

*Flash estimates*  
*of income inequalities and poverty indicators for 2021 (FE 2021)*  
*Experimental results*

Version 2 – August 2022

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## 1. Providing flash estimates one year earlier

Providing timelier social statistics – especially indicators on income poverty and inequality – is a priority for the Commission and the [European Statistical System \(ESS\)](#).

Indicators on poverty and income inequality are based on EU statistics on income and living conditions ([EU-SILC](#)). These indicators represent an essential tool to prepare the [European Semester](#) (the annual cycle of economic policy coordination between EU countries) and to monitor progress for the poverty and social exclusion targets.

Efforts for improving the timeliness of EU-SILC data are ongoing but the collection and processing of EU-SILC data for poverty and inequality will always have a certain time lag as it collects the information for the previous year income.

To better monitor the effectiveness of social policies at EU level Eurostat has developed [flash estimates of income inequalities and poverty indicators \(FE\)](#). They are calculated based on nowcasting and modelling techniques<sup>1</sup> and have a release date appreciably earlier than the survey data: i.e., FE of income 2021 (EU-SILC 2022) published in July-August 2022 complement EU-SILC 2021 data that refers to income 2020. These can be used in preliminary analysis until the final EU-SILC data for income 2021 will become available next year.

## 2. What are the flash estimates on income distribution?

FE refer to a set of key income indicators:

- a. **At-risk-of-poverty ([AROP](#)) & Income quintile share ratio<sup>2</sup> (QSR)** are inequality indicators, both high on the priority of the Commission and the ESS. They are used by policy makers at EU and national level for preparing the [European Semester](#), and for identifying the key social trends.
- b. **Evolution of [income](#) deciles (D1, D3, MEDIAN, D7 and D9)** can provide useful information on the developments within different parts of the income distribution. The deciles can provide support for assessing the yearly changes in the distribution: they are more sensitive to income changes and therefore can be informative as early warnings as well as for better explaining the estimated changes in inequality indicators.
- c. **Breakdowns of AROP by age as well as the in-work poverty indicator provide further information on the evolution of AROP for particular sub-groups of the populations.** In several countries there are different dynamics for particular age groups in comparison with the whole population. At the same time, the in-work poverty flash estimate monitors the poverty risk for people on the labour market (e.g., the evolution of the share of temporary contracts, atypical workers and precarious self-employed).

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<sup>1</sup> Please see also the [methodological note](#) on FE for more details

<sup>2</sup> S80/S20 ratio

It is important to note that the flash estimates and EU-SILC values used throughout the paper always refer to income year and not the survey year<sup>3</sup>.

**Table 1. Definition of the inequality and income distribution indicators**

<b>Indicators</b>	<b>Definition</b>
At-risk-of-poverty rate (AROP)	Share of people with an equivalised disposable income <sup>4</sup> (after social transfers) below the at-risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income after social transfers.  This indicator shows the percentage of the population whose income is likely to 'preclude them from having a standard of living considered acceptable in the society in which they live' <sup>5</sup> .
Income quintile share ratio (QSR)	The ratio of total income received by the 20 % of the population with the highest income (the top quintile) to that received by the 20 % of the population with the lowest income (the bottom quintile). It is a measure of the inequality of income distribution.
Income deciles	Income deciles groups are computed based on the total equivalised disposable income attributed to each member of the household. Nine cut-point values (the so-called <b>deciles cut-off points</b> ) of income are identified, dividing the survey population into ten groups equally represented by 10 % of individuals each: The data (of each person) are sorted according to the value of the total equivalised disposable income and then divided into 10 equal groups each containing 10 % of individuals. For example, the first decile group represents the 10 % of the population with the lowest income and the decile 1 is the cut-off point for this group. Five representative income deciles have been selected in our analysis to show the evolution of the different parts of the national income distribution. For more details on the calculation of the indicators, please see <a href="#">EU-SILC notes on the calculation of indicators</a> .
AROP by age groups	AROP by main age groups represents the share of people at-risk-of-poverty in the following sub-groups: 0-17 (child poverty); 18-64 and 65+.
In work poverty	Individuals (18+) who are classified as employed according to their most frequent activity status and are at risk of poverty. For the 'in work poverty risk indicators', an individual is considered as having a particular activity status if he/she has spent more than half of the reference year in that status.

