

Explanations on the calculation of break-free time series for selected main indicators from the Labour Force Survey in Germany

1. Background

The new IESS legal framework¹ for the European Labour Force Survey (EU Regulation 2019/1700² and EU Implementing Regulation 2019/2240³) came into force in 2021. With several changes regarding the measurement of employment status, the variables to be collected and the methodology, the new legal basis directly affects the Labour Force Survey (LFS). Of particular relevance for the German Labour Force Survey is the change in the order and placement of the questions on the employment status in the survey. Due to the changes from the previous specifications, Eurostat expects breaks in a number of results derived from the LFS. In the course of the preparation of the new legal bases, Member States and Eurostat have agreed that a strategy for the compilation and publication of selected break-free time series is needed in order to provide users with the most relevant indicators for analysis. At the EU level, the main purpose for estimating break-free time series is to ensure continuity of analysis on certain key indicators, including those that are parts of the Europe 2020 Strategy, the MIP⁴ Scoreboard, the PEEIs⁵, and the Employment and Social Policy and Sustainable Development Indicators.

Article 10 of the Labour Force Survey Implementing Regulation sets out the minimum requirement for the set of indicators that Member States must meet when transmitting break-free time series. Correction factors or break-free time series for at least 14 of the main LFS indicators are to be provided. The time series are to be transmitted at the end of 2021, the year in which the new framework enters into force. In addition, metadata for the back-calculated break-free time series must be provided, describing the underlying methodology and procedure used to calculate the time series.

The Federal Statistical Office not only provides back-calculated break-free time series for Germany for the 14 indicators specified as mandatory in the LFS Regulation, but for a total of 28 indicators (employed and unemployed persons with 14 subgroups each). The results for the main indicators that are also intended for publication are determined by Eurostat using its own estimation procedure. The break-free series for all indicators are to

¹ Integrated European Social Statistics – IESS.

² 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.

³ 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.

⁴ Macroeconomic Imbalance Procedure – MIP.

⁵ Principal European Economic Indicators – PEEI.

be published by Eurostat in the first quarter of the year following the entry into force of the IESS framework.

2. General approach

To calculate break-free time series, the results for the years 2009 to 2020 are retroactively adjusted to the values for 2021 produced by using the new methodology. With the help of the correction factors mentioned above (denoted here by f_{LFS}^{method}), previous time series are retroactively corrected for a level effect caused by the changed methodology. As equation (1) shows, new back-calculated results $LFS_t^{back\ calc}$ are obtained in this way via

$$(1) \quad LFS_t^{back\ calc} = LFS_t^{orig} \cdot \underbrace{f_{LFS}^{method}}_{\substack{\text{methodological} \\ \text{level effect}}} \quad \forall t = 2009, 2010, \dots, 2020 \quad \text{with unknown } f_{LFS}^{method}.$$

To calculate the correction factor, the average results for quarters one to three of 2021 are set in relation to the average results for all quarters of 2018 and 2019. Results for 2020 are not used, as the German LFS did not provide results of comparable quality.⁶ A calculation of a level factor from the LFS results using the following equation

$$(2) \quad f_{LFS}^{method+covid} = \frac{LFS_{2021}^{orig-IESS}}{LFS_{2019/2018}^{orig}} = \frac{\frac{1}{3} \cdot \sum_{t=2021q1}^{2021q3} LFS_t^{orig-IESS}}{\frac{1}{8} \cdot \sum_{t=2018q1}^{2019q4} LFS_t^{orig}}$$

can, however, only describe a level factor that reflects the method effect *and* a corona effect (or an economically induced effect) between the years 2018/2019 and 2021.

The estimation of a pure method effect is based on the following consideration: A corona effect (or an economically driven effect) is extracted from the LFS level factor (2), which is determined from external data sources. The method effect so determined is assumed to be constant for the entire back-calculation period. For the LFS employed, the external source is the Employment Accounts (EA), and for the LFS unemployed, it is the Federal Employment Agency (FEA) with the registered unemployed. Thus, for the estimated factor to calculate the pure method effect for employment figures:

$$(3) \quad \hat{f}_{LFS|emp}^{method} = \underbrace{f_{LFS|emp}^{method+covid}}_{LFS|emp\text{-level factor}} - \underbrace{f_{EA|emp}^{covid}}_{EA|emp\text{-level factor}} + 1$$

EA|emp: employment figures from Employment Accounts;
LFS|emp: employment figures from Labour Force Survey.

and for unemployment figures:

$$(4) \quad \hat{f}_{LFS|unemp}^{method} = \underbrace{f_{LFS|unemp}^{method+covid}}_{LFS|unemp\text{-level factor}} - \underbrace{f_{FEA|unemp}^{covid}}_{FEA|unemp\text{-level factor}} + 1.$$

FEA|unemp: registered unemployed figures from Federal Employment Agency;
LFS|unemp: unemployment figures from Labour Survey Force.

