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The application of the employment method for the exhaustiveness of GDP estimates

Practical guidelines for enhanced comparability between countries

2024 edition

MANUALS AND GUIDELINES

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Contents

Abbreviations

ESA	European System of Accounts
EU	European Union
FTE	full-time equivalent
GDP	gross domestic product
GNI	gross national income
GNIG	gross national income expert group
GNI OR	gross national income for own resources
GVA	gross value added
IC	intermediate consumption
LFS	labour force survey
NA	national accounts
NACE	general industrial classification of economic activities within the European Union
SBR	statistical business register
SBS	structural business statistics
SMEs	small and medium-sized enterprises

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Introduction

1. One of the distinctive features of the system of national accounts is that it is designed to capture all economic activity within the production boundary, including those activities that are not observed in the basic statistical sources underlying the estimates of the main economic aggregates, such as gross domestic product (GDP) or gross national income (GNI). Including the non-observed economy in those estimates, referred to as 'exhaustiveness', is essential for the quality of the national accounts data, and has therefore been on the research agenda of national accountants for a long time.

2. Exhaustive national accounts data contribute to sounder economic analysis and better-informed policy making. However, some of the initiatives to improve exhaustiveness were undertaken in the context of using national accounts data for administrative purposes, namely to determine Member States' contributions to the EU budget. This was because the relevant legislation ([1]) recognised exhaustiveness – alongside reliability and comparability – as a key dimension of the quality of the GNI data for own resources (GNI OR). For this reason, Eurostat and the GNI Expert Group (GNIG), who are both charged with the task of verifying sources and methods used to compile GNI OR, have always attached a lot of importance to this issue of exhaustiveness.

3. Against this background, in spring 2020, the GNIG mandated the Subgroup on Exhaustiveness to investigate some priority areas identified in a cross-country comparison of exhaustiveness carried out by Eurostat as part of the 2016-2019 GNI OR verification cycle. One of these areas concerned the 'employment method' ([2]). The employment method, also called the labour input method, is based on the confrontation between the supply and demand of labour in the economy. The aim was to identify good practices and develop practical guidelines for the open issues in the application of the employment method. There was no intention to develop a one-size-fits-all method.

4. The subgroup specified the issues to be investigated based on the initial list of open issues identified in the cross-country comparison of exhaustiveness. For analytical purposes, all the identified issues have been grouped under the three main steps of the employment method:

• Step 1: Harmonisation of data on employment;
• Step 2: Comparison of supply and demand of labour; and
• Step 3: Conversion of extra labour inputs to non-observed production.

([1]) Regulation (EU) 2019/516 of the European Parliament and of the Council of 19 March 2019 on the harmonisation of gross national income at market prices and repealing Council Directive 89/130/EEC, Euratom and Council Regulation (EC, Euratom) No 1287/2003 ('the GNI Regulation').

([2]) The members of the sub-group working on this area were representatives of the national statistical authorities from Czechia, Germany, Spain, France, Italy, Hungary, Poland and Slovakia, as well as representatives of Eurostat, the Directorate-General for Budget and the Directorate-General for Taxation and Customs Union. Representatives of the national statistical authorities of Estonia, Ireland, Greece, Latvia, Luxembourg, Austria, Portugal and Romania also made contributions.

5.　　　An overview of issues and priorities is shown in Annex A (³). In addition, issues of a general nature and issues related to validation have also been discussed. Considering the timetable and resources available, the issues were also prioritised as primary or secondary, with the latter ones subject to a less in-depth analysis.

6.　　　The primary means of the investigation was country case studies, with 14 countries contributing in the form of presentations and/or methodological documents. The contributing countries were Czechia, Germany, Estonia, Ireland, Greece, Spain, Italy, Latvia, Luxembourg, Austria, Poland, Portugal, Romania and Slovakia. The subgroup discussed the countries' cases in five meetings on the employment method between June 2022 and May 2023. The countries' cases reflected their experience in the application of the employment method over the past two decades. Based on those cases, the subgroup discussed possible solutions to the identified issues. The solutions recommended in this paper are based on the synthesis of different aspects of national practices in the EU, the new insights gained through the investigation, and the analysis of developments in the relevant data sources following the recent changes in the relevant EU legislation (⁴).

7.　　　This paper presents the results of the work done by the subgroup. Chapter 2 is on general issues, while Chapters 3 – 5 are on Step 1, 2 and 3 of the employment method respectively. The validation aspects are discussed in Chapter 6. Finally, the recommendations put forward in this paper are summarised in Chapter 7.

8.　　　The guidelines presented were endorsed by the GNI Expert Group in its meeting of 22–23 November 2023. Guihong Chi and Marcin Bujnowski from Eurostat coordinated the work on the guidelines and were responsible for editing the manuscript. Eurostat appreciates that many countries have shared how they implement the employment method and is grateful to the members of the GNIG and its Subgroup on Exhaustiveness for their valuable contributions and comments.

(³)　Based on insights from the investigation, the original wording of some issues as given in Annex A has been slightly modified in this paper.

(⁴)　The regulations concerned are indicated in Section 3.1 of this paper.

2

General issues

2.1. Assumptions/conditions for using the employment method for exhaustiveness adjustments

9.   According to the OECD Handbook *Measuring the Non-Observed Economy*, the labour input method (employment method) is the most predominant supply-based method for estimating the size of the non-observed economy (⁵). This method is based on the confrontation between the supply and demand of labour.

10.   The data sources for the supply of labour are based on individuals/persons (employees/self-employed), while the data sources for the demand of labour are based on enterprises (employers). It is assumed that household survey data (on the supply side) give more complete coverage of labour input to GDP than do the enterprise survey data (on the demand side). There are two main reasons for this:

• Household-based surveys pick up labour inputs to production that may not be included in the enterprise surveys, e.g. because these enterprises are too small to be registered in the files from which the survey frames are constructed or because they are too small to be included within the survey.
• Individuals have fewer incentives to misreport their labour inputs (official or unofficial) to household surveys whereas enterprises may conceal some inputs because they wish to evade taxes or do not follow administrative regulations.

11.   The difference between the supply and demand of labour is the 'labour gap' and it is, in essence, 'non-observed labour input to production'. It can also be referred to as 'extra labour input' because it is the extra labour input that is observed from the supply side of labour compared to the demand side (non-observed on the demand side). In this paper, these three terms are used interchangeably.

12.   Based on the reasons underlying the above assumptions and on the experiences of countries, it can be said that it is beneficial to use this method if the following two main conditions are met:

• condition I: the reliable data sources available for labour supply indeed show more labour inputs to production/GDP than those for labour demand;
• condition II: it is known that there is a significant presence of unregistered producers and/or undeclared labour from registered producers.

13.   Furthermore, it is assumed that there is a link between the labour gap and non-observed production, although the exact relationship between these two is unknown.

(⁵)   See Measuring the Non-Observed Economy: A Handbook, OECD, IMF, ILO, CIS STAT, Paris, 2002.

14.   The strength of the employment method lies in capturing the non-observed labour inputs at the level of the total economy. Whereas the method does not, in principle, target individual industries, industry-specific information can be used in the process of determining the labour gaps by NACE ([6]) activities (see Section 4.1).

2.2. The scope of application of the employment method

15.   The employment method can be used to make explicit exhaustiveness adjustments to GDP estimates, as well as to validate GDP. The data on the demand side of labour to be used would differ depending on the purpose of the application of the method, while the data for the supply side are the same (see Section 2.3). When the method is used to validate GDP estimates, i.e. not for explicit exhaustiveness adjustments, the data for the demand side of labour should be the final employment estimates in the national accounts (NA). In this case, the supply of labour based on the demographic sources is used to validate the employment data underlying the GDP estimates.

16.   Validation of the employment data that underlies GDP estimates is required by Commission Decision 94/168 on the harmonisation of the compilation of gross national product at market prices ([7]) for all Member States.

2.3. Supply and demand of labour: which data sources should be used?

17.   The data on labour supply should be based on information on persons, i.e. it should come from demographic sources. This is in line with Commission Decision 94/168, where it is required to compare employment data according to demographic sources with the employment data underlying GDP estimates that are mainly based on business statistics for which the data collection units are mostly enterprises.

18.   The demographic data sources are the Labour Force Survey (LFS) and the population census (including the data sources used in census data). There are no other sources that could cover non-observed employment to a large extent for the total economy from the perspective of labour supply. There are some other data sources on persons, such as some household surveys that cover parts of the economy (e.g. agriculture) or data on social contributions or social security. However, they cannot be used as the main sources of data, only as supplementary ones. This is because those data do not cover the total economy or are based on registers that, by definition, do not cover non-registered labour inputs.

19.   By definition, enterprise-based data sources, i.e. data from the demand side of labour, should not be used as the main sources for the supply of labour. This is also because enterprise-based data are mainly derived from administrative sources that do not cover non-registered employment.

20.   Direct interviewing is used in the LFS whereas most Member States use mainly administrative registers or sources for population censuses. The use of the LFS in the employment method is preferred to the population census for the following reasons:

- the direct interviewing applied in the LFS may lead, as has been shown in some cases, to the disclosure of employment which is in excess of that recorded by the population census;
- the LFS is a continuous survey that may reflect the reality more quickly than the population census;
- the methodology of the LFS is harmonised for both the input (i.e. questionnaire, data collection, data processing etc.) and the output (i.e. the variables to be delivered), whereas the population census is harmonised only for the output as each country is free to choose the data sources, methods and technology to conduct their census;
- the LFS has more detailed information on labour inputs than the population census. Those details, e.g. second jobs, breakdown between full-time and part-time jobs, and between employees and self-employed persons, are useful for the employment method.

([6])   'NACE' refers to the general industrial classification of economic activities within the European Union. The version in force is NACE Revision 2 (NACE Rev.2), which is defined in Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2.

([7])   94/168/EC, Euratom: Commission Decision of 22 February 1994 on measures to be taken for the implementation of Council Directive 89/130/EEC, Euratom on the harmonization of the compilation of gross national product at market prices.

21.   Using the administrative registers and sources that underlie the population census may have some other advantages that meet NA needs, e.g. the estimates may be more stable or the breakdowns of the NACE may be more reliable.

22.   When using the employment method for explicit exhaustiveness adjustments, the data sources for the demand of labour normally come from business statistics. On the one hand, business statistics refer to the results based on the enterprise surveys for structural business statistics (SBS), which are an important input for NA estimates. On the other hand, the business statistics include other comprehensive business statistical products such as the statistical business register (SBR), and other multiple primary data sources, in combination with various business surveys and administrative sources used to cover the non-market sectors of economy, i.e. General government and Non-profit institutions serving households. In this paper, the term 'business statistics' is used when the description can be applied to the SBS and all other business-related sources. When special attention is drawn to structural business statistics, the term 'SBS' is used.

23.   The comprehensive statistical product, the SBR, which is created by using multiple data sources, such as statistical surveys, administrative sources, commercial databases and published information, may be very useful in the context of the employment method. In some countries, the coverage of the enterprises in the SBR may be exhaustive, i.e. there are no thresholds for inclusion of units in the register.

24.   In most countries the SBR is primarily meant to contain the basic variables of the business units, such as name, address, number of employees, turnover and NACE activity, which are used for the sample frame of other business statistics, e.g. the SBS. Among the basic variables, the classification of NACE activities is very useful (see Section 3.1).

25.   The figure for the 'number of employees' in the SBR may come from the same sources as that in the SBS. In addition, the SBR of some countries may contain information on the 'number of self-employed', which is not a SBS variable. In some countries 'the number of self-employed' feeds into the SBR from another source. Some other countries may have this information stored in another register or derive this information directly from another source.

26.   Depending on the national situation, the SBR could be considered to serve as a main source of information on employment for the demand side of labour. Despite its comprehensiveness, the main information source of the SBR is from businesses. In general, businesses report on contractual employment and contractual hours, and are not expected to report on 'unofficial' or 'informal' employment, or to declare all the hours actually worked by their employees. Therefore, it is unlikely that the SBR would capture non-observed labour inputs to production as the demographic sources do.

27.   Both the LFS and SBS surveys are compulsory under EU rules. Nevertheless, the quality and coverage of the two surveys may vary between countries. For instance, under-reporting in the LFS may not be a significant issue in one country, but may be the opposite in another (see Section 4.6, Under-reporting in the LFS). The coverage of the SBS may differ between countries due to different data collection techniques, e.g. sample surveys or administrative sources.

28.   Nevertheless, from the reference year 2021 onwards, the quality of the compulsory variables of both surveys has increased as they are more harmonised at the EU level under the new regulations for the LFS and SBS (see Section 3.1 Scope of harmonisation). Besides the compulsory variables, national statistical institutes have the possibility to include other national variables or more details in both surveys according to their needs. The additional information obtained can help to develop the comparison between the supply and demand of labour.

29.   The practices in different countries show that complementary sources are often used in the balance of labour exercise (i.e. the comparison between the supply and demand of labour) in addition to the LFS and SBS as main sources. The type of complementary sources used depends on the availability and reliability of data. For instance, administrative data sources or another business survey can be used for self-employed persons who are not covered by the SBS. Administrative sources can supplement the LFS data for the NACE breakdown.

30.   Among the country cases studied, condition I mentioned in Section 2.1 above is usually met at least for the total economy, i.e. the derived labour gap (the supply of labour minus the demand) is positive. However, it could occur that the labour gap is negative even for the total economy, and/or that it fluctuates from year to year without a plausible economic explanation. This may be caused by issues with the quality of the LFS in a country.

31.   Therefore, if condition I is not met, but at the same time condition II is met, the NA compilers are encouraged to investigate the quality issues they have encountered in their country's LFS and take measures to tackle them. For instance, using the average of several years could solve the problem of data instability in the LFS. It is for the country to decide how to average the data. For example, in one country, for the reference year t, the value of the weighted average of three years is used, i.e. the years t-1 (20 %), t (60 %) and t+1 (20 %).

32.   If such an approach is not successful, switching to population census as a main source of data on the supply of labour could be considered the second-best solution.

33.   This second-best solution can be considered only if the administrative data underlying the census can be used to estimate employment annually. Furthermore, the NA compilers need to carefully assess whether those administrative data can indeed overcome the shortcomings of the LFS and meet the needs of the NA.

34.   One country case shows that the LFS and other complementary household surveys should be used as a supplementary data source when annually available administrative source data on persons, which are used in census data, are adopted as the main source. The administrative sources on persons are for registered employment (observed employment). The LFS and other household surveys are used to capture non-observed employment. Additional measures are needed to combine these two sources. The kinds of additional measures necessary would depend on national circumstances, and should capitalise on the advantages of the LFS, e.g. capturing non-observed employment, providing details on labour inputs.

35.   In the country case in question, the same unique identification for persons is available in the microdata of the LFS, other household surveys and the administrative data on persons. The microdata linkage approach is used to impute the non-observed labour inputs by individual persons, and then the data are grossed up to the total population. After the imputation of the non-observed labour inputs, additional mathematical methods are used to obtain a more reliable distribution of employment by status in the population (e.g. employed, unemployed, pensioners, students, other status). Furthermore, the LFS data are used to estimate details that are not available in the administrative data on persons, such as the split between employees and self-employed persons, and the conversion of 'persons' to 'FTE' (full-time equivalent) (see Section 3.1.5).

36.   One country uses the NA employment final estimates as the data for the supply of labour. The NA employment final estimates are supposed to be exhaustive. However, to judge whether this data can be used in the context of the employment method, it is necessary to assess whether the input data to the NA employment final estimates are indeed exhaustive, i.e. whether demographic sources are used and/or whether additional measures have been taken to ensure the inclusion of labour inputs that are not recorded in the administrative sources.

37.   Two countries estimate the final NA employment estimates simultaneously with the labour gap analysis and the exhaustiveness adjustments to GDP. It means that the labour gap estimates are used not only to adjust GDP, but also to adjust the demand of labour (the starting point of NA employment estimates) to obtain the final NA employment estimates. In these cases, the final NA employment estimates are not the data for supply of labour, but the results of the employment method. This is considered a good practice.