<sup>3</sup> Ireland is the only country where the survey year is considered the same as the income year for EU-SILC. For all the others the income year is equal to survey year minus 1.

<sup>4</sup> The equivalised income takes into account the structure of the household. The income is calculated by dividing the total household income by its size determined after applying the following weights: 1.0 to the first adult, 0.5 to each other household members aged 14 or over and 0.3 to each household member aged less than 14 years old.

<sup>5</sup> See for instance the Joint Report by the Commission and the Council on social inclusion as adopted by the Council (EPSCO) on 4 March 2004, [http://ec.europa.eu/employment\\_social/soc-prot/soc-incl/final\\_joint\\_inclusion\\_report\\_2003\\_en.pdf](http://ec.europa.eu/employment_social/soc-prot/soc-incl/final_joint_inclusion_report_2003_en.pdf)

The FE should estimate to the extent possible the values captured in the EU-SILC<sup>6</sup> survey. The main target indicators (AROP and QSR) are based on an entire distribution that evolve relatively slowly, except in times of crisis. Survey based yearly changes can be rather small and/or not statistically significant. It is therefore relevant:

- to assess yearly changes together with the trends during a certain period across several years,
- to consider the whole set of indicators as it provides a coherent picture about the evolution of the underlying income<sup>7</sup> distribution in each country. Deciles make it possible to assess the relation between changes in poverty or inequality and the relative movement at different points of the distribution. Deciles can help in answering better policy questions like: is a possible decrease of poverty related to a higher increase of the income for poorer people (left tail of the distribution) or is a possible decrease linked to a decline of the middle class? More generally, the examination of deciles at different points of the distribution helps to answer the questions on who is benefiting from growth and who is affected by recession.

### 3. How are the flash estimates on income distribution produced?

The FE should anticipate the changes (that will appear later in EU-SILC) based on auxiliary information already available for the target year. Yearly changes are estimated as described below and combined with the EU-SILC value for the preceding year, which constitutes the baseline for the analysis.

A variety of approaches was tested, tailored to each country situation, and the most robust methodology for a given country was selected. The publication as experimental statistics puts the basis for receiving feedback from users and the research community and further improving the flash estimates.

The main methodology used for most countries is **microsimulation**. It relies for year 2021 on EUROMOD I4.0+, a tax-benefit microsimulation model for the European Union that was originally maintained, developed and managed by the Institute for Social and Economic Research (ISER). Since 2021, EUROMOD has been maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission, in collaboration with Eurostat and national teams from the EU countries.

EUROMOD is used to simulate changes in the income distribution within the period of analysis. All simulations are carried out based on the tax-benefit rules in place in the given year.

For the purposes of the FE, standard EUROMOD policy simulation routines are enhanced with additional adjustments to the input data to take into account changes in the evolution of employment and main indexation factors. The microsimulation approach in the frame of the FE is based on previous work done by ISER, University of Essex (Rastrigina, O., Leventi, C., Vujackov S. and Sutherland, H. (2016)) and is being further developed by Eurostat in collaboration with the dedicated

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<sup>6</sup> <http://ec.europa.eu/eurostat/web/income-and-living-conditions/overview>

<sup>7</sup> [http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised\\_disposable\\_income](http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income)  
[http://ec.europa.eu/eurostat/statistics-explained/index.php/EU\\_statistics\\_on\\_income\\_and\\_living\\_conditions\\_\(EU-SILC\)\\_methodology\\_%E2%80%93\\_concepts\\_and\\_contents](http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_statistics_on_income_and_living_conditions_(EU-SILC)_methodology_%E2%80%93_concepts_and_contents)

task force on ‘Flash estimates on income distribution’. In general, microsimulation is the preferred approach for both main users and the National Statistical Institutes (NSIs) given the possibilities for further detailed analyses and the link with policy changes. During the COVID-19 pandemic, several methodological changes were put in place to capture substantial labour market changes and support schemes put in place by Member States to alleviate the effects of the crisis for workers and households. For more details, please consult the latest [methodological note](#) on FE.

For Romania, flash estimates are based on **current income information** collected in Household Budget Survey (HBS– Romania)<sup>8</sup>. This differs from traditional EU-SILC income indicators as information is collected via a small set of questions that refer to the current reference period (e.g., current month).