⁶ See document “[Publication note on German EU-LFS in 2020](#)”, available on the Eurostat-Webpage.

Previous studies (see Körner/Puch 2012, 2011)⁷ have shown that changes in the measurement of employment status have different effects on the results of individual sociodemographic subgroups. The procedure described for estimating the correction factors f_{LFS}^{method} is therefore not only carried out separately for employed and unemployed persons, but also for each of the sociodemographic subgroups shown in table 1.

Table 1: Sociodemographic subgroups

Group	Breakdown	Group	Breakdown
(I)	Male 15-24	(VIII)	Female 15-24
(II)	Male 25-54	(IX)	Female 25-54
(III)	Male 55-64	(X)	Female 55-64
(IV)	Male 65-74	(XI)	Female 65-74
(V)	Male 20-64	(XII)	Female 20-64
(VI)	Male 25-64 (Sum II+III)	(XIII)	Female 25-64 (Sum IX+X)
(VII)	Male 55-74 (Sum III+IV)	(XIV)	Female 55-74 (Sum X+XI)

In this general approach to estimate the methodological effects caused by the new IESS regulation, it remains to be considered that at the current time only three quarterly results of the year 2021 were available, which are produced with the changed measurement of employment status. Future quarterly results will show whether the calculated effects are confirmed.

3. Indicators on Employment

As mentioned above, the employment accounts are used as external data source for the number of persons in employment. It should be noted that there are discrepancies between the employment accounts and the LFS in terms of the number of persons in employment.⁸ In addition, the results of the employment accounts do not provide data for sociodemographic subgroups.

The economically induced change in the number of employed persons between the years 2018/2019 and 2021, which was simplified called the corona effect here, can therefore not be estimated directly by, but only *on the basis of* the figures from the Employment Accounts. For this purpose, the sociodemographic structure observed in the LFS was transferred to the results of the Employment Accounts. Table 2 shows which estimated economically determined level factors $\hat{f}_{EA|emp}^{covid}$ thus result for the individual subgroups of the employed. By comparing these with the level factors calculated from the original LFS figures, a pure method effect due to the change in the measurement of employment status under the new IESS legal framework can be estimated according to equation (3). For example, a method effect of -1.30% is calculated for employed women aged 25-54, and -1.29% for employed men in this age group.

⁷ Körner, Thomas/Puch, Katharina. [Measuring marginal employment in surveys and registers](#). Statistics and Science. Volume 20. Wiesbaden 2012.

Körner, Thomas/Puch, Katharina. [Coherence of German Labour Market Statistics](#). Statistics and Science. Volume 19. Wiesbaden 2011.

⁸ Detailed information concerning the differences in results are available on the webpage of the German Federal Statistical Office under [www.destatis.de: https://www.destatis.de/EN/Themes/Labour/Labour-Market/Employment/Methods/tab-etr-zum-mz.html?nn=23096](https://www.destatis.de/EN/Themes/Labour/Labour-Market/Employment/Methods/tab-etr-zum-mz.html?nn=23096)

This approach can be extended to aggregate subgroups, so that corresponding method effects can also be estimated for groups such as women aged 15-74 or 15-74 year-olds total (see Table 2).