38.   One country has made significant efforts to establish integral databases at micro level for both the supply and demand of labour, i.e. the database on employers based on administrative survey sources and the database on workers that is the LFS integrated with administrative records. The comparison of supply and demand of labour is performed comprehensively at micro level. As a result, high quality estimates of the labour gap and non-observed production have been obtained. The benefits outweigh the costs because condition II mentioned in Section 2.1 is very significant in that country.

2.4. For which non-exhaustiveness types (N1-N7) can the employment method be used?

39.   The basic assumption is that in terms of labour input the sources based on people are more exhaustive than those based on enterprises. The non-exhaustiveness types (N types) of Eurostat's tabular approach are defined from the

perspective of producers, i.e. employers (see Figure 1). Therefore, in theory the labour gap can be related to all the N-types of non-exhaustiveness. However, the data sources on persons may not fully cover all the elements of each N-type. There are N-types of non-exhaustiveness that typically can be covered by the employment method, and others that most likely cannot.

FIGURE 1

Eurostat's tabular approach: non-exhaustiveness types in the production approach
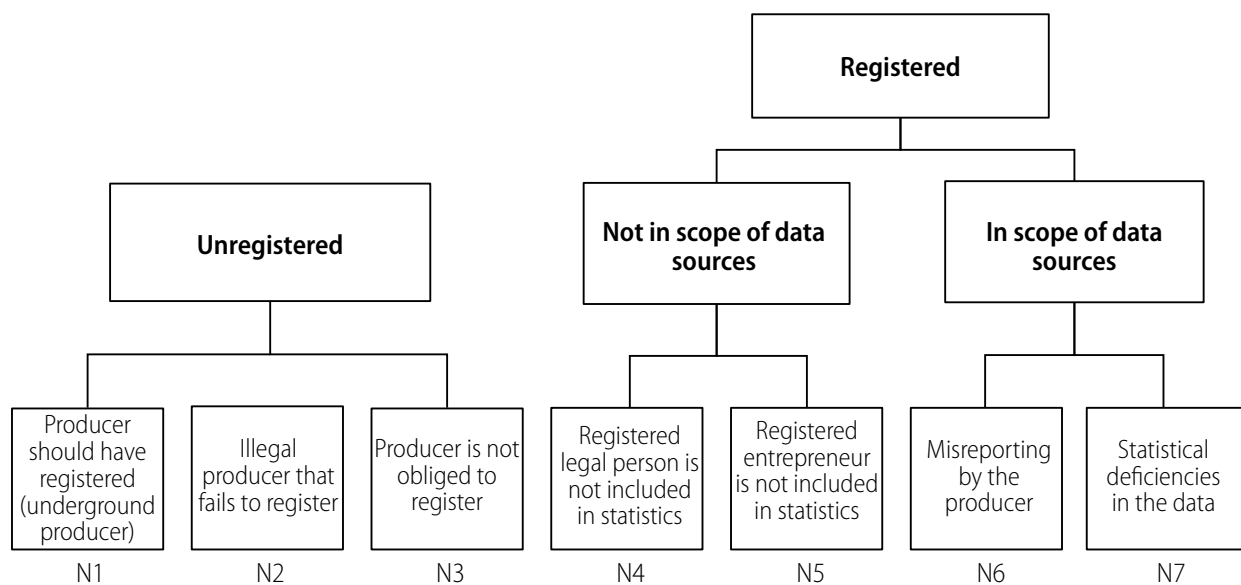
Source: Guidelines to Eurostat's tabular approach to exhaustiveness, GNIG/110 ([8]).

40.   Typically, N1 ([9]), part of N3 ([10]), N4, N5, and part of N6 (undeclared gross value added (GVA) of a registered producer due to undeclared labour or hours worked) are captured in the labour gap.

41.   The N types that are typically not covered in the labour gap are N2 (illegal activities), part of N6 (non-collected VAT due to tax evasion without complicity and insolvency) and part of N7 (tips, gratuities, wages in kind). Usually, other methods are used to target those elements of non-exhaustiveness.

42.   The exact types and elements of non-exhaustiveness that are covered by the employment method depend on the reliability of the data sources, the economic characteristics, the legislation of the country concerned and the chosen approach to exhaustiveness. For instance, a small proportion of illegal activities may be included in the LFS of a given country, whereas all illegal activities may not be covered in the LFS in most countries.

43.   An extension of this issue is how to classify the adjustments made by the employment method to the N-types. A common factor that can be considered is that the labour gap needs to be derived for employees and self-employed persons separately because the two groups have significantly different productivity ratios. In this regard, the adjustments made as a result of the labour gap of employees (undeclared labour input to production by registered producers) could be classified

([8])   See Eurostat's tabular approach to exhaustiveness. Guidelines, GNIG/110.

([9])   In most country cases, it was observed that individuals would not mind answering the LFS as 'employed' even though the employer is underground. However, it might not always be the case.

([10])   Own-account production by households might not be included in the data for employees /self-employed in the LFS because respondents may not perceive work for their own account (e.g. own housing construction) as 'work'.

under N6 (misreporting by producers), while that of self-employed persons could be classified under N1 (underground producers). This distinction can be made clearer if the employment method is designed to cover only N1 and N6 in a given country.

44.   When the employment method is designed to cover several N-types adjustments together (including N1 and N6) in a given country, and if it is not possible to allocate the adjustments to the individual categories of the non-observed economy, for the sake of comparability between countries, the following simplified solution should preferably be applied:

- the adjustments made for self-employed persons (that would cover N1, part of N3 and N5) should be classified under N1 (underground producers);
- the adjustments made for employees (that would cover N4 and part of N6) should be classified under N6 (misreporting by producers).

2.5. How to avoid potential double counting?

45.   To avoid double counting of exhaustiveness adjustments, it is necessary to examine whether the non-observed labour input to production has been explicitly or implicitly addressed via other methods. A holistic examination is necessary in each country. The NA compilers must have an overview of the relevant elements of non-exhaustiveness for each N-type, and the methods used for the relevant adjustments. The above-mentioned typical N-types covered by the employment method can serve as hints or observations for the analysis of potential double counting if multiple methods are used.

46.   The examination should analyse the design of the country's exhaustiveness approach. Careful design of the methods used to address different N-types of non-exhaustiveness (or different elements within the N-types, e.g. different patterns of misreporting within N6) can prevent double counting so that no additional corrections would be needed. In that case, all relevant elements of each N-type should be identified first, after which methods should be designed to target those elements of non-exhaustiveness and calculate respective adjustments necessary. It is essential that the designed methods target the elements of non-exhaustiveness separately without overlap.

47.   Sometimes, countries have other dedicated methods besides the employment method in place to address some types and elements of non-exhaustiveness that are typically addressed by the employment method (e.g. parts of N3, N5). In that case, measures should be taken to avoid or correct double counting.

48.   When the employment method is used, but at the same time other methods are applied to estimate the N-types typically addressed by this method, i.e. N1, part of N3, N4 and N5 and part of N6 (undeclared GVA of registered producers), countries should check whether double counting corrections are needed, if this has not already been done. For example, if the employment method is used and at the same time a special survey (on persons) is used to target some parts of the N1 adjustment, it is worthwhile to carefully assess whether corrections of double counting should be made.

49.   The risk of potential double counting is also discussed in Section 5.4.

3

Step 1: Harmonisation of data on employment

50.　　　The main purpose of the harmonisation of data on employment is to ensure that data on employment from the independent data sources, the supply of labour on the one hand and the demand for labour on the other, are comparable in terms of scope (see Section 3.1) and concept (see Section 3.2). In addition, other adjustments may be needed (see Section 3.3).

3.1.　Scope of harmonisation

51.　　　To make sure that the source data from the LFS and business statistics are comparable, it is necessary to decide how the data should be harmonised in terms of the following five aspects, which are explained in paragraphs 3.1.1 to 3.1.5:

• reference period;
• scope of economic activities (NACE activities to be considered);
• NACE codes;
• NACE level of detail;
• measures of labour inputs.

52.　　　Furthermore, it should be noted that the renewed legal frameworks for both LFS and SBS have been implemented recently. These legal frameworks are meant to improve the comparability of the collected and reported data between countries.

53.　　　Since 1 January 2021, the LFS is based on Regulation (EU) 2019/1700 ([11]), also called the Integrated European Social Statistics Framework Regulation, and its Implementing Regulation (EU) 2019/2240 ([12]). This provides that from the reference year 2021 onwards, the LFS data are collected according to a more input-harmonised approach, i.e. a harmonised flow of questions and a common model questionnaire for key LFS variables are used in all countries. Consequently, since 2021, the key LFS labour input data, including the hours worked, are of higher quality and are more comparable between countries. In addition, the NACE information should be transmitted to Eurostat at a more detailed level than before (NACE 3-digit data have been compulsory since 2021).

([11])　Regulation (EU) 2019/1700 of the European Parliament and of the Council of 10 October 2019 establishing a common framework for European statistics relating to persons and households, based on data at individual level collected from samples, amending Regulations (EC) No 808/2004, (EC) No 452/2008 and (EC) No 1338/2008 of the European Parliament and of the Council, and repealing Regulation (EC) No 1177/2003 of the European Parliament and of the Council and Council Regulation (EC) No 577/98.

([12])　Commission Implementing Regulation (EU) 2019/2240 of 16 December 2019 specifying the technical items of the data set, establishing the technical formats for transmission of information and specifying the detailed arrangements and content of the quality reports on the organisation of a sample survey in the labour force domain in accordance with Regulation (EU) 2019/1700 of the European Parliament and of the Council.

54.   From the reference year 2021 onwards, the SBS and its data transmission to Eurostat must be fully in line with Regulation (EU) 2019/2152 on European business statistics (the EBS Regulation) ([13]) and its Implementing Regulation (EU) 2020/1197 ([14]). The definitions of the relevant variables on employment and labour inputs have not been changed ([15]). Two main developments that are important for this paper are ([16]):

• The statistical unit 'enterprise', the best proxy for the institutional unit in the European System of Accounts (hereafter 'ESA 2010' or 'ESA'), has been implemented in the statistical business register (SBR) and SBS: the definition of 'enterprise' is not changed in the EBS Regulation. Most Member States had not (fully) applied the correct definition in the past. With reinforced efforts, implementation had been completed in almost all Member States by the reference year of 2021.
• The NACE coverage of SBS is extended by including more service activities: this is new since the reference year 2021, as a result of the EBS Regulation.

55.   The recommendations on the LFS and SBS in this paper have taken into account the best available information resulting from those recent developments in the LFS and SBS (the main data source of business statistics), and are therefore best suited to be applied to the reference year 2021 onwards.

3.1.1. Reference period

56.   On the supply side of labour, data from a population census have a reference period of a year ([17]), while the main variables of LFS are collected quarterly. On the demand side of labour, business statistics are usually annual. Hence, the comparison between the supply and demand of labour should be based on the annual data. The LFS variables collected every quarter lead to quarterly results that can be averaged throughout the year, hence producing so-called 'annual average results' ([18]). These annual average results should preferably be used when comparing the LFS quarterly variables with the annual variables of business statistics.

3.1.2. Scope of economic activities (NACE activities to be considered)

57.   On the scope of economic activities, an important aspect is that the LFS and SBS cover different NACE activities. While the LFS covers the total economy, the SBS cover only the business economy, which includes industry, construction, distributive trades and services. Previously, the SBS covered NACE sections B to N and division S95 (Repair of computers and personal and household goods). With the implementation of the EBS Regulation, starting from the reference year 2021, the coverage of SBS has been extended to also cover NACE sections P (Education), Q (Human health and social work activities), R (Arts, entertainment and recreation), S96 (Other personal service activities) and K (Financial services). This means that, starting from the reporting year 2021, the SBS cover all NACE industries except NACE A (Agriculture, forestry and fishing), NACE O (Public administration and defence; compulsory social security), NACE S94 (Activities of membership organisations), NACE T (Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use), and NACE U (Activities of extraterritorial organisations and bodies).

58.   The ultimate purpose of comparing supply and demand of labour is to identify non-observed labour inputs and subsequently convert them to non-observed gross value added for NA estimates. Most Member States use dedicated, reliable and exhaustive data sources to estimate gross value added for NACE A, K and O. Furthermore, financial institutions

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([13]) Regulation (EU) 2019/2152 of the European Parliament and of the Council of 27 November 2019 on European business statistics, repealing 10 legal acts in the field of business statistics.

([14]) Commission Implementing Regulation (EU) 2020/1197 of 30 July 2020 laying down technical specifications and arrangements pursuant to Regulation (EU) 2019/2152 of the European Parliament and of the Council on European business statistics repealing 10 legal acts in the field of business statistics.

([15]) See Eurostat, Methodological manual on European Structural Business Statistics–2021 edition, Publications Office of the European Union, Luxembourg, 2021.

([16]) The statistical unit 'enterprise' has been implemented in the statistical business register (SBR) and the SBS in most EU countries since the reference year 2018, and in almost all countries since 2021. However, extension of the NACE coverage in the SBS has been implemented since the reference year 2021, which is why the starting reference year of 2021 has been chosen.

([17]) The population census is not usually conducted every year, but at least once every ten years. Some input data (e.g. the administrative data) for the population census may be available yearly.

([18]) See Metadata of LFS.

and public administrations are not expected to have a high level of non-observed output due to a strict regulatory framework and control by tax authorities. In addition, labour input in real terms (as FTE or hours worked) is less frequently used in financial services. The labour input method seems less suitable for estimating undeclared activities in the financial sector because of different approaches between the financial and non-financial sectors ([19]) to measuring NA aggregates (e.g. Financial Intermediation Services Indirectly Measured–FISIM, net insurance premiums) and productivity differentials between those sectors.

59.   Keeping in mind the considerations discussed above, the scope of activities to be chosen can be:

- the total economy (excluding NACE U ([20])), or
- NACE sections B to N, or
- NACE sections B to T.

60.   Furthermore, the choice of whether to exclude NACE section A or only some of the NACE divisions A01, A02 or A03 depends on the level at which reliable data sources on Agriculture, Forestry and Fishing are available. The additional exclusion of NACE K and O; and NACE S94, NACE T can also be considered.

61.   If the total economy is chosen for the harmonisation of employment data, data on the NACE activities that are not covered by business statistics, e.g. NACE A, O, S94 and T (from reference year 2021 onwards), should be added to the business statistics data to make the scope of the LFS and the business statistics comparable.

62.   If the chosen scope consists of certain NACE activities, data on the non-selected NACE activities should be excluded from the comparison between the LFS and the business statistics. However, this can best be done if the two data sets are harmonised as regards the NACE codes.

63.   It should be noted that putting a few NACE industries outside the scope of data harmonisation in the first place is based on the availability of other exhaustive data sources for those NACE industries. Coincidently, no significant non-observed economy in NACE K and O is expected in almost all countries. Further possible exclusion of other NACE industries that are outside the scope of the non-observed economy depends on a country's situation, and should be analysed when the confrontation between the supply and demand of labour is being examined (see Section 4.3).

3.1.3. NACE codes

64.   On the NACE codes, the NACE Rev. 2 classification is used for economic activities in both the LFS and business statistics, and NACE codes are available in both data sources. However, the NACE attributes are not directly comparable between the LFS and business statistics. The NACE in the LFS is classified based on local units, while it is based on the 'enterprise' statistical unit in the business statistics. As mentioned above, the latter is more in line with NA. In addition, the NACE attribution in the LFS is generally coded based on information self-reported by respondents, versus information registered by enterprises in the business statistics.

65.   The NACE codes of the business statistics usually stem from SBR, the sample frame of the business statistics. Given the fact that national statistical institutes have access to their LFS microdata, a precise way to harmonise the NACE allocation is to link the LFS microdata to the country's SBR. The variable used for this linkage could be the name and address of the company where the respondent has their main job. It is recommended that this information is collected in the LFS to facilitate the coding of the LFS variable 'NACE' (see the explanatory notes of the EU-LFS in line with Regulation (EU) 2019/1700 ([21])). Making the link to the SBR makes it possible to identify the NACE classification of the local unit, and, if applicable, the 'enterprise' statistical unit of the mother company.