An essential point in producing the FE is the active participation of the Member States at different levels and the support from JRC and the national EUROMOD teams, in the validation and improvement of the FE methodology and estimates.

#### 4. How were the flash estimates assessed?

The FE of income 2021 are produced by Eurostat (unless specified differently) and published as experimental statistics. The accuracy of the FE depends on the model assumptions and on several factors explained throughout the quality assessment. Moreover, capturing perfectly changes in the EU-SILC estimates cannot be expected. Differences can emerge, due to inconsistencies in the input datasets, model errors or theoretical assumptions underlying the microsimulation techniques. It is important to consider also that the uncertainty of the FE are particularly high in the current context of the pandemic and several caveats should be considered: incomplete information and model errors for the estimation of income from work; simulation of losses and compensation schemes for self-employed; over-simulation of benefits related to compensation schemes and assumptions of full take-up of benefits.

Developing FE on poverty and income inequalities in the ESS involves that their methods, sources and output adhere to a common quality framework. This was developed together with the Member States and validated with the NSIs and the academic community.

The quality framework contains two main parts:

1. **Quality as an integrated process in the production:** this ensures that quality is considered in the inputs and methods used in all the steps of the production, by analysing inconsistencies in the input data and performing several intermediate quality checks along the process. It is useful for identifying possible sources of error and ways of fixing them.
2. **Quality assessment** put in place to ensure a comparable way to assess results stemming from different methods and national estimates within this ESS exercise:
  - 2.1 The plausibility of the estimated change is assessed based on the available information for the target year. Unlike forecasting, for FE several auxiliary sources in the target year are used either in the estimation process or for validation checks (for plausibility assessment).

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<sup>8</sup> <http://statistici.insse.ro/shop/index.jsp?page=tempo2&lang=en&context=20>

Connecting the estimated changes in the income distribution with observed evolutions in related indicators (e.g., employment trends, total household income in national accounts, national data) is a key step in the quality assessment framework. This implies the triangulation of the different sources available, the analysis of inconsistencies and adjustment of the models to ensure to the extent possible a consistent estimation of different income components and indicators. This analysis is further supported by the information on relevant changes in social policies described in EUROMOD country reports. Finally, we usually use benchmark models based on simple time series models, which show the trend based on previous EU-SILC values. This allows checking whether the deviations from the trend are supported by changes related to policy and labour effects. However, during the COVID-19 crisis, the extrapolation of simple trends brings a limited added value to our exercise due to the magnitude of labour changes and important social policies put in place.

- 2.2 The historical performance of the model is defined as the ability to accurately predict the past changes in the main target indicators as captured by EU-SILC. The FE were simulated for past years and compared with EU-SILC indicators. However, it is important to note that during COVID-19 pandemic special methods and additional data sources had to be used. A full quality assessment will follow when EU-SILC data for the COVID-19 period will be available for all countries.

Please see also Annex 2 for more details on the quality assessment.

## 5. Communicating the FE: magnitude and direction of change using Rounded Uncertainty Interval (RUI) dissemination format

This report presents the figures for the flash estimates relating to the income year 2021 (FE 2021, i.e., EU-SILC 2022 whose results are expected in 2023 for most countries). These figures refer to the year-on-year (YoY) change in absolute terms for AROP and QSR, and in percentages for the deciles.

### Calculation of the YoY change

AROP & QSR:  $YoY_{Year\ N} = Indicator_{Year\ N} - Indicator_{Year\ N-1}$

Deciles (%):  $YoY_{Year\ N} = \frac{Indicator_{Year\ N}}{Indicator_{Year\ N-1}} - 1$

The FE are subject to several sources of uncertainty: e.g., model bias and variance, the sampling error in EU-SILC, inconsistencies between the different data sources entering the estimation. This raises not only a question of quality, but also of communication of the results. Following in-depth discussions with both users and producers, it was decided that the FE are disseminated using a ***Rounded Uncertainty Interval*** (RUI)<sup>9</sup>. This format takes into account that the expected changes cover a range of values, associated with uncertainty.