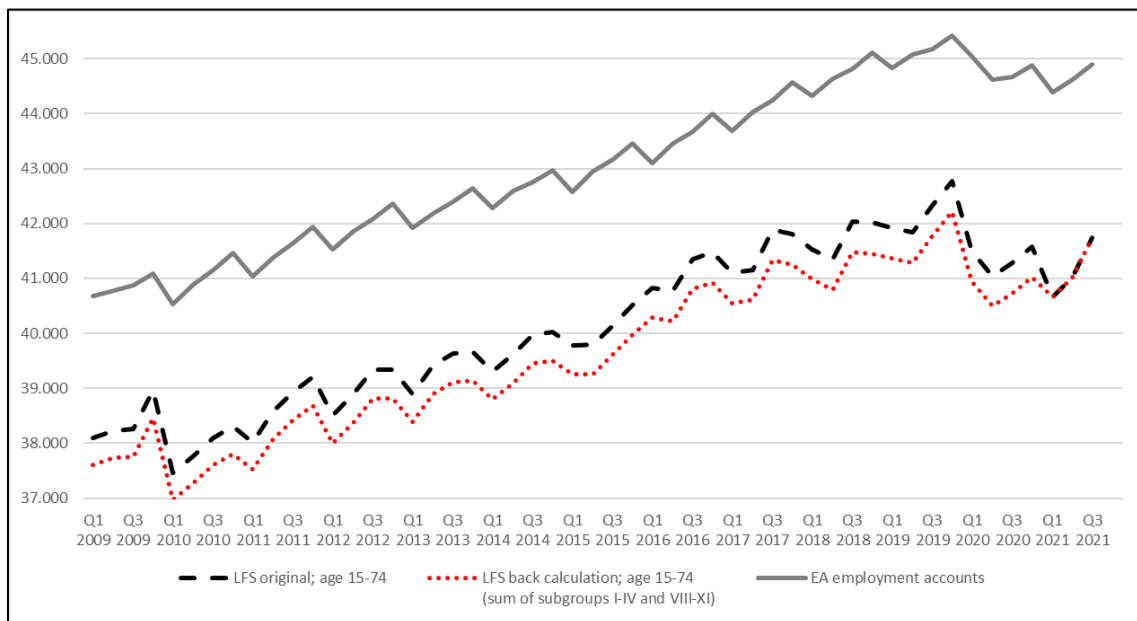
Table 2: Level factors and estimated method effects for employment

Socio-demographic groups		Level factors* from LFS (eq. 2) $f_{LFS emp}^{method+covid}$	Estimated level factors* on the basis of Employment Accounts $\hat{f}_{EA emp}^{covid}$	Estimated factors of pure method effect (eq. 3) $\hat{f}_{LFS emp}^{method}$	Method effect in percent %
Total	15-74	0,9802	0,9935	0,9867	-1,33
	15-24	0,9791	0,9924	0,9867	-1,33
	25-54	0,9553	0,9682	0,9871	-1,29
	55-64	1,0563	1,0707	0,9856	-1,44
	65-74	1,0163	1,0302	0,9861	-1,39
	20-64	0,9818	0,9951	0,9867	-1,33
	25-64	0,9792	0,9925	0,9867	-1,33
	55-74	1,0517	1,0661	0,9857	-1,43
Female	15-74	0,9810	0,9943	0,9867	-1,33
	15-24	0,9761	0,9894	0,9868	-1,32
	25-54	0,9560	0,9690	0,9870	-1,30
	55-64	1,0561	1,0704	0,9856	-1,44
	65-74	1,0443	1,0585	0,9858	-1,42
	20-64	0,9826	0,9959	0,9867	-1,33
	25-64	0,9799	0,9932	0,9867	-1,33
	55-74	1,0549	1,0693	0,9857	-1,43
Male	15-74	0,9795	0,9928	0,9867	-1,33
	15-24	0,9817	0,9950	0,9867	-1,33
	25-54	0,9546	0,9675	0,9871	-1,29
	55-64	1,0566	1,0710	0,9856	-1,44
	65-74	0,9980	1,0118	0,9862	-1,38
	20-64	0,9811	0,9944	0,9867	-1,33
	25-64	0,9786	0,9918	0,9867	-1,33
	55-74	1,0490	1,0633	0,9857	-1,43

* For all level factors the average results for quarters one to three of 2021 are set in relation to the average results for all quarters of 2018 and 2019. Results for 2020 are not used, as the German LFS did not provide results of comparable quality.

The estimated effects of the new IESS regulation show a *negative method effect* of -1.33% on average for the total series of employed persons. This means that, for example, of the 41.978 million employed persons identified on average in the LFS in 2018/2019, one would have measured about 560 thousand fewer employed persons due to methodological effects if the current measuring methods had already been used in this period.

Using the estimated method effects, back-calculated quarterly results for the years prior to 2021 can now be calculated according to equation (1). Figure 1 shows these back-calculated quarterly results in comparison with the original LFS quarterly results as well as the quarterly results of the employment accounts.