66.   Another variable that could be considered for the microdata linkage is the unique identifier of the person surveyed (the employed person). The application of this unique identifier may vary between countries. It might be a unique code in

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the country's LFS questionnaire or a unique code that is used uniformly in most of the country's other administrative sources. In the latter case, this unique identifier can be used to trace back the NACE code of the enterprise in the SBR via microdata linkage with another administrative database (e.g. the employer's database).

67.	It is recommended that countries make efforts to explore and possibly adopt the microdata linkage approach via the statistical business register to harmonise NACE codes between the LFS and business statistics.

68.	If it is not feasible to harmonise the NACE code via microdata linkage, then other remedies should be considered (see Section 4.5).

3.1.4. NACE level of detail

69.	On the level of detail in NACE, it is considered that the reliability of data in both the LFS and business statistics decreases when the level of NACE detail increases. For the LFS, the reliability at the level of the total economy is higher than at the NACE 2-digit or 3-digit level. As regards business statistics, under the EBS Regulation, in general, the required NACE level of detail in the data transmission has been reduced from NACE classes (4-digit) to divisions (2-digit).

70.	In addition, the reference productivity ratios (used later on to convert non-observed labour input to NA estimates) can be computed at the chosen NACE levels.

71.	Given the above, the level of detail for the data harmonisation (and, later on, the computation of the labour gap between the demand and supply of labour) that can be considered the most suitable is the total economy. However, the level of detail can go deeper, to the level of NACE sections (1-digit level) or, at most, of NACE divisions (2-digit level).

72.	Most of the countries studied use the NACE section or division as the working level. One country uses NACE classes (4-digit level) because the same level of detail is used in the supply and use tables of their NA and the source data of the LFS and SBS are designed in line with this level of detail. However, in the context of the employment method, working with a NACE level of detail deeper than NACE division should be considered an exception.

73.	The NACE level chosen for the harmonisation of labour inputs will have an impact on the approach used to derive the labour gap between supply and demand of labour and to then convert it to non-observed GVA. When the total economy is chosen, the total labour gap should be distributed to the different NACE activities (at a maximum of the NACE 2-digit level) in a top-down approach, by using complementary information. When a certain NACE level is chosen, the labour gap will be determined for the chosen NACE level via the bottom-up or hybrid approach. These approaches are explained in Chapter 4.

3.1.5. Measures of labour inputs

74.	The labour inputs can be measured in persons, jobs (full-time or part-time), hours worked or full-time equivalent (FTE). The FTE is defined as the total hours worked divided by the average annual number of hours worked in full-time jobs within the economic territory (see ESA 2010 §11.32). The hours worked or FTE reflect the real labour contribution to production, while persons or jobs give a picture of the labour market. When we know that one person has one or two jobs, we still don't know how much 'labour input' this person contributes to production. To calculate this, we need to know how many hours this person works in each job.

75.	The labour gap measured in different labour inputs does give different results. In the hypothetical example below, the supply-side source (LFS) shows two persons, one with a full-time job and one with two part-time jobs. The demand-side source (business statistics) shows the same number of jobs for three persons. This happens in some countries because in the administrative sources for business statistics one person with two part-time jobs is counted twice. It is also very likely that the number of hours worked in a full-time job or part-time job is different in these two data sources. In this example, we see that the labour gap measured in persons is negative, and measured in jobs it is zero. However, there is a significant positive labour gap measured in hours worked and FTE. The labour gap in FTE is relatively smaller than the gap in hours worked. This is because the annual hours worked per full-time job is used to convert the total hours worked to FTE, and this conversion makes the labour gap smaller.

Labour gap in different labour input measures – a hypothetical example

Labour inputs	Data sources		Labour gap	
	Supply-side	**Demand-side**	**Absolute**	**relative in %**
Number of persons	**2**	**3**	**-1**	**-33%**
full-time jobs	1	1	0	0%
part-time jobs	2	2	0	0%
Number of jobs	**3**	**3**	**0**	**0%**
Actual hours worked				
full-time job per week	40	35	5	14%
part-time job per week	30	20	10	50%
Average per week	**33.3**	**25.0**	**8.3**	**33%**
Hours worked one full-time job per year (52 weeks)	2080.0	1820.0	260	14%
Total hours worked per year	**5200.0**	**3900.0**	**1300.0**	**33%**
Total hours worked in FTE	**2.50**	**2.14**	**0.36**	**17%**

Source: Eurostat's illustration based on input from Austria.

76.   Total hours worked is considered the most appropriate measure of labour inputs for the NA (see ESA 2010 §11.27). Furthermore, ESA 11.34 states: 'Total hours worked are the best measure of labour inputs, but where this information is lacking, full-time equivalence may be the best available proxy; it can be estimated more easily and enables international comparisons with countries which can only estimate full-time equivalent employment'. In some countries, business statistics provide data primarily on jobs (full-time or part-time), and no data on hours worked. The FTE employment may be estimated by making assumptions such as that a part-time job is a half of a full-time job.

77.   In short, labour input in 'persons' is a rough estimate of employment. The measure 'jobs' links persons to their contribution to production (i.e. GVA/GDP). 'Hours worked' is the best measure of real labour inputs to production, FTE is the second-best measure.

78.   Consequently, for the purpose of deriving non-observed labour inputs to production (the gap between the supply and demand of labour), hours worked should be considered the best choice, and FTE as the second best. For the LFS data, hours actually worked is the preferred measure (from the reference year 2021 onwards).

79.   The hours worked or FTE can be obtained directly in the main sources for supply and demand of labour or they can be converted. Some recommendations are given below on how the labour inputs can be obtained based on these main sources, i.e. the LFS, the population census and the SBS.

Hours worked

80.   The total hours worked are equivalent to the average working hours for the target population during the reference year. 'Hours worked' are in the data collection of the LFS and business statistics. Considering the different levels of detail in the two data sources, recommendations are given below for each of them.

Hours worked based on the LFS

81.   Hours worked related to each different job status (main, secondary) and employment status (employees, self-employed) are available in the LFS data. The quarterly LFS data should be aggregated and averaged to obtain the average hours

worked for the reference year for employees and self-employed persons by NACE industry. The LFS collects data on different types of hours worked: hours actually worked, hours usually worked and (from the reference year 2021 onwards) the contractual working hours in an employee's main job. It is recommended to use the data on hours actually worked (see Figure 3 below).

FIGURE 3

Aggregation schema of hours worked (employment status x job status)

NACE: total or by chosen industry	Employees		Self-employed	
	Main job	Secondary jobs	Main job	Secondary jobs
	Hours actually worked	Hours actually worked	Hours actually worked	Hours actually worked

An alternative is to use the same aggregation method as used for the conversion to FTE (see Figure 4 below).

FIGURE 4

Aggregation schema of hours worked (employment status x job status by full-time/part-time)

NACE: total or by chosen industry	Employees		Self-employed	
	Main jobs (full-time)	Main and secondary jobs (part-time)	Main jobs (full-time)	Main and secondary jobs (part-time)
	Hours actually worked	Hours actually worked	Hours actually worked	Hours actually worked

*By definition, secondary jobs are considered part-time.

Hours worked based on the population census

82.   In most countries, hours worked are not available in the population census. 'Persons' is usually the labour input measure there. To estimate hours worked, the splits as defined in Figure 4 are necessary, but these are not available either in the census data. Those splits can, however, be obtained for 'persons'.

83.   The allocation of full-time vs part-time for employees and self-employed persons can be estimated by using the LFS data, i.e. the share of full-time/part-time combined with the share of employees/self-employed per selected NACE industry.

84.   The split between main and secondary jobs can be estimated by applying the coefficient of secondary jobs/main jobs from the LFS at the chosen NACE level to the population census data. It should be done separately for employees and for self-employed persons.

85.   The above splits are estimated for the number of persons based on the population census. The same splits for hours worked and for persons are available in the LFS. The ratio of hours worked to persons per cell can be used to convert the splits in persons to hours worked. Following this, the hours worked can be calculated according to the aggregation method in Figure 4.

Hours worked based on the business statistics

86.   The data on hours worked are much less detailed in business statistics. 'Hours worked by employees' is the only variable on hours worked in the SBS, the predominant source for the business statistics. It is a mandatory variable in the

transmission programme of Eurostat. It represents the total number of hours actually worked by employees for the output of the statistical unit during the reference period, regardless of whether they work full-time or part-time. Member States are obligated to transmit the aggregated data by NACE sections and divisions to Eurostat. This aggregate should be the same as the one in the national publication. Countries can use this aggregate directly.

87. There might be some data collection challenges for hours actually worked in SBS. Sometimes, the hours of work that are contracted for are filled in as approximations for the hours actually worked. This happened during the COVID-19 pandemic.

88. Furthermore, the (yearly) average working time is available in other business statistics such as the Labour Cost Survey. The Labour Cost Survey can be used as a complementary data source for the NACE activities that are not covered by the SBS.

89. Hours worked by self-employed people are not available in the SBS. It is recommended to compute this labour input based on the available variable 'Hours worked by employees' multiplied by the ratio of hours actually worked by self-employed persons compared to employees from the LFS data.

FTE employment

90. Given the definition of FTE in ESA 2010 §11.32, a full-time worker is counted as one FTE, while a part-time worker gets a score in proportion to the hours the person works. FTE needs to be calculated based on the LFS, population census or business statistics.

Calculation of FTE employment based on the LFS

91. Firstly, the hours worked must be calculated. Then they are divided by the average annual number of hours worked in a full-time job to convert to FTE. Eurostat calculates FTE based on the LFS microdata transmitted by Member States.

92. For calculating FTE, the use of the following formula is recommended.

Number of employed people in full-time equivalent (FTE):

$$FTE = EMP\_FT + \frac{AVG\_PT(HWACTTOT)}{AVG\_FT(HWACTUAL)} \times EMP\_PT$$

Where:

- EMP_FT = number of people employed full-time
- EMP_PT = number of people employed part-time
- AVG_FT(HWACTUAL) = average actual working hours for people with full-time jobs (only for main jobs)
- AVG_PT(HWACTTOT) = average actual working hours for people with part-time jobs (taking the sum of hours for the main and secondary jobs)

The above formula can be used to calculate FTE for employees and self-employed people separately, see the schema in Figure 5.

FIGURE 5

Computation schema of full-time equivalent (FTE)

NACE: total or by chosen industry	Employees		Self-employed	
	Main jobs (full-time)	Main and secondary jobs (part-time)	Main jobs (full-time)	Main and secondary jobs (part-time)
	Hours actually worked = 1 FTE	Converting hours actually worked to a fraction of 1 FTE	Hours actually worked = 1 FTE	Converting hours actually worked to a fraction of 1 FTE

*By definition, secondary jobs are considered part-time.

93.   Some countries calculate FTE based on the LFS already in line with Eurostat's method. An example is shown below:

FIGURE 6

Computation schema of FTE, a practical example
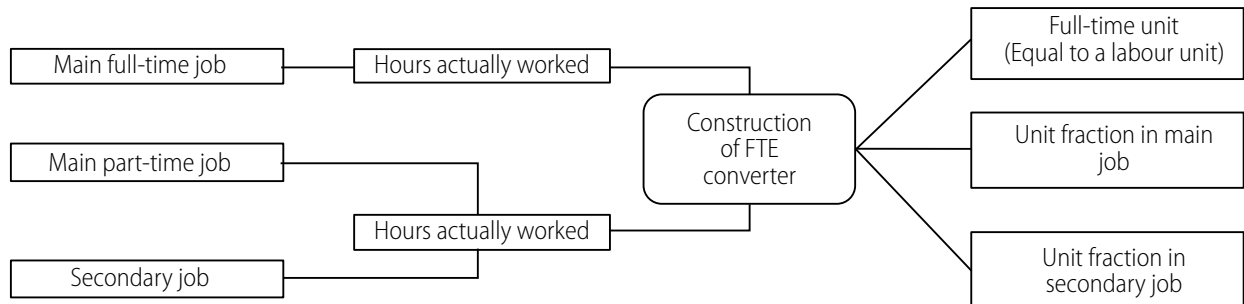
Source: based on the practice of Portugal.

In this example, the FTE results from the sum of units of work in the full-time main job, plus the fractions of units of work associated with working in part-time main or secondary job. Secondary jobs may cover second, third or more jobs. This is calculated for each chosen NACE industry and according to the employment status (employees, self-employed).

Calculation of FTE employment based on the population census

94.   The FTE employment is not available in the population census. The estimates of hours worked done for the population census as described above can be used to calculate the FTE according to the schema in Figure 5.

Calculation of FTE employment based on the business statistics

95.   'Number of employees in full-time equivalent units' is a mandatory variable of the SBS. Data are collected based on hours (contractually) worked converted to FTE by using the standard working time of a full-year full-time worker. The FTE is calculated separately in each job group, then added up. It is recommended to use this variable of the SBS.

96.   The number of self-employed persons in FTE is not directly available in the business statistics and must be computed. It is recommended to compute this labour input based on the available 'Number of employees in FTE units', multiplied by the ratio of FTE self-employed to employees from the LFS data.

97.   Another way to compute FTE is to use the calculation analogous to the one described above for the LFS. If the relevant information is available, the hours worked can be calculated by employment status (employees, self-employed) x job status (main, secondary) per chosen NACE. Then the conversion from hours worked to FTE can be made based on the total number of hours actually worked divided by the annual average number of hours worked in a full-time job.

98.   Tables 1 and 2 give an example of how to calculate jobs in FTE based on the business statistics for employees and self-employed persons.

99.   Table 1 shows the calculation of the average annual number of hours worked in a full-time job based on the business statistics data for employees (A). The total hours actually worked are directly available from the business statistical surveys (B). The conversion to FTE is calculated by dividing B by A (B/A).

TABLE 1

Example of how to compute the average annual number of hours worked in a full-time job (for employees)

Indicator	Item
The average annual number of hours worked in a full-time job	1 = (4-5)/(2-3)
Average registered number of employees [1][3]	2
- of which employees with shorter working time	3
Number of hours worked by registered employees[2][3] (this relates to item 1)	4
- of which the number of hours worked by registered employees with a shorter working time (this relates to item 2)	5

[1] Registered number of employees includes persons in an employment, service or membership relationship (e.g. membership in an association of private dwellings owners) with the employer (hereinafter only 'employment'). The 'registered employees' indicator includes all full-time and part-time employees under contract to their employer.
[2] Hours worked include hours actually worked during normal periods of work and directly contributing to production + overtime hours worked + paid time spent on training + time spent working on tasks such as the preparation of the workplace. Hours worked do not include hours paid for but not worked (such as paid annual leave, paid public holidays, paid sick leave or meal breaks).
[3] The data source: Business statistics.
Source: based on the practice of Czechia.

100.   Table 2 shows the calculation of jobs in FTE for self-employed.

TABLE 2

Example of how to estimate jobs in FTE for self-employed persons

Indicator	Item
Jobs in FTE	1 = 2+4
Main jobs in FTE	2 = 3*6
share of full-time in main jobs from the LFS	3
Second jobs in FTE	4 = 5*7
share of full-time in second jobs from the LFS	5
Main jobs	6 = 9+10
Second jobs	7 = 8-9
The total number of working entrepreneurs (owners of the company)[1][3]	8
- of which the number of working owners of companies for whom the job is their main activity	9
Number of cooperating members of households for whom the job is their main activity[2][3]	10

[1] The number of owners who participate in the work of their company and this work is their main or secondary activity.
[2] Unpaid cooperating household members regardless of the number of hours worked.
[3] Data source: Business statistics.
Source: based on the practice of Czechia.

3.2. Conceptual adjustments: from the LFS to the NA employment concept

101.　This section presents an overview of conceptual adjustments from the LFS to NA concepts. This is not done for the population census, because there is no harmonised EU questionnaire for the population census. Each country is free to use any relevant input data that is available for it. The conceptual adjustments needed to align the population census with the NA concept may vary between countries, depending on the input data used. Nevertheless, countries are encouraged to determine conceptual adjustments that they need to make to the population census by using the content in this section as references or suggestions.

102.　As mentioned above, since the reference year 2021, the Integrated European Social Statistics Framework Regulation (Regulation (EU) 2019/1700) and its Implementing Regulation (EU) 2019/2240 for the labour force domain have entered into force. In 2022, all Member States published time series (corrected for breaks) back to 2009 ([22]). The main changes in the definitions of labour status, data collection and processing in the new LFS make the data more comparable between countries. However, the overall effect of all these changes varies between countries due to different national applications of the old LFS.