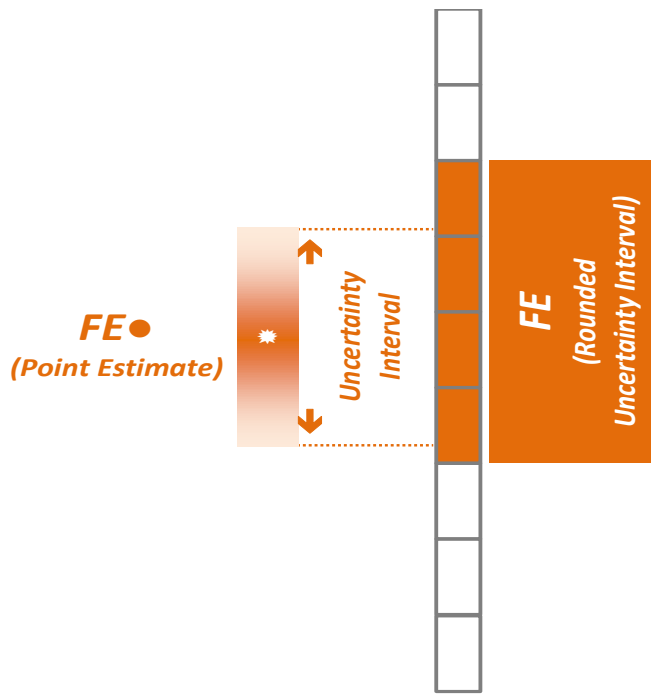
RUI will give an indication – in terms of intervals – on the type (magnitude and direction) of expected change. It is a way of communicating our estimates without showing the actual value (FE●, the point

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<sup>9</sup> This dissemination format is based on a proposal from Thomas Piasecki-Statistics Poland

estimate), to minimise misinterpretation and misuse due to disregarding the uncertainty of the estimate. As the name suggests, it incorporates an uncertainty interval as the core element of the communication.

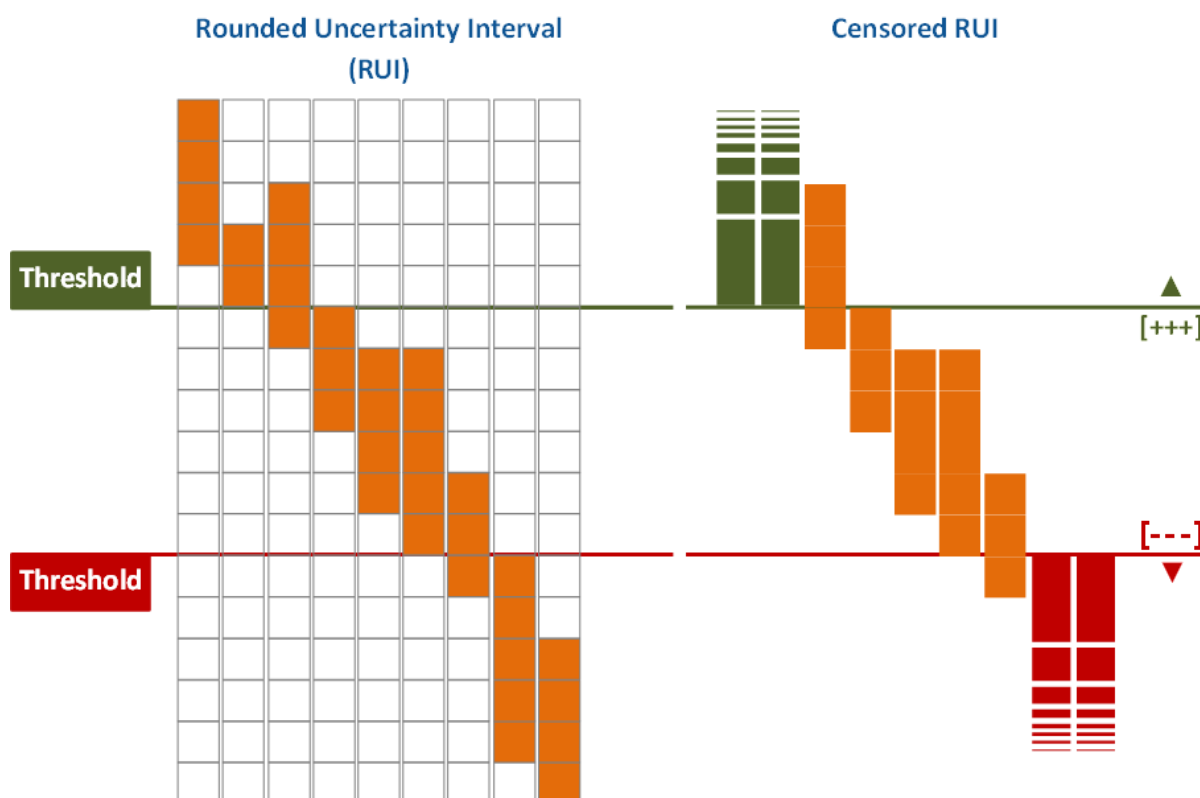
- (1) It starts with a fine grid of predefined classes, which are a percentage point or half a percentage point wide (e.g., 1-2, 2-3, 11-12, or 5.5-6, 6-6.5, 6.5-7);
- (2) The grid is superimposed on the interval reflecting the uncertainty of the estimate, and the interval is rounded outwards (expanded) to the nearest threshold;
- (3) The resulting range – RUI – is communicated as the FE, instead of the FE● (the point estimate).



