number of unemployment people (117.7 thousand in Q3 2022), we shall find a row closest to the number 117.7 in the column the Czech Republic. This is 8.9 thousand for the estimate size 100.0 thousand. The next neighbouring value – 9.9 thousand – corresponds to the estimate 125.0 thousand. Since the difference between 117.7 and 100.0 makes up about three-fifths of the difference between 125.0 and 100.0, we shall add to 9.9 the corresponding part of the difference between 9.9 and 8.9 and get 9.6. The resulting 95% confidence interval for the estimate of the number of unemployed people in Q3 2022 is approx. 117.7 ± 9.6 thousand, i.e. there is a 95 % probability that the actual number of unemployed people in the Czech Republic was not lower than 108.1 thousand and not higher than 127.3 thousand.

Tab II Estimates of 95% confidence interval of the partial estimates for population aged 15+ at the national level

Variants:
- 1a for annual estimates in total
- 1b for annual estimates for men and women

The table is designed to determine the approximate 95 % confidence interval of **partial estimates** for the basic sample of 15+ population **at the national level only**. For example, if we want to determine the confidence of the estimate of employment in manufacturing in the year 2022 (1339.8 thousand, i.e. 25.9 % of the total employment of 5173.5 thousand), we find the value in a row corresponding roughly to 5173.5 and in a column corresponding roughly to 25.9. We can also make the following correction using a simple linear interpolation:

	25	**25.9**	30
5000	0.43		0.46
5173.5	cca 0.423 =0.43-(5173.5 -5000) / (5500-5000) * (0.43-0.41)	**cca 0.428** **=0.423+(25.9-25) / (30-25)*** **(0.441-0.423)**	cca 0.453 =0.46-(5173.5 -5000) / (5500-5000) * (0.46-0.43)
5500	0.41		0.44

This implies that there is a 95 % probability that there were no fewer than 25.9 % - cca 0.428% (1317.6 thousand) and more than 25.9 % + cca 0.428% (1362.0 thousand) of the employed in manufacturing.

For comparison: When substituting that into the above formula we reach the same interval: from 1317.6 to 1362.0.

Table II can also be used for basic aggregates in the age groups and sex **for the whole country**, providing that the basic aggregate is replaced with the size of the basic sample and partial aggregate with the respective estimate.

In this chapter we intend to give the reader general instructions on how to roughly determine **the error** which arises from **applying characteristics of the sample to the basic sample**. This error depends on three variables (on four in the case of partial aggregates), namely the size of the sample and of the estimate and, to a lesser extent, on the size of the basic sample. Giving an objective overview on errors of all the estimates would require compiling a large annex of tables and it would be difficult for the readers to find the necessary information there. This is why all of the methods used are considerably approximating but still fully sufficient for getting an idea of the accuracy of the estimates.

Sources and classifications used

Population Figures on the number and structure of the population are derived from statistics on demography (resident population and foreigners with long term residence permit).

CZ-ISCED 2011 Data on the level (degree) of education according to the International Standard Classification of Education (ISCED 2011), UNESCO, November 2011.

CZ-NACE Figures on the sectors of activity are split by the sections of the Classification of Economic Activities (*CZ-NACE*), which replaced the Industrial Classification of Economic Activities (OKEČ). The classification is compatible with the international classification NACE Rev.2.

CZ-ISCO Occupations are classified in compliance with the national Classification of Occupations (*CZ-ISCO*) published by the CZSO in 2011. This classification is compatible with the international classification ISCO-08. Since 2011, data are published by employment classification CZ-ISCO, which replaced the classification valid until 2010.

CZ-ICSE Status in employment is classified by the group of CZ-ICSE of 1998, which correspond to individual groups of the international classification ICSE-93.

CZ-NUTS Territorial structure is defined in compliance with CZ-NUTS effective since 1 January 2008.

Characteristic of classifications

CZ-NUTS: NUTS (La Nomenclature des Unités Territoriales Statistiques) was implemented by the Statistical Office of the European Communities in co-operation with the other EU authorities to allow to classify the standard unified structure of territorial units. It has been used in EU legislation, particularly for subsidies from the EU Structural Funds, since 1988.

There are 6 NUTS levels (NUTS 0, NUTS 1, NUTS 2, NUTS 3, NUTS 4 and NUTS 5), which represent the territorial size groups. The definition of each level depends on population and area. CZ-NUTS describes the territorial structure of the Czech Republic, using units that comply with the criteria of the European Union and approved by Eurostat for statistical purposes. This publication uses the following levels: NUTS 1 for the Czech Republic, NUTS 2 for Areas and NUTS 3 for Regions.

CZ-ISCED 2011: Czech version of the international standard ISCED. This is a translation of the international standard that is used terminology established and commonly used in the Czech Republic. ISCED serves as a tool for collecting and presenting statistics on education, both at national and international level. Member States ISCED 2011 classification applied in the reporting of statistics in the field of education since 2014.