103.　The definition of employment in the new LFS has been analysed to facilitate its alignment with the NA concept of employment. The adjustment items and the signs of the adjustments (positive, negative or zero) are listed in Table 3. 'Zero adjustment' means that there are no significant conceptual differences between the LFS and the NA for the item concerned. For comparison, the signs of the adjustments based on the old LFS are also shown. The changes between the new and old LFS are described briefly.

TABLE 3

Adjustments for the transition of employment from the LFS to the national accounts concept

ID	Adjustment item	Major or minor item	Adjustment sign		Changes new vs old LFS?	ESA 2010 Reference
			Old LFS based	New LFS based		
1	Territory coverage	Minor	+ or 0	+ or 0	No	2.05–2.07
2	Conscripted forces	Minor	+ or 0	+	Yes, the new LFS excludes them more explicitly from the reference population.	11.19 a
3	Non-residents working for resident units	Major	+	+	No	11.19 c
4	Residents stationed in the rest of the world	Minor	+	+	No	11.17 c-g

([22])　For more information see the EU labour force survey.

ID	Adjustment item	Major or minor item	Adjustment sign		Changes new vs old LFS?	ESA 2010 Reference
			Old LFS based	New LFS based		
5	Residents employed by non-resident producers	Major	-	-	Yes, it concerns one sub-category of resident seasonal workers employed by non-residents. The new LFS includes them during the off-season only if they continue to regularly perform tasks and duties, excluding legal or administrative obligations.	11.18a, 11.19 b
6	Resident seasonal workers employed by resident producers	Minor	+	+	Yes, the new LFS includes them during the off-season only if they continue to regularly perform tasks and duties, excluding legal or administrative obligations.	11.11
7	Resident workers living permanently in an institution	Major	+	+	No	11.19 d
8	Resident workers under the age taken into account in LFS.	Minor	+	+	No	11.19 e
9	Resident workers above the age taken into account in LFS.	Minor	+	0	Yes, old LFS: >=15 years old, some countries might have an upper age limit; new LFS: 15-89 years old.	11.11
10	Employees on maternity or parental leave	Major	+ or 0	0	Yes, old LFS: different in each country; the new LFS includes them if they receive and/or are entitled to job-related income or benefits, or if their parental leave is expected to be 3 months or less.	11.14
11	Employees on (long-term) sick leave	Major	+ or 0	0	No, but some countries did not follow the rules on how to treat sick leave in the old LFS.	11.14
12	Unpaid students/trainees	Minor	+	+	No	11.13 f
13	Unpaid family workers	Reminder item	0	0	No. This reminder item makes sure the 'Unpaid family workers' in LFS are selected as 'self-employed' for NA purposes.	11.16 a
14	Unpaid outworkers (on commission agreements)	Minor	+	+	No	11.16 b

ID	Adjustment item	Major or minor item	Adjustment sign		Changes new vs old LFS?	ESA 2010 Reference
			Old LFS based	New LFS based		
15	Unpaid voluntary work resulting in goods	Minor	+	+	No	11.16
16	Persons in own-use production work (e.g. agricultural activities)	Major	0	+	Yes, the new LFS excludes them if the majority of the production is for self-consumption.	11.16 c
17	Owners of corporations and quasi-corporations: transferring from self-employed to employees	Minor	Internal transfer	Internal transfer	No. Internal transfer: LFS classifies owners of corporations and quasi-corporations if they work in those enterprises as self-employed, but ESA includes them in employees.	11.13e

104.   In total, 17 conceptual adjustment items have been identified. It is neither feasible nor necessary to require all Member States to make all these adjustments with the same degree of accuracy. Instead, a distinction is made between the major and minor adjustment items. Compared to minor adjustments items, the major ones are considered conceptually more significant, and their impact on the exhaustiveness adjustments is likely to be bigger.

105.   For the transition from the new LFS-based concept to the NA concept, the major adjustment items are:

• non-residents working for resident units, such as non-resident migrant workers, non-resident cross-border workers or seasonal workers;
• residents employed by non-resident producers, such as resident cross-border workers or seasonal workers;
• resident workers living permanently in an institution – they can live and work in communal establishments (such as prisons or long-term care facilities), collective households (such as religious institutions) or in accommodation for military forces;
• persons in own-use production work (e.g. agricultural activities).

106.   Persons in own-use production work often engage in agricultural activities. It is considered a major item because of its significant role in the economies of some Member States.

107.   'Persons in own-use production work' is the only additional adjustment item for the new LFS-based data compared to the old LFS-based data. The new LFS explicitly excludes this category from 'employed persons'. However, if agricultural own-use producers, who comprise most of the 'Persons in own-use production work', have a significant share of the economy, it is required that Member States collect this data via an optional LFS sub-module related to producing agricultural goods. Therefore, data for this adjustment item can be obtained by adopting the relevant sub-module of the LFS. A few countries have successfully done this, and it is considered good practice.

108.   There is no need to adjust 'Employees on maternity or parental leave' and 'Employees on (long-term) sick leave' anymore for the new LFS-based data because the new LFS guidelines have been sufficiently aligned with the NA. These were major adjustments to the old LFS-based data (the old LFS of some countries exclude them from employed persons).

109.   In the new LFS, persons on parental leave, either receiving or entitled to job-related income or benefits, or whose parental leave is expected to be 3 months or less, are counted as 'employed persons'. This definition is considered sufficiently close to ESA 2010 §11.14, where persons on maternity or parental leave are treated as employed if they have continued to receive a wage or salary or have an assurance of a return to work following the end of the leave, or an agreement as to the date of return.

110. The category 'non-residents working for resident units' includes all kinds of non-resident workers, e.g. cross-border workers, migrant workers, seasonal foreign workers and foreign students. The adjustment for this category could be very significant in some countries. It is challenging to find reliable data sources for this adjustment item. Usually there is no single data source with complete information. Countries synthesise as much as possible the available national data sources, such as data from relevant ministries (e.g. the ministries of interior, labour and social affairs, industry and trade or education), from national immigration records, and from income tax records (giving earnings and nationality data on a monthly basis).

111. There are extra challenges for countries with a large number of unregistered migrant workers who are not covered by existing data sources. These countries are encouraged to investigate new data sources, e.g. mirror data sources in neighbouring countries, or dedicated surveys among migrants.

112. The reasons why the other adjustment items are considered minor are as follows:

- territory coverage: this is only relevant for countries that have overseas departments and territories. The NA include these overseas areas that belong to the economic territory of the national economy. In principle, the LFS should also cover those overseas areas. However, the actual data coverage of the overseas areas in the LFS needs to be checked ([23]).
- Conscripted forces: in the EU only Austria, Cyprus, Denmark, Estonia, Finland, Greece, Lithuania and Sweden still have conscription.
- Residents stationed in the rest of the world, such as members of the country's armed forces abroad or members of the crews of ships, aircraft and floating platforms operated by resident units: in general they are not considered to be economically significant in the total economy.
- Resident seasonal workers employed by resident producers: ESA 2010 treats all resident workers, including seasonal workers who are working for resident producers, as employed persons. The old LFS does not count seasonal workers during the off-season as employed while the new LFS counts them only if they continue to regularly perform tasks and duties for the job or business, excluding the fulfilment of legal or administrative obligations. This off-season treatment is considered economically insignificant until there is evidence proving the opposite.
- Resident workers under the age that is taken into account in the LFS and resident workers above the age taken into account in the LFS: the old LFS covers persons aged 15 and above. The new LFS covers persons aged 15 to 89 years old. The economical contributions of persons outside this age range are considered insignificant.
- Unpaid students/trainees and unpaid outworkers (on commission agreements) are not considered to be economically significant in the total economy.
- Owners of corporations and quasi-corporations: this entails transferring the values under this category from 'self-employed' in the LFS to 'employees' for NA purposes.

113. Unlike 'Unpaid students/trainees' and 'Unpaid outworkers (on commission agreements)', 'Unpaid family workers' are counted as 'employed persons' in both the old and new LFS. However, 'Unpaid family workers' is a separate category of 'professional status' in the LFS and is not labelled as 'self-employed'. Due to the significance of 'Unpaid family workers' in the economy of some Member States, this item serves as a reminder for the compiler to select 'Unpaid family workers' in the LFS as 'self-employed' for NA purposes.

114. The item 'Owners of corporations and quasi-corporations' concerns adjustments within the LFS data. The LFS classifies owners of corporations and quasi-corporations if they work in those enterprises as self-employed persons, but ESA 2010 includes them in employees. These owners should be transferred from self-employed to employees in the transition from the LFS to the NA concept. The number of employees is increased by the same number as the reduction in self-employed, without impacting the total employment of the LFS. This is relevant because 'employees' and 'self-employed' are compared separately later on. The adjustments can be made, for example, by applying a coefficient based on national business registers.

([23]) This is mainly relevant for France. Since 2014, the French LFS covers the French overseas departments of Guadeloupe, French Guiana, Martinique and Réunion, but not Mayotte (see the Quality report of the European Union Labour Force Survey 2020–2022 edition). Since 2014, Mayotte is included in the GNI data for Own Resource purposes. However, the economic activity of Mayotte is included in the GDP and GNI estimates published on the website of the national statistical institute (Insee.fr) for the whole of the period 1949-2015.

115.   Furthermore, it is considered good practice to conduct validation checks on the adjustments made. For instance, the number of unofficial workers should not significantly exceed the number of unemployed persons unless there is a plausible explanation.

116.   The significance of the major or minor items might differ between Member States. While countries may make adjustments for all the items, adjustments should be made at least for the following major conceptual differences:

- non-residents working for resident units; such as non-resident migrant workers, non-resident cross-border workers or seasonal workers;
- residents employed by non-resident producers; such as resident cross-border workers or seasonal workers;
- resident workers living permanently in an institution; they can live and work in communal establishments (such as prisons or long-term care facilities), collective households (such as religious institutions) or in accommodation for military forces;
- Persons in own-use production work (e.g. agricultural activities).

117.   Once the items for conceptual adjustments have been decided, the adjustments should be made in line with the chosen labour input measure and NACE level (see Section 3.1 Scope of harmonisation).

3.3. **Other adjustments**

118.   Other adjustments, to ensure comparability of the LFS and business statistics, may entail:

- Correcting data deficiencies or statistical deviation; deficiencies in the data due to poor quality or coverage can appear in both the LFS and business statistics. If the deficiencies are not sufficiently corrected in the source data, the NA compilers should make additional corrections. Examples include:

  - countries working with microdata may impute missing values (does not know/does not answer) in the LFS microdata. This can be done together with NACE correction measures for the LFS microdata;
  - corrections based on the confidence interval of the LFS employment data when there is a big difference between the LFS and business statistics data;
  - corrections due to level shifts in the LFS figures after each census (updated demographic data);
  - adding estimates for units that are not covered by business surveys: 'private dwelling unit owners' associations' might not be covered in the business statistics in some countries even though they are registered in the business registers. Estimates may be added for the employees of these associations (i.e. the board of the association) on the demand side of labour.

- Examples of country specific adjustments:

  - adding underestimated data for the employees in secondary jobs in the LFS. In some countries, the LFS under-estimates secondary jobs (see further Section 4.6 Under-reporting in the LFS).
  - adding employed persons with short-term contracts in the business statistics data for employees: this is needed if workers with short-term contracts are not included as employees in the business statistics although they should have been.

4

Step 2: Comparison of supply and demand of labour

119.		The aim of Step 2 is to derive the labour gap from the harmonised data on supply and demand of labour. This chapter explains the findings of the investigated issues.

4.1. Approaches to the comparison of supply and demand of labour

120.		The labour gap should be determined for the individual NACE categories (e.g. NACE divisions) because the productivity ratios (applied to convert the labour gap to non-observed production) are different per NACE. Four approaches have been identified to do this:

- top-down;
- bottom-up;
- hybrid: top-down and bottom-up combined;
- integrated micro-approach.

121.		In the top-down approach, the comparison of labour is made for the total economy in the first place, and then the labour gap is distributed among the NACE categories. The distribution should be done separately for employees and self-employed persons. The distribution can be done based on supporting information and/or assumptions. The supporting information can be special surveys, expert articles/opinions, fiscal data or a combination of some of these sources. The supporting information and/or assumptions should reflect the distribution of non-observed labour input among industries in a given country. An example in Annex B illustrates how the top-down approach works.

122.		In the bottom-up approach, the labour gap is derived for the chosen NACE categories with possible non-observed economy. The choice of those NACE categories is based on a qualitative judgement (e.g. sector reports, news articles). The NACE specific information on the supply and demand of labour is used in the calculation. As a result, the labour gap is only determined for those chosen NACE categories rather than for the total economy.

123.		The hybrid approach analyses the labour input / labour gap at the level of both the total economy (or in the chosen NACE scope for the labour gap analysis) and the chosen NACE activity. The NA compilers aim to obtain the reliable labour gaps by NACE while retaining the original total labour gap as much as possible. This is achieved through a comprehensive analysis by NACE, taking into account additional information e.g. labour market development. The adjustments to the labour inputs/gaps for different NACE industries are made simultaneously and iteratively. An illustrative example for this hybrid approach is presented in Annex C.

124.   The integrated micro-approach is the most comprehensive and advanced approach ([24]). The employers database and the workers database are linked at micro level. Each job is assessed as declared or undeclared. The NACE classification is available for each job. The undeclared jobs form the labour gap.

125.   As the LFS is more reliable at the level of the total economy than that by NACE, the top-down or hybrid approach should be preferred over the bottom-up approach. Both approaches require additional resources. The top-down approach requires additional sources to distribute the total labour gap by NACE, and the hybrid approach requires extensive analysis at NACE levels. The goal of spending these additional resources is to achieve as accurate a labour gap distribution by NACE as possible. Countries should choose between the top-down and hybrid approaches based on their specific circumstances, and they may consider developing their own approach to achieve the goal. Countries are encouraged to carry out a certain degree of analysis to obtain reliable labour gaps by NACE as much as possible if special surveys and/or extensive analyses at NACE levels are not feasible.

126.   The integrated micro-approach is only feasible when comprehensive microdata (from administrative sources and surveys) are available and can be linked. To adopt this approach, a long-term investment in the statistical infrastructure is needed, perhaps requiring a change in how the NA are compiled in a country. For the time being, an integrated micro-approach might not be feasible for most countries. However, considering the development trend of statistical analysis, i.e. applying data mining techniques to microdata to achieve the accuracy that cannot be achieved via macro-analysis, countries are invited to weigh the costs and benefits to consider working in this direction in the long run. This work may begin with experimenting on specific improvements via microdata linkage ([25]).

4.2. To what extent should the derived labour gap be addressed through subsequent non-observed GVA adjustments?

127.   It is considered good practice to address the total labour gap or to address it to the maximum extent possible. The way to address this is linked with the approach to compare the supply of labour with the demand. The top-down approach aims to address the total labour gap, whereas the hybrid approach aims to address it to the maximum possible extent (see Section 4.1).

4.3. Assumptions about the absence of non-observed labour input to production in certain NACE industries

128.   It is logical to assume that it is very unlikely to have non-observed labour input to production in certain NACE sections due to strict regulations. The common ones are NACEs K (Financial and insurance activities) and O (Public administration and defence; compulsory social security). For the other NACE industries, the situation may vary among countries depending on their legal frameworks and economic characteristics. For instance, in one country, the regulations in NACEs D (Electricity, gas, steam and air conditioning supply) and E (Water supply; sewerage, waste management and remediation activities) may be so strict that they leave no room for non-observed labour input to production, but this might not be the case in another country. NA compilers should assess their national circumstances carefully before making any such assumptions.

129.   However, given that the LFS is supposed to give a reliable estimate of the supply of labour at the total economy level, the fact that non-observed labour does not occur in certain NACE activities should not lead to a reduction in the labour gap to be addressed in the employment method. In other words, the total labour gap should be distributed among the relevant NACE activities rather than being reduced due to the absence of non-observed labour in certain NACEs. The

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([24])   The Italian practice for the employment method (labour input method) is the use of the integrated micro-approach. A separate paper provided by the Italian National Institute of Statistics (Istat), The use of labour input method for exhaustiveness in Italian national accounts (SG Exhaustiveness Employment method Italian practice), gives more information.