The centre of RUI is not the FE● (the point estimate) but it is close. Using a single value to represent RUI should be avoided or interpreted as a general indication of the magnitude and direction of the change.

Extreme values, where the uncertainty interval is entirely beyond a certain threshold, are censored, and an open-ended interval bounded by the threshold is shown instead of the RUI, conveying the message that the changes are relatively large. The lower limits for what is considered an extreme value are: 2 percentage points for AROP, 0.6 percentage points for QSR, and 5 % for the deciles. These thresholds were data driven and chosen based on the magnitude of past changes and performance of the flash estimates that is more imprecise in case of extreme values.





This is applied to the YoY changes. The RUI of the levels is directly derived from the RUI of the YoY change. In the visuals and tables included in the report, the annexes, or the complementary documents, the cases where the point estimate ( $FE_{\bullet}$ ) is outside the range of non-significant values is also indicated.

The main advantages of the chosen communication format are that it is guiding the reader, in terms of statistical significance (to avoid over-interpretation of non-significant changes), and is providing useful information for users and policy makers concerning the expected changes and trends for income indicators.

## 6. Income evolution in 2021: flash estimates

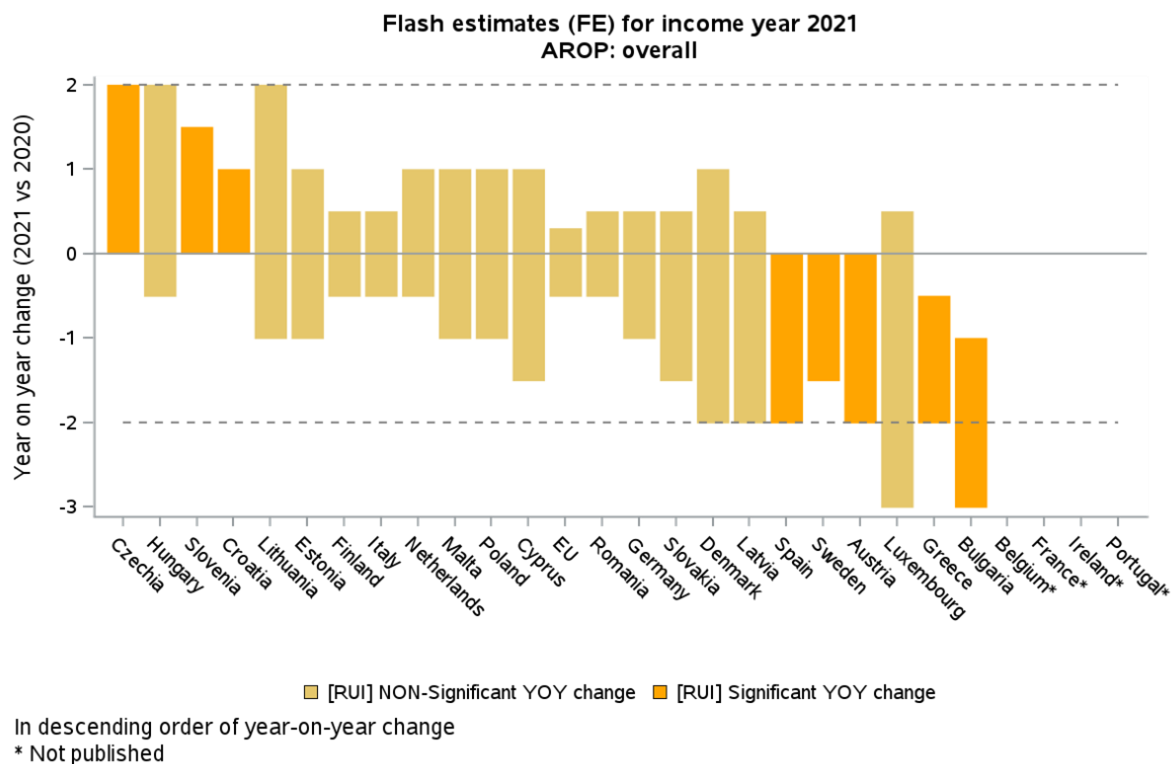
This section presents the figures for FE 2021 in terms of YoY change. FE 2020-2021 are published as experimental data under the responsibility of Eurostat. To also note that in one country FE are based on national sources (Romania).