According to ISCED A (ISCED-Attainment), the levels of education break down as follows:

0 Less than primary education
1 Primary education
2 Lower secondary education
3 Upper secondary education
4 Post-secondary non-tertiary education
5 Short cycle tertiary education
6 Bachelor or equivalent level
7 Master or equivalent level
8 PhD or equivalent level

CZ-NACE: Since Q1 2009, only the Classification of Economic Activities (CZ-NACE) is applied in the LFSS. The classification is based on the international classification of economic activities in compliance with the Regulation of the European Parliament and the Council (EC) no. 1893/2006 of 20 December 2006 introducing statistical classification of economic activities NACE Rev.2. As a consequence of switching from OKEČ to CZ-NACE all time series data were recalculated to the new classification backwards from 1993.

CZ-ISCO: The subject of this classification is occupation, i.e. activity executed by a person (even though it is not their profession) and which is their main source of income from work. The classification is based on ISCO-08 (International Standard Classification of Occupations).

CZ-ICSE: CZ-ICSE is based on the revised International Classification of Status in Employment - ICSE-93, approved by the 15th International Conference of Labour Statisticians in January 1993. ICSE-93 is obligatory only at the one-digit level, more detailed breakdown is recommended. CZ-ICSE is obligatory down to the four-digit level. Only economically active persons are included.

Development of methodology of the indicators and characteristics of their changes

As the time went by, the LFSS conceded some changes, especially in the process of harmonisation with methodology of Eurostat. These changes partially created the possibility to develop complete and fully comparable time series. In adjusting primary data to comparable methodology, most of the methodological changes were registered and methodological discrepancies were removed. However, the reader should be informed about places where the methodological changes influenced the completeness and time comparability.

The more important changes appeared in these characteristics:

Population - End-of-year demographic figures interpolated for individual quarters were used for the years 1993 to 1996. An extrapolation method based on the latest end-of-year figures was applied in 1997–2000, the method taking account of migration and natural changes in the population. The data for 2001–2002 were designed according to definitive demographic data regarding the final results of Census 2001 and were interpolated to each quarter of relevant year. Since 2003 demographic projection of quarterly middle states for Labour Force Sample Survey on the base of final data at 31. 12. of relevant year regarding the changes in administrative division and the prediction of both development of natural movement and migration balance in particular quarters of 2003–2022 was used. The results of Census 2021 are taken into account in the data for 2022. At the same time, double data for 2011 are published, the data in column 2011*) based on the definitive results of Census 2011.

Education - From 1993 to 1998 the national scale of stages was used. Since 1998 a wider scale of the highest educational attainment according to ISCED 97 has been used in the survey. Since 2002 the special type of the tertiary education on the level ISCED 5b has been classified as tertiary, while in last years it belonged to vocational high secondary education with GCE. From 1 January 2014 was introduced Classification of Education - CZ-ISCED 2011. Classification CZ-ISCED 2011 replaces ISCED 97 on levels of education.

CZ-NACE - Up to 2008, published data on industrial assignment were broken down by the OKEČ classification. The older data, which were based on the classification of industrial activities in force at that time were re-coded to the OKEČ classification. In sporadic cases, non-convertible groups were placed under “Not identified”. With effect from the beginning of 2009, only the Classification of Economic Activities (CZ-NACE) is applied in the LFSS. As a consequence, all time series data were recalculated to the new classification backwards from the start of the LFSS, i.e. 1993. Affiliation to industries is monitored by the workplace method and that is why the results differ from the reporting based on enterprise.

CZ-ISCO - older figures derived from the classification of occupations in force by the 31st December 2010 were re-coded according to the classification CZ-ISCO, which is compatible with the international ILO classification ISCO-08.

Job seeking ways - Up to and including November 1994, only one way of seeking job was reported for persons in unemployment (or of seeking another /second/ job by employed persons). Since December 1994, two ways can be reported for both cases. Since 2002 it is possible for respondents to state all used seeking method.

List of tables

The tables are placed in four basic **groupings**, each grouping dealing with a certain group of the population. The last one shows relative labour market indicators. All of the data are converted to comply with comparable methodology (see above).

When preparing the publication we were trying to offer the reader a wide view of labour market trends in the Czech Republic from the perspective of the new administrative arrangement at the level of NUTS 2 and NUTS 3. With regard to the range of this basic division the annual averages were preferred to the more detailed quarterly data. The quarterly data was chosen only in key features. For this reason some specific views on the labour market published in regular quarterly releases are ignored here. However, the missing information is available in the Czech Statistical Office. This publication thus offers two types of tables labelled:

A annual averages derived from calendar quarter data. The tables which are specifically for NUTS2 (areas) and NUTS3 (regions) have an extra sign **(R)**.
Q quarterly data.

All of the tables are broken down by sex.

Grouping I. Population of the Czech Republic

Grouping I of the tables includes the entire population of the Czech Republic

101 A (R) Population by age and highest educational attainment

Annual averages of demographic data of the Czech Republic employed for processing the LFSS; no standard balanced demography is involved. It contains data for five-year age groups and the level of the highest educational attainment. The table is processed for the Czech Republic, areas and regions.