([25])   Microdata linkage can be used to improve a specific aspect, e.g. to harmonise NACE codes via microdata linkage between the LFS data and the statistical business register. This specific application is not the same as the integrated micro-approach for exhaustiveness adjustments mentioned here.

labour gaps in those NACEs without non-observed labour input can be attributed to discrepancies in the NACE classification between the supply and demand sources.

4.4. At which NACE level should the supply and demand of labour be compared?

130.   The NACE level at which the supply and demand of labour is compared should be consistent with that at which data on employment are harmonised. The recommended level is NACE sections (NACE 1-digit) or, at most, NACE divisions (NACE 2-digit).

131.   However, in one case using the hybrid approach, the labour gap analysis is made at a more detailed level than the NACE 2-digit level, i.e. NACE 4-digit. This is because the supply and use tables in the country concerned are also built at this more detailed NACE level, making it necessary to keep the same level of NACE detail. Furthermore, the reliability of those granular data is acceptable in that particular country (both the LFS and SBS allow the country to collect more detailed information at national level than legally required at EU level). Nevertheless, carrying out the labour gap analysis at such a detailed level is an exception.

4.5. How to tackle the problems linked to different NACE codes in the LFS and the NA? How to deal with negative labour gaps for some NACE activities?

132.   The coding of NACE in LFS data is often different from that in business statistics. It is due to different ways of coding in the data collection, i.e. 'local unit' (where the person/employee works) in LFS vs 'enterprise' in business statistics. Another reason is that NACE activity is self-reported by the person/employee in the LFS, while it is based on the enterprise/ employer's registration in business statistics. The coding in business statistics is considered to be more consistent. The different coding of NACE seems to be the main cause of negative labour gaps that are sometimes observed. Resolving the negative labour gaps is embedded in the top-down and hybrid approaches. The top-down approach ignores the labour gap by NACE, and it distributes the total gap to the different NACEs instead. In the hybrid approach, the negative labour gaps for some NACE activities are redistributed to other related NACEs with positive gaps, e.g. by using ratios.

133.   The top-down and hybrid approaches are suitable methods to tackle the problem of negative labour gaps at macro level. Another measure at micro level can help ease this problem as well, namely by modifying the NACE codes in the LFS microdata. This can be achieved via the microdata linkage between the LFS data and the statistical business register (see also Section 3.1.3).

4.6. Under-reporting in the LFS

134.   Due to its self-reporting nature, there may be biases in the LFS responses. On the one hand, under-reporting in the LFS of 'unofficial' jobs, secondary jobs and/or some self-employed persons and the related hours actually worked may occur in many countries. On the other hand, in some countries certain categories of workers may over-report their hours actually worked. It is observed that under-reporting predominates the overall bias.

135.   The extent to which under-reporting affects the LFS data is different between countries. Factors influencing this difference could be sampling errors, coverage errors, non-response and respondents' tendency to misreport. For instance, according to the quality report for the 2020 LFS, the confidence limits (at a 95 % significance level) vary from ± 0.0 to ± 0.9 hours for the average actual hours worked per week among countries [26].

136.   The LFS data provide in principle an upper limit for the supply of labour. It is important that this threshold reflects reality as much as possible. Therefore, the NA compilers should consult with their LFS colleagues to determine the

[26]   Quality report of the European Union Labour Force Survey 2020–2022 edition

significance of under-reporting in the LFS. If this issue is significant in the country concerned, appropriate solutions need to be found that fit the country's circumstances. One known empirical approach to correct the under-reporting of the LFS's total result involved applying a coefficient to LFS data derived from a complementary survey among interviewers. In the empirical case in question, this complementary survey showed that the surveyed LFS data included only one out of every four 'unofficial' jobs; therefore, the correction coefficient applied to the initial labour gap was the factor of four. A complementary survey could be considered to tackle under-reporting in the LFS. However, the content of the survey should be country-specific.

137.   Other corrective measures can be considered to correct the results of the LFS partially. For example, one may consider using the coefficient of variation of the LFS to make corrections when the labour gaps between the LFS and business statistics seem implausible.

138.   When there seems to be some under-reporting of secondary jobs in the LFS, one may consider correcting it by using the ratio 'jobs (main + secondary)/persons' from the available reliable administrative sources.

4.7. Analysis of specific LFS items on informal employment

139.   Hours worked in 'jobs' is the 'standard' labour input in the LFS that is used to convert to FTE to obtain the supply of labour. However, national practices show that the LFS can deliver information on informal employment separately through items such as 'Persons working with verbal agreements' or 'Persons working without contract'. Those items relating to informal employment can supplement the 'standard' labour input in the LFS to get specific information on non-observed labour input.

140.   One country has used this possibility in their employment method. The country adds people who work under a verbal agreement (i.e. without any formal contract) to the 'standard' labour input to obtain more 'hidden' employment (assuming that the work under a verbal agreement would not be reported in the 'standard' labour input). 'Working under a verbal agreement' may likely mean moonlighting, which is not officially registered and on which often no taxes are paid. The significance of this type of work may vary between countries and over time. The country concerned has observed that the number of people working under a verbal agreement is quite small and is decreasing.

141.   It should be clarified that from the reference year 2021 onwards, the new LFS employment data should include people working under all kinds of contracts (including verbal agreements) and without contracts. No additional corrections should be needed in this regard. The practice described above was applied to the years before 2021; it was country-specific probably because the LFS questionnaire was not yet harmonised among countries on this aspect at that time.

142.   The new LFS can still collect information on the types of contracts separately in a national module. The practice of another country confirms this possibility. It concerns the use of dedicated surveys (or dedicated questions in an existing survey) to obtain primary data on other non-observed labour inputs ('Employees who do not have a work contract in a written form').

143.   For undeclared employees, a special question is included in the national module of the LFS of the country concerned. For unregistered self-employed persons, a dedicated survey on unregistered work is conducted on the LFS sample. This aims to obtain data on unregistered self-employed persons for a number of relevant NACE sections in that country.

144.   The application of such a direct method depends on national circumstances. The reliability of responses from the survey on irregular workers may be questioned as households may be reluctant to answer honestly. This is particularly true for irregular self-employed workers who are also most likely to be evading taxes. However, this could vary from one country to another. It may be that the respondent is not 'afraid' to answer the survey because it is anonymous and has no legal consequences. The results of the dedicated survey in the country concerned seem plausible and stable over the years.

145.   In the future, countries may consider using a national LFS module to collect additional information on other labour inputs that could be major parts of the non-observed labour inputs in their country, e.g. persons working with verbal agreement/without written contracts. This information could be used to validate the labour gap derived from comparing the supply and demand of labour.

5

Step 3: Conversion of the extra labour inputs to non-observed production

146. In Step 3, the computed extra labour inputs obtained in Step 2 for those NACE industries with missing production are converted to non-observed production. This chapter explains the findings of the investigated issues.

5.1. Which variables should be adjusted? What is the rationale of adjusting intermediate consumption alongside output?

147. Concerning non-observed production, GVA should be the primary target variable for adjustment. As GVA = output – intermediate consumption (IC), one needs to decide whether output and/or IC needs to be adjusted. In practice, that decision is made through assumptions, possibly in combination with additional information.

148. For unregistered self-employed persons, as the whole unit is not observed, it is often assumed that both output and IC should be adjusted.

149. For undeclared labour from registered producers, some countries assume that only the output is missing, and all the costs (IC) are already reported (i.e. included in the data sources). Consequently, only extra output is imputed. This assumption may not be valid in other countries. Some other countries base their adjustment strategy on additional evidence from the misreporting bookkeeping practice. An accounting practice observed in some countries is to report lower output and IC in order to stay within a hypothetical range of surplus and not to report extremely low operating profits. In that case, both output and IC should be adjusted upwards.

150. The decision on whether IC should be adjusted along with output should be based on the patterns of the registered producers' misreporting behaviour in the country concerned. These patterns may vary among countries, i.e. only under-reporting output, under-reporting output/sales together with over-reporting IC, or under-reporting output together with less under-reporting of IC. They may also vary by NACE activities in the same country.

151. Countries are encouraged to make an informed decision on whether IC should be adjusted and in which direction. The decision should preferably be based on direct information, such as fiscal audits results, expert opinion or reference information, for example, reference GVA and IC per unit of labour, reference ratio of IC to output.

152. On the sequence of adjusting GVA, output and IC (when deemed to need adjustment), it is a matter of practical choice as long as the relationship of the adjustment is conditioned by the ratios such as GVA/output or IC/output or IC/GVA. For example, some countries adjust output first, then adjust IC by using the ratio IC/output, and finally GVA = output – IC. Some other countries first impute the missing GVA based on the missing labour input and then calculate the IC by using an estimated ratio of IC/GVA (e.g. 1/4), finally output = GVA + IC.

153.   The non-observed labour inputs relate not only to GVA but also to wages and salaries. It is considered good practice to impute missing wages and salaries along with imputing GVA by using, for example, the ratio of wages and salaries to unit of labour.

154.   The reference information on the productivity ratio, the ratios of GVA/output, IC/output, IC/GVA or wages and salaries/unit of labour in the non-observed segments should come from the comparable observed segments (see Sections 5.2 and 5.3).

5.2. What should be the computation segments and reference segments?

155.   The conversion of the extra labour inputs to non-observed production is done by multiplying the labour gap by a relevant productivity ratio. The labour gap is the one computed per computation segment in Step 2 (see Chapter 4). The productivity ratio to be used should be the one derived for each comparable reference segment. The comparable reference segments refer to the segments in the observed economy that best approximate the computation segments where both labour inputs and production have been concealed.

156.   Factors that have an impact on productivity are crucial for determining the computation and reference segments. Productivity is different for employees and for self-employed persons, and it varies also by NACE activity. Moreover, the productivity of the employees changes with the size class of the enterprise.

157.   Ideally, the reference segments should match the computation segments. This means that the individual reference segments (for which the information on the productivity ratio is available) should be related as accurately as possible to the individual computation segments (for which the information on the labour gap is available). For self-employed persons, this good match can be obtained by NACE activity. In principle, for employees, it would be desirable to additionally take into account (for both computation and reference segments) enterprises' other characteristics like their size class in terms of employment or turnover. However, in practice, countries' experiences confirm that it is not feasible to compute the labour gap at a more detailed level than by NACE. Therefore, for employees, the computation segments are by NACE, whereas the reference segments are per 'NACE x selected stratum of enterprises'. For the reference segments, selecting the appropriate stratum in a given NACE activity is essential. The chosen stratum should be the one that is considered prone to unregistered or undeclared labour and that would best reflect the productivity of the undeclared employment (see Section 5.3).

5.3. How to determine the appropriate productivity ratio in the reference segments for use in the computation segments?

158.   The key input for converting the extra labour input to production for the computation segments is the productivity ratio of the comparable reference segments (i.e. observed segments). The extent to which the extra labour inputs per NACE activity are eventually converted to production depends on the reference segments' productivity ratio.

159.   The productivity ratio can be expressed in terms of GVA or output per unit of labour. No matter what the denominator is, the unit of labour should be consistent with the labour input measure in which the labour gap is expressed, i.e. hours worked or FTE. The productivity for the non-observed segments is approximated by that of the comparable reference segments. In practice, the data for the observed segments may come from the same data source as that of the demand of labour. GVA or output should preferably be measured in basic prices and not in market prices because avoidance of VAT and other taxes are often one of the reasons for which these activities are non-observed.

160.   The SBS or SBS-other business statistics combined data are preferred to other business sources alone to derive the productivity ratio of the comparable observed segments. In particular, this is because, starting from 2021, the SBS have been extended to almost all the NACEs that are usually chosen to use the employment method, and the relevant data are available there.

161.   Data on GVA and output based on the SBS transformed to the NA concept can be used if they are available in the NA compilation system of the country concerned. As productivity is about a proxy ratio, output and GVA in the SBS can also

be used although they do not have exactly the same definition as in the NA. Sometimes, the turnover may be used as a proxy for output.

162.   The choice of the comparable observed segments to obtain the productivity ratio may vary among countries, depending on national circumstances. When choosing the reference segment, in principle, the selected stratum should provide good coverage, on average, of the units' characteristics in the computation segment that are prone to undeclared labour (and thus reflect the fact that, for example, undeclared labour occurs mainly in the small and medium-sized enterprises (SMEs) for a given NACE activity). However, most importantly, this stratum should represent the productivity of undeclared labour sufficiently (for example, so it can be decided to deliberately choose the stratum of small enterprises to reflect the fact that the productivity in the non-observed economy may be on average lower than that in the observed economy). Some examples of the chosen reference segments within each chosen NACE to compute the productivity ratio are:

- enterprises with up to 20 employees;
- the stratum with the lowest productivity rate (usually 0–9 employees);
- the average of all SMEs;
- enterprises with an annual GVA below a certain upper limit (e.g. less than EUR 500 000).

163.   Experience from different countries shows that undeclared labour usually occurs in smaller enterprises. This is because larger enterprises usually undergo stricter and more frequent bookkeeping inspections by national authorities. Therefore, it is recommended to use the lower boundary of productivity or the productivity of the smaller units within a given NACE activity.

164.   To obtain more stable results, the NACE level for adjusting GVA is sometimes different from that at which the reference productivity ratio is computed. In particular, this occurs when a more detailed NACE level is used for adjusting GVA. For example, while the GVA is adjusted by 4-digit/class level, the reference productivity is computed by 2-digit/division level. The obtained productivity ratio at the NACE 2-digit level is used for all the NACE 4-digit categories under the same NACE 2-digit.

165.   The productivity of self-employed persons is not available in the SBS. Some countries use the comparable segments of the employees for self-employed persons, and some other countries use information from other business sources for self-employed persons. It is observed in national practices that when the productivity ratio for missing self-employed persons is based on the reference data for self-employed persons, productivity is significantly lower than the lowest productivity for employees in enterprises. Furthermore, empirical evidence in one country shows that self-employed persons can under-report output and wages significantly, relatively more than registered enterprise units. Therefore, particular care should be taken when choosing the productivity ratio for self-employed persons. If appropriate, unreliable low productivity ratios in the reference segment should be corrected.

166.   In addition, the same reference segments for the productivity ratio should be used to derive other relevant reference ratios, such as GVA/output, IC/output, IC/GVA or wages and salaries/unit of labour. Some countries make additional adjustments to these reference ratios based on assumptions/expert opinions for each NACE activity, such as the ratio IC/output in the non-observed segments is about x % as that in the observed segments.

5.4. To what extent should the productivity ratio be adjusted to account for misreporting in the reference segment?

167.   The productivity ratio of the observed reference segment is used as a proxy for that of the non-observed segment. If the reference productivity ratio is based on NA source data that has not been adjusted for possible misreporting (which could be linked to phenomena other than undeclared labour), it raises the question of whether any adjustments should be made to the reference productivity ratio.

168.   In one country, the productivity ratio used is the one adjusted for misreporting in the source data. Most countries do not seem to make such adjustments for the following reasons:

- the misreporting (not driven by the undeclared labour) is claimed to have already been corrected in the observed data source, i.e. the SBS, in particular for SMEs;
- any misreporting not driven by undeclared labour is considered to be addressed by other exhaustiveness methods or to be implicitly addressed in the process of balancing of GDP.

169.   When considering adjusting productivity ratios for misreporting in the reference segment, self-employed persons may be treated differently than employees. The risk of overlapping with other exhaustiveness methods in place should be analysed separately for these two groups before deciding on the possible adjustment to reference productivity ratios. This is because the other exhaustiveness methods in place (addressing misreporting unrelated to undeclared labour) may only target one of these groups. For example, if there is already another method applied to correct the misreported output (unrelated to undeclared employment) of all registered enterprises, then it might not be necessary to adjust the productivity ratio used for the employees in the employment method, while for the self-employed persons (that are not subject to other methods tackling misreporting) such adjustments may have to be considered.