Figure 1: Back-calculated LFS total employment compared to Employment Accounts

4. Indicators on Unemployment

For the unemployed, the registered unemployed of the Federal Employment Agency are used as an external data source. However, there is only limited comparability between the two sources. First, there are differences in definition between the unemployed defined in the LFS according to the ILO concept and the registered unemployed.⁹ Second, although figures for the registered unemployed are available in sociodemographic breakdowns, it is apparent that the gender- and age-specific structures of the two data sources differ significantly in some cases.

In order to estimate the economically induced change in the number of unemployed $\hat{f}_{FEAunemp}^{covid}$ between the years 2018/2019 and 2021, the gender-specific structure of the unemployed observed in the LFS was determined here in each case for the individual age groups considered and transferred to the corresponding figures for the registered unemployed in these age groups. This was done against the background that the registered unemployed have changed more between the age groups than between the sexes in recent years.

Table 3 shows the results of the estimated economically determined level factors $\hat{f}_{FEAunemp}^{covid}$, with which, according to equation (4), the pure method effects can again be estimated by comparison with the level factors determined from the original LFS figures. Compared to the employment figures, however, the differences between the subgroups are much more

⁹ Explanations on the different definitions between the ILO unemployment in the LFS and the registered unemployed measured by the German Federal Employment Agency are available on the webpage of the German Federal Statistical Office under [www.destatis.de](https://www.destatis.de/EN/Themes/Labour/Labour-Market/Employment/Methods/Unemployment.html?nn=23096): <https://www.destatis.de/EN/Themes/Labour/Labour-Market/Employment/Methods/Unemployment.html?nn=23096>

noticeably here. For example, for unemployed women aged 25-54, a method effect of -9.68% is obtained, while for employed men of the same age group this effect is -9.38%.

Table 3: Level factors and estimated method effects for unemployment

Socio demographic groups		Level factors* from LFS (eq. 2)	Estimated level factors* on the basis of registered unemployed by FEA	Estimated factors of pure method effect (eq. 4)	Method effect in percent
		$f_{LFS unemp}^{method+covid}$	$\hat{f}_{FEA unemp}^{covid}$	$\hat{f}_{LFS unemp}^{method}$	%
Total	15-74	1,1050	1,1740	0,9309	-6,91
	15-24	1,2122	1,1553	1,0569	5,69
	25-54	1,0608	1,1558	0,9050	-9,50
	55-64	1,1285	1,2264	0,9021	-9,79
	65-74	1,6863	1,8259	0,8604	-13,96
	20-64	1,0984	1,1734	0,9251	-7,49
	25-64	1,1119	1,1725	0,9394	-6,06
	55-74	1,1526	1,2397	0,9130	-8,70
Female	15-74	1,1519	1,2237	0,9282	-7,18
	15-24	1,4139	1,3465	1,0675	6,75
	25-54	1,0806	1,1774	0,9032	-9,68
	55-64	1,1371	1,2320	0,9051	-9,49
	65-74	1,7528	1,8684	0,8845	-11,55
	20-64	1,1380	1,2153	0,9227	-7,73
	25-64	1,0933	1,1908	0,9025	-9,75
	55-74	1,1604	1,2471	0,9133	-8,67
Male	15-74	1,0736	1,1408	0,9328	-6,72
	15-24	1,0919	1,0410	1,0508	5,08
	25-54	1,0472	1,1410	0,9062	-9,38
	55-64	1,1272	1,2225	0,9047	-9,53
	65-74	1,6341	1,7957	0,8384	-16,16
	20-64	1,0719	1,1452	0,9267	-7,33
	25-64	1,0644	1,1599	0,9045	-9,55
	55-74	1,1471	1,2344	0,9128	-8,72

* For all level factors the average results for quarters one to three of 2021 are set in relation to the average results for all quarters of 2018 and 2019. Results for 2020 are not used, as the German LFS did not provide results of comparable quality.

Once again, the single steps in estimating the method effects can also be extended to aggregate subgroups (for results, see Table 3). Overall, a predominantly *negative method effect* is also estimated for the unemployed. For the total series of unemployed persons, this amounts to -6.91%, which means a methodological decrease of about 100 thousand unemployed persons in relation to an average number of unemployed persons observed in the quarters of 2018 and 2019 of 1.420 million persons.

Back-calculated quarterly results for unemployed persons are calculated via equation (1) using the estimated method effects and are shown in Figure 2 in comparison with the original LFS quarterly results and the quarterly results for registered unemployed persons measured by the Federal Employment Agency.

Figure 2: Back-calculated total LFS unemployment compared to registered unemployment