Figures 1-4 provide the detailed results in terms of RUI for 23 countries available in the current release, also including the EU aggregate. Orange bars indicate the RUI for the FE 2021 in cases where the flash estimates for the YoY change ( $FE_{\bullet}$ ) are statistically significant. Yellow bars indicate the RUI for the FE 2021 in cases where the flash estimates for the YoY change ( $FE_{\bullet}$ ) are not statistically significant. Fading bars designate the censored RUI for large increases/decreases (see previous page).

It is important to highlight that the uncertainty of the early estimates is particularly high in the current context and a number of caveats should be considered<sup>10</sup>. In specific cases the FE is not published, as the estimate is considered not reliable (indicated by ‘NOT published’). While the uncertainty for specific countries and indicators might be considered high and FE 2021 are not published at national level, they are included in the EU aggregate. The EU aggregate is not published for indicators such as AROP 65+, which proved to be very volatile during the crisis and its reliability is low in several countries<sup>11</sup>.

Data for all indicators are available [here](#).

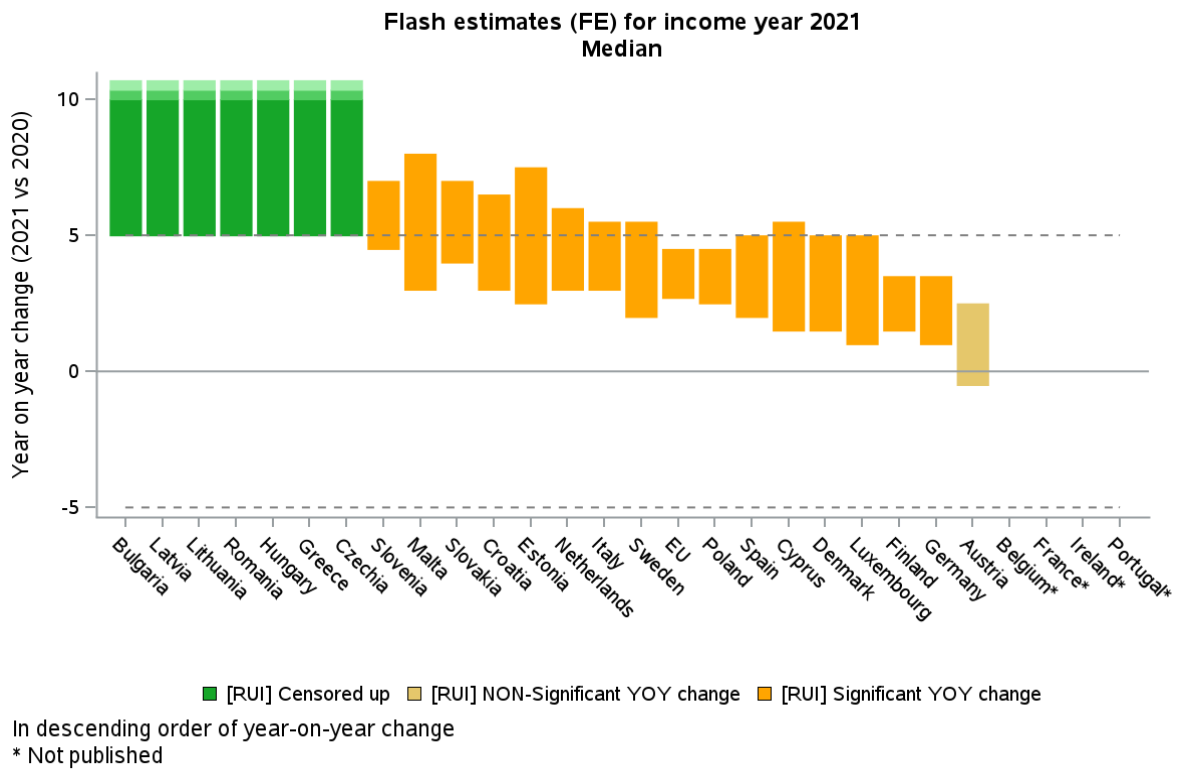
**Figure 1: FE 2021 (RUI) – ALL countries available, AROP**