6

Validation

6.1. Validation checks in the application of the employment method for explicit exhaustiveness adjustments

170.   In addition to the findings in the previous chapters, it is also important to carry out validation checks to ensure the results obtained are as plausible as possible. Given the wide range of country-specific circumstances and practices, it is not easy to draw up a set of standard checks. When applying the employment method for explicit exhaustiveness adjustments, the NA compilers should consider carrying out at least some of the following consistency and plausibility checks:

- comparing the labour gap with the official unemployment figures: if the labour gap is significantly bigger than the number of unemployed persons, a plausible explanation should be given;
- LFS data evolution, by employees and self-employed persons (persons, FTE, hours worked by branches – main jobs and secondary jobs by branches);
- SBS data on employees (if available, data on self-employed from other business sources), evolution year to year and over the years, to check the trend of the legal market of employment by NACE activity;
- number of registered self-employed persons, evolution year to year and over the years in relation to SBS data, total and by NACE activities;
- evolution of average salaries by NACE activities and over the years;
- productivity evolution in observed data sources (e.g. the SBS), total economy, by NACE activities and by the chosen reference segments.

171.   It should be emphasised that the above checks should be made during the exhaustiveness adjustment process. The checks are not for validating the final NA estimates.

172.   Among the cases studied, a few countries have ensured the consistency of the exhaustiveness adjustments on economic variables (i.e. GVA, compensation of employees) and on employment data (i.e. FTE jobs, hours worked) through the design of their NA compilation system. This means that the same data sources are used to estimate NA employment data, the demand of labour is mainly used to estimate the observed employment, and the difference between the supply and demand of labour is mainly used to estimate non-observed employment. At the end, the extra labour inputs used for the exhaustiveness adjustments of GVA are also included in the final estimates of the NA employment data. This is considered a good practice.

173.   The employment method is mainly used to perform explicit exhaustiveness adjustments for the economic variables of NA estimates, e.g. GVA, the compensation of employees. In practice, countries may estimate NA employment data (e.g. persons employed, hours worked) by using a separate methodology. Carrying out the consistency and plausibility checks of the final estimates between the economic values and employment data by using indicators, such as the ratio of GVA to output or GVA per unit of labour, are considered part of the regular practice of compiling the NA. However, these

checks are not the primary focus of investigations in the context of this paper. Countries are encouraged to continue conducting their existing consistency checks between the economic values and employment data of the NA final estimates.

174.   Lastly, if feasible, countries are encouraged to cross-check the results of the employment method with other sources on the non-observed economy. For example, the NA compilers may compare the trends of the non-observed economy based on fiscal audit data with those resulting from the employment method.

6.2. **Validation of the employment data underlying the GDP estimates**

175.   Commission Decision 94/168 on the harmonisation of the compilation of gross national product at market prices requires all Member States to compare the employment data underlying the GDP estimates with employment data based on demographic sources. The purpose of this comparison is to validate the exhaustiveness of GDP estimates via employment. The demographic sources to be considered are the LFS and the population census, which are essentially the data sources for the supply of labour when using the employment method for explicit exhaustiveness adjustments. The employment data underlying GDP estimates is the final NA employment estimate, including the exhaustiveness adjustments.

176.   The required comparison should be done separately for employees and self-employed persons. However, Commission Decision 94/168 (from the year 1994) did not set out the different roles of the different labour input measures, namely that 'persons' is a basic estimate, 'jobs' is the link between 'persons' and their contribution to production (GVA/GDP), 'hours worked' is the best measure for the labour inputs to production, and 'FTE' is the second-best measure. The reason for not explicitly requiring a comparison based on hours worked is presumably because at that time not all Member States had a sound methodology in place to estimate the number of hours worked. In recent years, many countries did a comparison based on 'persons' because this is a straightforward labour input measure available both in demographic sources and the NA.

177.   Based on the findings in this paper, it would be beneficial to base the ultimate validation of employment data underlying GDP estimates on 'hours worked' (the best option) or 'FTE' (the second-best option). Commission Decision 94/168 should preferably be updated to reflect this in the future by taking this paper's recommendation into account.

178.   To make the comparison, it is essential that the data on employment from demographic sources (the LFS and the population census) are aligned with the NA concept of employment. To do so, the recommendations on 'Step 1: Harmonisation of data on employment' should be followed, in particular those on labour input measures, and the conceptual adjustments, to align the data with the NA concept.

179.   The comparison is required at the level of both total economy and economic activities by NACE. It is critical to ensure the NACE classification in the LFS is harmonised with the one in the NA estimates. The NACE classification in the NA is usually enterprise-based. If microdata linkage is feasible, the statistical business register can best be used to harmonise the NACE classification in the demographic sources (see Section 3.1.3).

180.   Furthermore, recommendations on 'Step 2: Comparison of supply and demand of labour' should also be taken into consideration. Those recommendations help make a meaningful comparison between the employment underlying the GDP estimates and employment based on demographic sources and help explain the comparison results.

Summary of the recommendations

181.　In the previous chapters, possible solutions to the identified issues have been analysed. This chapter summarises all the recommendations stemming from those solutions.

7.1. General recommendations

Recommendation 1
Assumptions, scope and conditions for using the employment method for exhaustiveness adjustments

182.　The employment method is based on the **confrontation between the supply and demand of labour**. It is assumed that household survey data or census data (on the labour supply side) give a more complete coverage of labour input to GDP than enterprise survey data (on the labour demand side).

183.　The employment method can be used to make explicit exhaustiveness adjustments to the GDP estimates as well as validate GDP estimates.

184.　Validating employment data underlying GDP estimates is required by Commission Decision 94/168 on the harmonisation of the compilation of gross national product at market prices for all Member States. In this case, the data used for the demand side of labour should be the final NA employment estimates.

185.　When explicit exhaustiveness adjustments to the GDP estimates are made based on the employment method, the data on the demand side of labour should be derived from the business statistics sources used to compile GDP.

186.　Using the employment method for explicit exhaustiveness adjustments is beneficial if the following two main conditions are met:

- condition I: the reliable data sources available for the supply of labour indeed show more labour inputs to production/GDP than those for the demand of labour;
- condition II: it is known that there is a significant presence of unregistered producers and/or undeclared labour from registered producers.

Recommendation 2
Data sources to be used for the supply and demand of labour

187.   The **main data sources for the supply of labour** should be demographic data (on persons). The demographic data sources are the Labour Force Survey (LFS) or the population census (including data sources used in census data). The **main data sources for the demand of labour** should come from business statistics, which often include structural business statistics (SBS), the statistical business register (SBR), other business-related sources, administrative data or combinations of them. For both the supply and demand side of labour, other data sources can be used but should be treated as supplementary for specific purposes, such as harmonising the NACE classification.

188.   To capture the non-observed labour inputs from **the supply side of labour**, **the LFS is the preferred source over the population census**. When using the LFS, if condition II mentioned above is met but condition I is not met, the NA compilers are encouraged to investigate the quality issues encountered in their country's LFS and take measures to tackle them. If this approach is not successful, switching to **population census data** (including the underlying administrative data) as the main data source for the supply of labour **can be considered a second-best solution**. This second-best solution can be considered if the relevant data are available annually. Furthermore, additional measures should be taken to capture the non-observed labour inputs that are not included in the administrative sources by definition. The additional measures depend on national circumstances but usually include using complementary sources and quantitative methods/econometric models. In this case, the LFS should be considered a complementary source to capture non-observed employment and provide details on labour inputs.

Recommendation 3
Avoiding the potential double counting of exhaustiveness adjustments

189.   In theory, the labour gap can be related to all the N1-N7 types of non-exhaustiveness. The exact **types and elements of non-exhaustiveness that are covered by the employment method** depend on the reliability of the data sources, the economic characteristics, the legislation of the country concerned and the chosen approach to exhaustiveness. When the employment method is used alongside other methods, the NA compilers should examine whether there is potential double counting, i.e. if the missing production elated to non-observed labour inputs has been explicitly/implicitly addressed via other methods.

190.   A **holistic examination** should be carried out in that context. The examination should look at the design of the exhaustiveness approach of the country concerned. Carefully designing the methods to tackle different N-types of non-exhaustiveness (or different elements within the N-types, such as different patterns of misreporting within N6) can prevent double counting, thereby eliminating the need for additional corrections. To achieve this, all relevant elements of each N-type should be identified first. Methods should then be designed to target those elements of non-exhaustiveness and calculate the necessary adjustments. It is essential that the methods designed target the elements of non-exhaustiveness separately and without overlap.

191.   The NA compilers may consider the following **observations for the analysis of potential double counting**. Typically, N1, part of N3, N4-N5, part of N6 (undeclared GVA of registered producer due to undeclared labour/hours worked) are captured in the labour gap. N2 (illegal activities), part of N6 (non-collected VAT due to tax evasion without complicity and insolvency) and part of N7 (tips, gratuities, wages in kind) are typically considered not to be included in the labour gap.

192.   If double counting cannot be **avoided ex ante through the design of** the approach to exhaustiveness, appropriate measures should be taken to **correct it ex post**.

Recommendation 4
The classification of the exhaustiveness adjustments resulting from the employment method

193.   When the employment method is **designed to cover only N1 and N6 types** of non-exhaustiveness in a given country, it is recommended for the sake of comparability between countries that **the adjustments resulting from the**

employee labour gap are classified under N6 (misreporting by producers) and the self-employed labour gap under N1 (underground producers).

194.   When the employment method is **designed to cover several N-types adjustments (including N1 and N6)** in a given country and it is not possible to allocate the adjustments to the individual categories of the non-observed economy, for the sake of comparability among countries, **the following simplified solution should preferably be applied**:

• adjustments made for self-employed persons (that would cover N1, part of N3 and N5) should be classified under N1 (underground producers);
• adjustments made for employees (that would cover N4 and part of N6) should be classified under N6 (misreporting by producers).

7.2. Recommendations on Step 1: Harmonisation of data on employment

Recommendation 5
Reference period

195.   On the supply of labour, data from the population census have a reference period of a year, while the main LFS variables are collected quarterly. On the demand of labour, business statistics are usually annual. **The comparison of the relevant variables between the supply and demand of labour should be done based on the annual data**, for which the 'annual average results' of the LFS quarterly variables should be used.

Recommendation 6
Scope of economic activities (NACE activities to be considered)

196.   The scope of NACE activities to be chosen can be:

• the total economy (excluding NACE U), or
• NACE sections B to N, or
• NACE sections B to T.

197.   The decision to exclude NACE section A or only some of the NACE divisions A01, A02 or A03 depends on the level at which reliable data sources on Agriculture, Forestry and Fishing are available. The additional exclusion of NACE K and O; and NACE S94, NACE T can also be considered.

198.   If data on the total economy is to be harmonised, data on the **missing NACE activities**, e.g. NACE A, O, S94 and T (from reference year 2021 onwards), should be added to the business statistics data to ensure the scope of the LFS and business statistics is comparable.

199.   If the chosen scope consists of certain NACE activities, data on the **non-selected NACE activities** should be excluded from the comparison between the LFS and business statistics. However, this can best be done if the two data sets' NACE classifications are harmonised.

Recommendation 7
Harmonising the NACE codes

200.   The assigned NACE codes in the demographic sources used (the LFS and/or population census) and those in the business statistics should be harmonised. Countries are encouraged to make efforts to explore and possibly adopt the **microdata linkage approach** via the statistical business register to harmonise NACE classifications between the demographic sources and business statistics.

201.   If it is not feasible to harmonise the NACE classification via microdata linkage, then **other solutions** should be applied. The solutions can be embedded in the approach used to compare the supply and demand of labour, i.e. the top-down approach or hybrid approach (see recommendation 12).

Recommendation 8
Harmonising the level of NACE detail

202.   The level of detail to harmonise the NACE code should be **consistent** with the level of detail at which the computation of the labour gap between demand and supply of labour is done. As the reliability of both LFS and business statistics data decreases when the level of NACE detail increases, this level of detail should be **NACE sections (1-digit) or at most NACE divisions (2-digit)**. In the employment method, working with NACE levels deeper than NACE divisions, e.g. NACE classes (4-digit), should be considered an exception, providing that the relevant detailed data are of sufficient quality.

Recommendation 9
Labour input measures

203.   The labour input in 'persons' is a rough estimate of employment. The 'jobs' measure links persons to their contribution to production (i.e. GVA/GDP). The 'hours worked' measures best the real labour inputs to production, while the full-time equivalent (FTE) approximates these inputs. For the employment method, measuring the real labour inputs to production is essential. Therefore, '**hours worked' is considered to be the best measure, and FTE is the second best**.

204.   For **hours worked in the LFS, the 'hours actually worked' variable should be preferably used**. To improve comparability between countries, one of the aggregation methods in the figures below should be preferably used to obtain the aggregated results for employees respectively self-employed persons at the chosen NACE level.

Aggregation schema of hours worked (employment status x job status)

NACE: total or by chosen industry	Employees		Self-employed	
	Main job	Secondary jobs	Main job	Secondary jobs
	Hours actually worked	Hours actually worked	Hours actually worked	Hours actually worked

Aggregation schema of hours worked (employment status x job status by full-time/part-time)

NACE: total or by chosen industry	Employees		Self-employed	
	Main jobs (full-time)	Main and secondary jobs (part-time)	Main jobs (full-time)	Main and secondary jobs (part-time)
	Hours actually worked	Hours actually worked	Hours actually worked	Hours actually worked

*By definition, secondary jobs are considered part-time.

205.   As hours worked are usually not available in the population census, the NA compilers are recommended to use the reference information based on the LFS to make the estimates. Various reference information in the LFS can be considered, e.g. by the chosen NACE industry, the ratio hours worked/person, the full-time/part-time share combined with the employees/self-employed share, the coefficient of secondary jobs/main jobs.

206.   For **the hours worked in the business statistics**, it is recommended to **use the 'hours worked by employees' variable** available in the SBS for the NACE industries covered by the SBS. For the other NACE industries, the NA compilers may consider using other business statistics as supplementary data.

207.   If **the second-best measure, FTE,** is chosen, for the LFS, the **formula as given below should preferably be used** to obtain the FTE per chosen NACE level. For the population census, the FTE can be estimated accordingly by using the estimated hours worked in the population census as described above.

208.   The recommended formula to calculate FTE is as follows.

Number of employed people in full-time equivalent:

$$FTE = EMP\_FT + \frac{AVG\_PT(HWACTTOT)}{AVG\_FT(HWACTUAL)} \times EMP\_PT$$

Where:

- EMP_FT = number of people employed full-time
- EMP_PT = number of people employed part-time
- AVG_FT(HWACTUAL) = average actual working hours for people with full-time jobs (only for main jobs)
- AVG_PT(HWACTTOT) = average actual working hours for people with part-time jobs (taking the sum of hours for the main and second jobs)

This formula can be used to calculate FTE for employees and self-employed persons separately as illustrated in the schema below.

Computation schema of full-time equivalent (FTE)

NACE: total or by chosen industry	Employees		Self-employed	
	Main jobs (full- time)	Main and secondary jobs (part-time)	Main jobs (full-time)	Main and secondary jobs (part-time)
	Hours actually worked = 1 FTE	Converting hours actually worked to a fraction of 1 FTE	Hours actually worked = 1 FTE	Converting hours actually worked to a fraction of 1 FTE

*By definition, secondary jobs are considered part-time.

209.   For **the demand side of labour**, it is recommended to **use the 'number of employees in full-time equivalent units' variable** that is available in the SBS. The number of **self-employed** persons in full-time equivalent is not directly available in SBS. It can be **estimated** based on 'number of employees in full-time equivalent units' multiplied by the FTE self-employed vs employees ratio from the LFS data.

Recommendation 10
Conceptual adjustments: from the LFS to the NA employment concept

210.   For the conceptual adjustments from the LFS to the NA employment concept, it is recommended to use **the overview table below as a guide**. Some adjustments are considered major and others minor. While countries may make adjustments for all items, **adjustments should be made at least for the following major conceptual differences**:

- non-residents working for resident units, such as non-resident migrant workers, non-resident cross-border workers or seasonal workers;
- residents employed by non-resident producers, such as resident cross-border workers or seasonal workers;
- resident workers living permanently in an institution; they can live and work in communal establishments (such as prisons or long-term care facilities), collective households (such as religious institutions) or accommodation for military forces;
- persons in own-use production work (e.g. agricultural activities).