102 A (R) Activity status of population by age

Annual averages of population of the Czech Republic aged 15 or more by activity status and gross age groups. The table is processed for the Czech Republic, areas and regions.

103 A Labour force by areas and regions

Annual averages of labour force in the Czech Republic by NUTS2 and NUTS3.

104 Q Labour force by areas and regions

Quarterly data of labour force in the Czech Republic by NUTS2 and NUTS3.

Grouping II. Employed persons in national economy

Grouping II of the tables includes all persons classified in compliance with ILO methodology to persons employed in the national economy, i.e. including temporary (till the year 2004) and regular members of the armed forces.

201 A Employed persons by areas and regions

Annual averages of persons aged 15 or more employed in national economy by NUTS2 and NUTS3.

202 Q Employed persons by areas and regions

Quarterly data of persons aged 15 or more employed in national economy by NUTS2 and NUTS3.

203 A (R) Employed persons by age and highest educational attainment

Annual averages of persons employed in national economy of the Czech Republic by five-year age groups and the level of the highest educational attainment. The table is processed for the Czech Republic, areas and regions.

204 A (R) Employed persons by industry

Annual averages of persons employed in national economy of the Czech Republic by CZ-NACE activity. The table is processed for the Czech Republic, areas and regions.

205 A (R) Employed persons by occupation and professional status

Annual averages of persons employed in national economy of the Czech Republic by CZ-ISCO occupation and professional status. The table is processed for the Czech Republic, areas and regions.

206 A Second job by areas and regions

Annual averages of second job holders employed in national economy by NUTS2 and NUTS3.

207 Q Second job by areas and regions

Quarterly data of second job holders employed in national economy by NUTS2 and NUTS3.

208 A Second job by professional status and industry

Annual averages of second job holders employed in national economy by professional status and CZ-NACE activity.

Grouping III. Unemployed persons

Tables of Grouping III include unemployed persons classified according to international definitions and recommendations of the ILO - i.e. persons who were without work in the reference, were actively seeking job in the reference week and were currently available for work within 14 days. Included under the unemployed are also persons who have found a job and will report for it for 3 months at the latest.

301 A Unemployed persons by areas and regions

Annual averages of unemployed persons according to ILO by NUTS2 and NUTS3.

302 Q Unemployed persons by areas and regions

Quarterly data of unemployed persons according to ILO by NUTS2 and NUTS3.

303 A (R) Unemployed persons by age and highest educational attainment

Annual averages of unemployed persons according to ILO by five-year age groups and the level of the highest educational attainment. The table is processed for the Czech Republic, areas and regions.

304 A (R) Duration and ways of seeking a job

Annual averages of unemployed persons according to ILO (without persons who have already found a job, but their commencement of work was fixed for 14 days at the latest) by duration of seeking a job and the most frequently ways of seeking a job. The table is processed for the Czech Republic, areas and regions.

Grouping IV. Rates

General unemployment rate by ILO methodology and participation rate constitute primary relative indicators for placing assessment on the labour market. Methodology of their calculations is mentioned above.

401 A Unemployment rate by areas and regions

Annual averages of general unemployment rate by NUTS2 and NUTS3.

402 Q Unemployment rate by areas and regions

Quarterly data of general unemployment rate by NUTS2 and NUTS3.

403 A (R) Unemployment rate by age and highest educational attainment

Annual averages of general unemployment rate by five-years age groups and the level of the highest educational attainment. The table is processed for the Czech Republic, areas and regions.

404 A Participation rate by areas and regions

Annual averages of participation rate by NUTS2 and NUTS3.

405 Q Participation rate by areas and regions

Quarterly data of participation rate by NUTS2 and NUTS3.

406 A (R) Unemployment rate by age and highest educational attainment

Annual averages of participation rate by five-years age groups and the level of the highest educational attainment. The table is processed for the Czech Republic, areas and regions.

Technical notes

- **ROUNDING - The absolute figures** are in thousands. Differences between the total and individual items used to provide the total are due to rounding-off (it was the total that was rounded off and not the individual items). Absolute and relative data in all textual and annex tables are derived from non-rounded-off figures. If the sum of divided characteristics is different from the total, the difference is caused by the reasons stated above or the scale of items is not complete (somewhere 'Not identified' is not stated).

- **SYMBOLISM -** The following **standard statistical symbols** are used in the tables to show cases of marginal values:

  — is used to indicate that the phenomenon given did not occur in the sample.
  • shows that the figure is not available or cannot be relied on.

- **NOT IDENTIFIED - "Not identified"** in the tables comprises refused answers, answers "do not know" and any other case of an unidentified answer of the respondent. Where more answers to the question asked are possible, the data are classified, in principle, according to the main variant of the answer.

It should be borne in mind in using the tables that sample methods were employed to acquire the information and, therefore, **the accuracy decreases as the sample diminishes**. The issue of confidence of estimates is dealt with in the respective chapter and the annex to the table part of this publication.

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