Adjustments for the transition of employment from the LFS to the national accounts concept

ID	Adjustment item	Major or minor item	Adjustment sign		Changes new vs old LFS?	ESA 2010 Reference
			Old LFS based	New LFS based		
1	Territory coverage	Minor	+ or 0	+ or 0	No	2.05–2.07
2	Conscripted forces	Minor	+ or 0	+	Yes, the new LFS excludes them more explicitly from the reference population.	11.19 a
3	Non-residents working for resident units	Major	+	+	No	11.19 c
4	Residents stationed in the rest of the world	Minor	+	+	No	11.17 c-g
5	Residents employed by non-resident producers	Major	-	-	Yes, it concerns one sub-category of resident seasonal workers employed by non-residents. The new LFS includes them during the off-season only if they continue to regularly perform tasks and duties, excluding legal or administrative obligations.	11.18a, 11.19 b
6	Resident seasonal workers employed by resident producers	Minor	+	+	Yes, the new LFS includes them during the off-season only if they continue to regularly perform tasks and duties, excluding legal or administrative obligations.	11.11
7	Resident workers living permanently in an institution	Major	+	+	No	11.19 d
8	Resident workers under the age taken into account in LFS.	Minor	+	+	No	11.19 e
9	Resident workers above the age taken into account in LFS.	Minor	+	0	Yes, old LFS: >=15 years old, some countries might have an upper age limit; new LFS: 15-89 years old.	11.11
10	Employees on maternity or parental leave	Major	+ or 0	0	Yes, old LFS: different in each country; the new LFS includes them if they receive and/or are entitled to job-related income or benefits, or if their parental leave is expected to be 3 months or less.	11.14

| ID | Adjustment item | Major or minor item | Adjustment sign | | Changes new vs old LFS? | ESA 2010 Reference |
			Old LFS based	New LFS based		
11	Employees on (long-term) sick leave	Major	+ or 0	0	No, but some countries did not follow the rules on how to treat sick leave in the old LFS.	11.14
12	Unpaid students/trainees	Minor	+	+	No	11.13 f
13	Unpaid family workers	Reminder item	0	0	No. This reminder item makes sure the 'Unpaid family workers' in LFS are selected as 'self-employed' for NA purposes.	11.16 a
14	Unpaid outworkers (on commission agreements)	Minor	+	+	No	11.16 b
15	Unpaid voluntary work resulting in goods	Minor	+	+	No	11.16
16	Persons in own-use production work (e.g. agricultural activities)	Major	0	+	Yes, the new LFS excludes them if the majority of the production is for self-consumption.	11.16 c
17	Owners of corporations and quasi-corporations: transferring from self-employed to employees	Minor	Internal transfer	Internal transfer	No. Internal transfer: LFS classifies owners of corporations and quasi-corporations if they work in those enterprises as self-employed, but ESA includes them in employees.	11.13e

Recommendation 11
Other adjustments

211.   To ensure comparability between the LFS and business statistics, the NA compilers are encouraged to **assess** whether there are other **country-specific circumstances** that would call for additional adjustments.

7.3. Recommendations on Step 2: Comparison of supply and demand of labour

Recommendation 12
Approaches to the comparison of supply and demand of labour

212.   Considering that the LFS is more reliable at the level of the total economy than the NACE**, the top-down or hybrid approach should be preferred over the bottom-up approach** when comparing the supply and demand of labour to determine the labour gap. **Each country should adopt either the top-down or hybrid approach based on its own circumstances**. When analysing the labour gap by NACE, countries are encouraged to make use of special surveys

and/or extensive analyses at NACE levels. If this is not feasible, countries should explore other ways, such as expert estimates, to obtain data on labour gaps by NACE that is as reliable as possible.

213.   The **integrated micro-approach** is only feasible when comprehensive microdata (from administrative sources and surveys) are available and can be linked. To adopt this approach, a long-term investment in the statistical infrastructure is needed, perhaps requiring a modification of the compilation approach of the NA. For the time being, an integrated micro-approach might not be feasible for most countries. However, considering the developments in statistical analysis, i.e. applying data mining techniques to microdata to achieve the accuracy that cannot be achieved via macro-analysis, in the long run countries are invited to weigh the costs and benefits of working in this direction. This work may begin by experimenting on specific improvements via microdata linkage.

Recommendation 13
The extent to which the derived labour gap should be addressed through subsequent non-observed GVA adjustments

214.   It is considered good practice **to address the total labour gap or to do this to the maximum extent possible**. The way to address this is linked with the approach taken to compare the supply of labour with the demand for labour. The top-down approach aims to address the total labour gap, whereas the hybrid approach aims to do this to the maximum extent possible.

Recommendation 14
Assumptions about the absence of non-observed labour input to production in certain NACE industries

215.   It is logical **to assume that it is very unlikely to have non-observed labour input to production in certain NACE sections** due to strict regulations. The common points in case are NACE sections K (Financial and insurance activities) and O (Public administration and defence; compulsory social security). For the other NACE industries, the situation may vary between countries depending on their legal frameworks and economic characteristics. The NA compilers should assess their country's circumstances carefully to make such assumptions.

216.   Given that the LFS is supposed to give a reliable estimate of the supply of labour at the total economy level, the fact that non-observed labour does not occur in certain NACE activities should not lead to a reduction in the labour gap to be addressed in the employment method. In other words, the total labour gap should be distributed among the relevant NACE activities rather than being reduced due to the absence of non-observed labour in certain NACE activities. This is because the labour gaps in those NACEs without non-observed labour input can be attributed to discrepancies in the NACE classification between the supply and demand sources.

Recommendation 15
The NACE level for the comparison of supply and demand of labour

217.   The level of NACE for the comparison of supply and demand of labour should be consistent with that at which the data on employment is harmonised. It is recommended to use the level of **NACE sections (1-digit) or, at most, NACE divisions (2-digit)**. Working at a deeper level should only happen on an exceptional basis, and providing that the reliability of those detailed data is acceptable in the country concerned.

Recommendation 16
Solutions for negative labour gaps in some NACE activities

218.   The different NACE coding between the LFS and business statistics seems to be the main cause of negative labour gaps that can sometimes arise. **The top-down and hybrid approaches** should be the appropriate methods for tackling the problem of negative labour gaps at the **macro level**. The top-down approach ignores the labour gap by NACE, and

instead distributes the total gap among the different NACEs. In the hybrid approach, the negative labour gaps for some NACE activities are redistributed among other related NACEs with positive gaps, e.g. by applying ratios.

219. This problem can also be tackled at the **micro level** by modifying the NACE codes of the LFS microdata. This can be achieved via the **microdata linkage** between the LFS data and the statistical business register.

Recommendation 17
Treatment of under-reporting in LFS

220. Under-reporting in the LFS may occur, but the significance of this phenomenon **varies between countries**. The NA compilers should determine, in consultation with their LFS colleagues, whether under-reporting in the LFS is significant in their country. If so, the country concerned is encouraged to find the appropriate solutions **suitable for its circumstances**. Examples of measures to tackle this under-reporting include using a dedicated complementary survey, or the coefficient of variation of the LFS, to make corrections when the labour gaps between the LFS and business statistics seem implausible.

Recommendation 18
Analysis of specific LFS items on informal employment

221. From the reference year 2021, the new LFS employment data should include information on people working with all kinds of contracts (including verbal agreements and without contracts. No additional corrections should be needed in this regard. Nevertheless, the NA compilers may consider collecting **additional information on informal employment via a national LFS module** through items such as 'persons working with a verbal agreement/without a written contract'. This information could be used **to validate the labour gap** derived from comparing the supply and demand of labour.

7.4. Recommendations on Step 3: Conversion of the extra labour inputs to non-observed production

Recommendation 19
Variables to be adjusted

222. The labour gap is the non-observed labour input to production. The **GVA should be the primary target variable** for adjustment.

223. For unregistered self-employed, as the whole unit is not observed, it is often assumed that both output and IC should be adjusted.

224. For **undeclared labour inputs of employees** from the registered producers, the decision on whether IC should be adjusted along with output should be based on the **patterns in the misreporting** behaviour of the registered producers in the country concerned. Countries are encouraged to make an informed decision on whether IC should be adjusted, and in which direction. The decision should preferably be based on direct information such as the results of fiscal audits, expert opinions or reference information such as the reference GVA and IC per unit of labour, or the reference ratio of IC to output.

225. The **sequence of adjusting** GVA, output and IC (when deemed to be adjusted) is considered a practical choice as long as the relationship of the adjustment is conditioned by ratios such as GVA/output, IC/output or IC/GVA.

226. It is considered good practice to **impute missing wages and salaries** along with imputing GVA by using, for example, the ratio of wages and salaries to unit of labour.

Recommendation 20
The productivity ratios and other ratios of the reference segments to be used for the computation segments

227.   The **computation segments** for both self-employed persons and employees should be determined by NACE activities. The reference segments for self-employed should be the same as the computation segments. For employees, it is recommended to use 'NACE x selected stratum' as a reference segment. The stratum in the given NACE activity that should be chosen is the one that is deemed most susceptible to the presence of unregistered/undeclared labour and which would best represent the productivity of the unregistered/undeclared labour.

228.   The **productivity ratio** can be expressed in terms of GVA/ hour worked or GVA/FTE; or output/ hour worked or output/FTE. In any case the denominator should be consistent with the labour input measure in which the labour gap is expressed. The productivity for the computation segments is approximated to that of the comparable reference segments (observed segments).

229.   The **non-observed production** is calculated as 'the labour gap in the computation segment' multiplied by 'the best proxy for the productivity ratio from the reference segment'.

230.   The SBS or SBS/other business statistics combined data are the preferred **sources for deriving the productivity ratio** of the comparable observed segments. This is particularly the case because since 2021 the SBS in the EU has been extended to cover almost all the NACEs of the business economy that are usually chosen to apply the employment method, and the relevant data are available there.

231.   If the data on GVA or output based on the SBS, transformed to the NA concept, are available in the NA compilation system of the country concerned, they should be used. Because the productivity relates to a proxy ratio, output or GVA as in the SBS can also be used although they do not have exactly the same definition as in the NA. Sometimes, turnover is used as a proxy for output.

232.   The productivity data for **self-employed persons** are not available in the SBS. If the reference productivity data for self-employed persons are taken from other business sources on the self-employed, the NA compilers should **assess whether the productivity ratios in the reference segments are plausible** (i.e. not unreliably low) and correct them if appropriate.

233.   Generally speaking, undeclared labour is more often found in smaller enterprises. Therefore, the NA compilers may consider using the lower boundary of productivity or the productivity of the small units within a given NACE activity. Some of the **proxy segments** to compute the productivity ratio that can be considered are:

• within each chosen NACE, enterprises up to 20 employees;
• within each chosen NACE, the stratum with the lowest productivity rate (usually 0–9 employees);
• within each chosen NACE, the average of all SMEs;
• within each chosen NACE, enterprises with an annual GVA below a certain upper limit (e.g. less than EUR 500 000).

234.   The same reference segments can be used to derive **other relevant reference ratios** such as GVA/output, IC/output, IC/GVA or wages and salaries/unit of labour. The NA compilers may consider making additional adjustments to these reference ratios based on national circumstances.

Recommendation 21
Possible adjustments to the productivity ratios in the reference segments

235.   If the **reference productivity ratios** are based on the source data for NA, and as such are not adjusted for possible misreporting that can be linked to phenomena other than undeclared labour, the NA compilers are encouraged to **investigate** whether **additional adjustments** need to be made.

236.   When considering adjusting productivity ratios for misreporting (unrelated to non-observed labour inputs) in the comparable reference segment, self-employed persons may be treated differently than employees. The risk of overlapping with other exhaustiveness methods in place should be analysed separately for these two groups before deciding on the

possible adjustment to reference productivity ratios. This is recommended because the other exhaustiveness methods in place (addressing misreporting unrelated to undeclared labour) may target only one of these groups.

7.5. Recommendations on validation

Recommendation 22
Validation checks in the application of the employment method for explicit exhaustiveness adjustments

237.   **When using the employment method for explicit exhaustiveness adjustments**, the NA compilers should consider performing at least some of the following **consistency and plausibility checks**:

- comparing the labour gap with the official unemployment figures: if the labour gap is significantly higher than the number of people officially registered as unemployed, a plausible explanation should be given;
- the trend in the LFS data, by employees and self-employed (persons, FTE, hours worked by branches, or main jobs and secondary jobs by branches);
- SBS data on employees (if available, data on self-employed persons from other business sources), or the evolution from year to year and over several years, to check the trend in the market of legal employment by NACE activities;
- the trend in the number of registered self-employed persons from year to year and over several years, in relation to SBS data, the total number and by NACE activities;
- the trend in average salaries, by NACE activities and over several years;
- the trend in productivity in observed data sources (e.g. the SBS), for the total economy, by NACE activities and by the chosen comparable segments.

238.   For **the final NA estimates** (including the exhaustiveness adjustments), the NA compilers are encouraged to continue performing the consistency checks that are done in their regular NA compiling practice, e.g. the ratio of GVA to output, or GVA per hour worked.

239.   If feasible, countries are encouraged to **cross-check** the results of the employment method with other sources on the non-observed economy. For example, NA compilers may compare the trends in the non-observed economy based on the fiscal audit data with those resulting from the employment method.

Recommendation 23
Validation of employment data underlying the GDP estimates

240.   Commission Decision 94/168 requires all Member States to **compare the employment data underlying the GDP estimates with the employment figures according to demographic sources**. The purpose of this comparison is to validate the exhaustiveness of GDP estimates via employment figures. The demographic sources to be considered are the LFS and the population census, which are, in fact, the data sources for the supply of labour when using the employment method to make explicit exhaustiveness adjustments. The employment figures underlying the GDP estimates are the final NA employment estimates, including the exhaustiveness adjustments. For this validation, the recommendations related to 'Step 1: Harmonisation of data on employment' should be followed completely.

241.   Moreover, for a meaningful comparison between the employment figures underlying the GDP estimates and those according to demographic sources, recommendations 12–18 of 'Step 2: Comparison of supply and demand of labour' should be considered.

Annex A Overview of issues and priorities for the investigation on the employment method

Issue	Priority
General	
Assumptions/conditions for using the method	Primary
The scope of application of the method	Primary
Supply and demand of labour: which data sources should be used?	Primary
For which non-exhaustiveness types (N1-N7) can the employment method be used?	Primary
How to avoid potential double counting: the other non-observed employment that has been explicitly/implicitly estimated (via another method/estimate)	Primary
Step 1: Harmonisation of data on employment supply and demand of labour	
The choice of comparable labour input measures in data on supply and demand of labour	Primary
Adjustments for transition LFS to NA concept	Primary
Other adjustments	Secondary
The harmonisation of NACE classifications in data on supply and demand of labour	Primary
Data sources for estimating transition adjustment items (LFS to NA concept), e.g. migrant workers.	Secondary
Step 2: Comparison of supply and demand of labour	
The approach for the comparison of supply and demand of labour (top-down vs bottom up)	Primary
To what extent should the derived labour gap be addressed through subsequent non-observed GVA adjustments (difference between top-down and bottom-up approaches)?	
Assumptions about no non-observed labour input to production in certain NACE sections	
At which NACE level should the comparison of supply and demand of labour be made?	Primary
How to deal with negative labour gaps in some NACEs?	Primary
How to tackle the quality problems of the NACE classifications in the LFS data?	Primary
Underreporting in the LFS (e.g. underreporting of second jobs, self-employed in the LFS)	Secondary
Analysis of other labour inputs	Secondary
Step 3: Conversion of the extra labour inputs into non-observed production	
Which variables of the production should be imputed? Conditions/rationale for imputing Output/IC	Secondary
What should be the computation segments?	Primary
How to decide the appropriate productivity ratio to be used for the computation segments?	Primary
To what extent should the productivity ratio be adjusted by taking into account misreporting in the comparable segment?	Primary
Consistency checks	Secondary

Annex B Comparison of the supply and demand of labour: example of the top-down approach

In Step 2 of the employment method, the top-down approach can be used to distribute the total labour gap among the NACE categories. In this case, the comparison of labour is made for the total economy, and the labour gap is obtained for employees respectively self-employed in the first place. Then the labour gap should be distributed separately for employees and self-employed persons. This can be done based on supporting information and/or assumptions. The supporting information can be special surveys, expert articles/opinions, fiscal data or a combination of some of these sources. The example below, based on the practice in Czechia, illustrates how this distribution is done for self-employed persons (producers should have registered/underground producers). For employees, a similar principle is applicable but different supplementary information and/or assumptions may be used.

After comparison between the supply and demand of labour, the labour gap for producers deliberately not registering is determined to be 33 568 full-time equivalents for 2018.

Allocating underground producers to separate NACE industries (Table 1) is based on the additional information and assumptions described below.

- The results of the survey on non-registered forms of small business conducted in a district region with the highest number of underground producers in the country.
- The results of labour office inspections of foreign workers in the country.
- The results of the analysis of unemployment data from the LFS and the Ministry of Labour and Social Affairs (the number of 'available unemployed job applicants' aged 15-64 who are registered with the labour offices). The industry structure of unemployed people and their last jobs are taken into account. It is assumed that the majority of underground producers are the unemployed persons. It concerns, in particular, long-term unemployed persons who have many reasons to earn money. To improve their economic situation, they are willing to perform 'unofficial work' despite facing potential penalties for such work.
- It is further assumed that, in particular, people with lower levels of education engage in 'unofficial work'. The results of the analysis of data on unemployed persons support this assumption – a high proportion of people with lower levels of education make up the number of total unemployed persons (70 %) and long-term unemployed persons (about 80 %).
- It is assumed that people with lower levels of education have more reasons and more opportunities to be involved in underground activities than people with higher education. The highest number of unemployed people with low levels of education are in industry and occupations where undeclared work is carried out the most (processing, construction, other service activities, crafts and related trade and repair work).
- The estimated number of underground producers in the industries where the occurrence of these producers can be expected.
- Information from other data sources, e.g. expert articles.

The analysis of the results of the survey mentioned above, inspections and the analysis of unemployment figures shows that 'unofficial work' is mainly carried out by individuals in crafts, repair and related trades as well as by unskilled labourers, auxiliary labour, assemblers and service workers.

TABLE 1

Underground producers by industry (jobs in FTE), 2018 (an example from Czechia)

NACE Rev.2	Number of underground producers	Percentage of underground producers
A Agriculture, forestry and fishing	415	1.2%
B Mining and quarrying	0	0.0%
C Manufacturing	3 997	11.9%
D Electricity, gas, steam and air conditioning supply	0	0.0%
E Water supply; sewerage, waste management and remediation activities	0	0.0%
F Construction	14 813	44.1%
G Wholesale and retail trade; repair of motor vehicles and motorcycles	1 410	4.2%
H Transportation and storage	1 034	3.1%
I Accommodation and food service activities	469	1.4%
J Information and communication	1 128	3.4%
K Financial and insurance activities	292	0.9%
L Real estate activities	0	0.0%
M Professional, scientific and technical activities	225	0.7%
N Administrative and support service activities	251	0.7%
O Public administration and defence; compulsory social security	0	0.0%
P Education	858	2.6%
Q Human health and social work activities	1 958	5.8%
R Arts, entertainment and recreation	95	0.3%
S Other service activities	6 623	19.7%
T Activities of households as employers and producers for own use	0	0.0%
Total	**33 568**	**100%**

Annex C Comparison of the supply and demand of labour: example of the hybrid approach

In Step 2 of the employment method, the hybrid approach can be used to compare the supply and demand of labour to determine the labour gaps. The labour input / labour gap is analysed at the most detailed NACE level where data are available (within the chosen NACE scope for the employment method). Subsequently, the labour inputs/gaps for the individual NACE activities are adjusted by means of a comprehensive analysis taking into account additional information, e.g. labour market developments. When making these adjustments, the NA compilers aim to obtain reliable labour gaps by NACE industries and keep the original total labour gap as much as possible.

The supply and demand of labour should be analysed from several key perspectives in order to have a systematic hybrid approach.

- The perspective of the totals of labour inputs based on the most comprehensive labour survey (i.e. LFS) before and after adjustments (totals after adjustments must only cover industries included in the analysis of the non-observed economy).
- The perspective of the balancing of different labour inputs into total employment (employees and self-employed persons). Notable shifts may occur between registered and not-registered work among employees, or between employee and self-employed status and vice versa. This could be caused mainly by legislative changes affecting social contributions or labour legislation.
- The perspective of industry from the most disaggregated level of compilation (NACE class/division). This depends on the scope of the surveys compared (from the perspective of legal entities and individuals), the kind of statistical unit used to balance the supply-use tables (principal or homogenous activities), and economic particularities – both in terms of evolution (observing year by year trends) and the reference year.
- The perspective of the most aggregated level by industry – NACE sections – where the overall year by year trend could give insights into the economy's development trend by activity, which could be validated by other economic information.

The example is based on the practice of Romania. In principle, the most appropriate level for comparing the supply and demand of labour to determine the labour gap is at the NACE 2-digit level (division). Analysis at a more detailed NACE level can be carried out if data are available and the NA system (supply-use balancing and input-output tables) is also built on the more detailed NACE level. This is the approach in this example.

The LFS is the main data source for the supply of labour, whereas the SBS is the source for the demand of labour. Additional administrative sources are used for the demand of labour. The chosen scope of the labour gap analysis is the total economy, except for certain NACE divisions (01, 64-66, 84, 94).

To identify the not-registered labour inputs, the following equation is the starting point for comparing the supply and demand of labour inputs (see Figure 1):

Employment (LFS) = Employees LFS (Registered employees SBS and of Households (S.14) + Undeclared labour of non-financial corporations (S.11)) + Self-employed persons LFS (Self-employed persons Registered + Self-employed persons not-registered)

From this, it results in:

Undeclared labour S.11 = Employees LFS – Employees SBS – Employees employed by S.14

*Self-employed persons not-registered = Self-employed persons LFS – Self-employed persons Registered*

In practice, the compilation is carried out simultaneously using the following relationship:

Employment LFS	Employees LFS	Employees SBS	Employees of S.14	Undeclared labour S.11	Self-employed persons LFS	Registered self-employed persons	Not-registered self-employed persons
1	2	3	4	5=2-3-4	6=1-2	7	8=6-7

This approach is applied after harmonising employment data and calculating FTE employment, which is then adjusted to the domestic concept. From the outset, the LFS employment data used for comparison excludes data corresponding to the NACE divisions that are not in scope of the non-observed economy (NACE divisions 01, 64-66, 84, 94).

FIGURE 1

Employment method, the practice of Romania
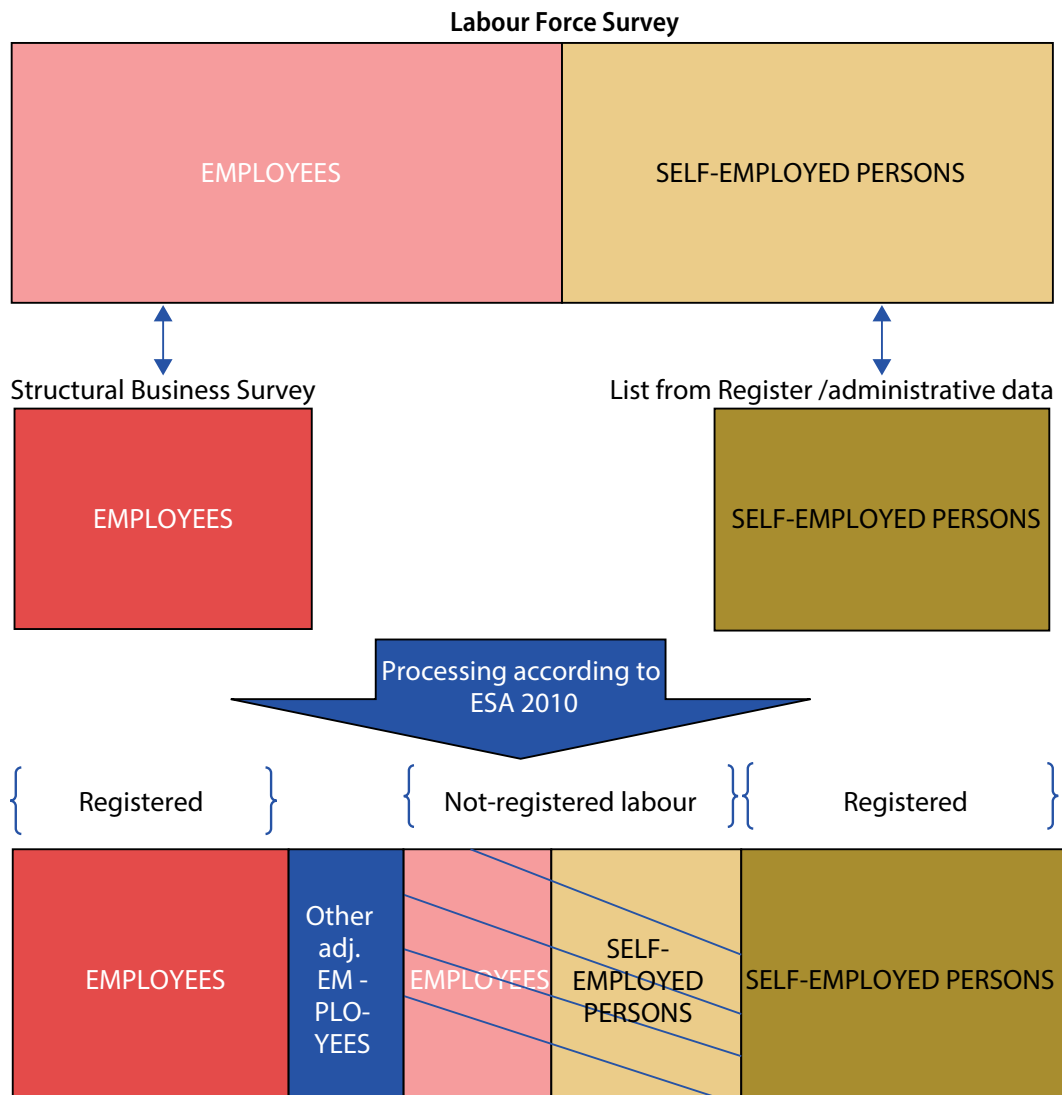
When comparing the supply and demand of labour force, certain adjustments are necessary based on the following analyses.

a. Analysis of excessive negative or positive results.

This is a pre-adjustment phase where the differences obtained are assessed at division and section levels. In general, the analysis reveals a pattern at this stage, which drives the next phases of the analysis as described below. This is mainly applied to verify the data in order to avoid any errors. No adjustments are made, except to correct any errors that are identified.

b. Analysis by industry and by class level (mainly because the LFS collects information by industry according to perceptions of respondents that could differ from business registrations on which the SBS are based on).

   b.1) Adjustments for homogenous branches – redistribution among industries (complementary and interlinked industries, neutral adjustments that offset positive and negative discrepancies).

   b.2) Adjustment of the LFS data for people working in the NACE industries of general government sector. The labour input from NACE Division 84 (Public administration and defence; compulsory social security) of the government sector was excluded from the start. Here, the labour input from other NACE divisions of the government sector is removed (such as education, the health system and culture).

   b.3) Analysis and adjustment for activities where undeclared labour is unlikely to occur or legislation does not permit involving self-employed persons.

   b.4) Balancing between the size of undeclared labour used by enterprises and self-employed persons not-registered;

   The balancing is done line by line, taking account of the total employment by each industry. This means the sum of employees (registered + not registered) and self-employed (registered + not registered) must equal employment by the related industry (from the LFS). When the number of employees in undeclared labour increases, it would decrease the number of not-registered self-employed persons.

   b.5) Analysis of past trends (growth indices year-on-year by class level and NACE Rev.2 divisions and sections).

   The year-on-year growth is compiled for all industries. In general, this is a very important tool, both by total and by industry because it gives the first indications about the evolution and distribution of undeclared labour compared to the previous year. In addition, when there is a big difference with a previous year (too much growth, too big a decrease), the source data must be analysed to determine why this happened. For example, in the pandemic years (2020, 2021), it was obvious why there was a decrease in undeclared labour for accommodation services, so the decrease was expected and accepted.

In certain industries, certain patterns can be observed across all periods or over several consecutive years. This allows for more reliable and systematic adjustment formulas.

The comparison of the three sets of data (LFS data, SBS data and administrative data on the number of registered self-employed persons) is a laborious process. It is based on the industry-by-industry adjustment and approaches, involving a lot of information from the labour market, national legislation, labour force tendencies and economic events occurring in the reference year. The labour market is a very sensitive market, and changes in the economic structure or legislation affecting the labour force could sometimes lead to erratic changes from year to year, which makes the comparisons very difficult to follow.

All the adjustments above are meant to give results that are as plausible as possible for the labour gap of employees (undeclared labour S.11 Employees) and self-employed persons (not-registered self-employed persons) as well as the adjusted LFS employment after the labour gap analysis. The plausibility by NACE activity and for the total NACE activities included in the analysis should also be acceptable.

Table 1 shows the final results in terms of employment evolution. It shows how the changes in the levels of the different types of employments evolved year by year. The evolution has been assessed as plausible. For example, total employment in the LFS (in FTE) was almost stable between 2015 and 2017. However, in 2018, it slowly decreased for two reasons: (i) the exit from the labour market of highly skilled employees going abroad (thus decreasing the number of employees reported in the SBS); and (ii) the number of hours worked diminished (so FTE was lower). In 2019, legislation on salaries changed, transferring a significant part of labour costs (different contributions) from the employer to the employee. Therefore, the number of employees reported in the SBS

increased, and the employee labour gap decreased. The onset of the COVID-19 pandemic in 2020 led to a general decrease in employment, impacting SBS-reported employees and not-registered labour. However, the number of registered self-employed persons increased because they preferred to register and receive compensation from the government for a certain time.

TABLE 1

Year-on-year comparison of the evolution in employment (%) by source and type of employment (in Romania)

	2016/2015	2017/2016	2018/2017	2019/2018	2020/2019
Employment LFS-adjusted	100.9	100.3	99.4	101.6	93.8
SBS employees	101.3	100.4	99.2	109.5	94.6
Undeclared labour S.11 employees	100.3	102.0	100.7	90.1	90.8
Not-registered self-employed	101.6	96.2	96.5	95.4	80.2
Registered self-employed	97.3	100.2	99.3	97.7	105.1

Finally, the initial total labour gap is mainly affected by removing the labour input in the NACE activities, except NACE 84 of the government sector (b.2 adjustment above). This approach aims to maintain the initial total labour gap for NACE activities within the chosen scope of the non-observed economy as much as possible.

The application of the employment method for the exhaustiveness of GDP estimates

The employment method, also called the labour input method, is based on the confrontation between the supply and demand of labour in the economy. This method can be used to make explicit exhaustiveness adjustments to GDP estimates, as well as to validate GDP.

The employment method is well-known and widely applied in the national accounts of the EU countries. However, the countries' practices are quite heterogeneous when it comes to the operational solutions applied at each step of the method. Against this background, this paper has been drawn up to propose practical guidelines for the individual elements of the employment method, to make its application more comparable between countries. The recommendations in this paper are based on the synthesis of different aspects of national practices in the EU, the new insights gained through the investigation, and the analysis of developments in the relevant data sources following the entry into force of Regulation (EU) 2019/1700 establishing common framework for European statistics relating to persons and households and Regulation (EU) 2019/2152 on European business statistics.

This paper presents the issues and solutions relating to the application of the employment method as follows. Firstly, issues of a general nature are discussed. Then, issues under the three main steps of the employment method are looked at in detail, i.e., Step 1: Harmonisation of data on employment; Step 2: Comparison of supply and demand of labour; and Step 3: Conversion of extra labour inputs to non-observed production. Subsequently, some solutions applied to validate the obtained results are put forward. Last but not least, all the recommendations stemming from the solutions to the aforementioned issues are summarised.

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