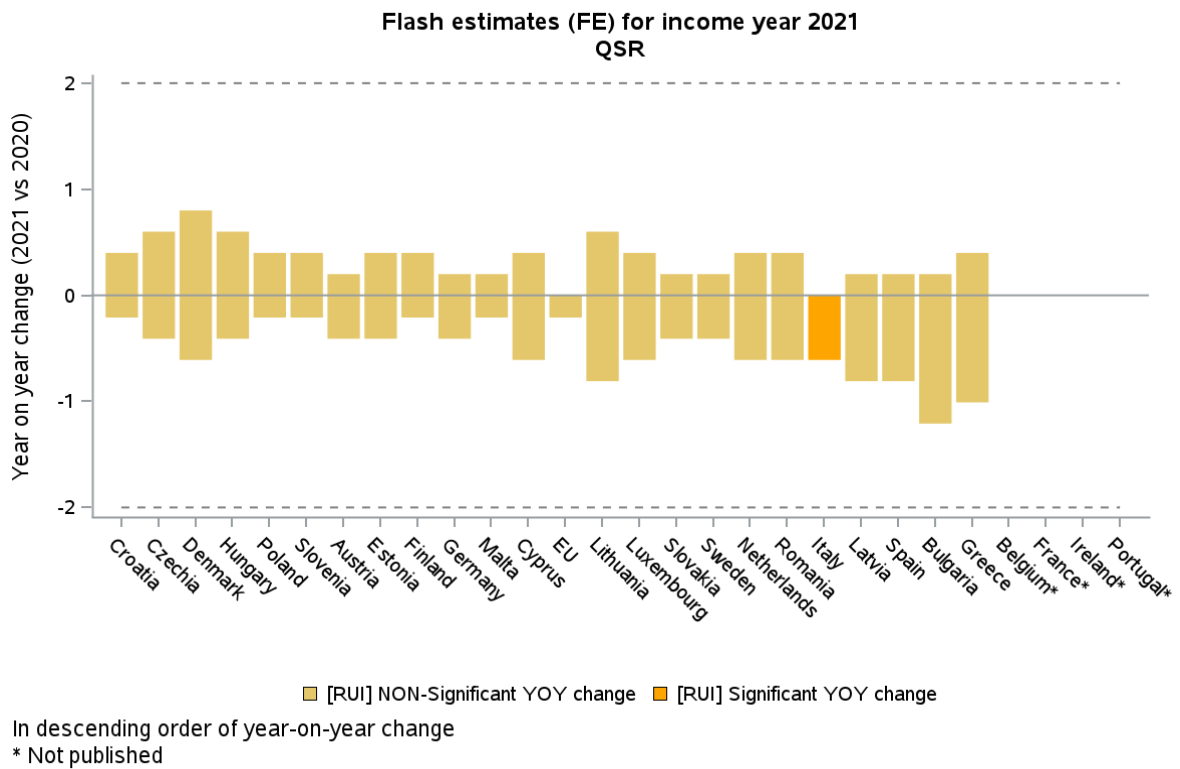
<sup>10</sup> Incomplete information and model errors for the estimation of income from work; over-simulation of benefits related to compensation schemes and assumptions of full take-up of benefits; lack of information on the informal economy and workers that fell outside the safety net of the tax-benefit system. Please see also the [methodological note](#) for more details.

<sup>11</sup> EU aggregate is published for a specific indicator if the coverage of the EU population is at least at 70%.

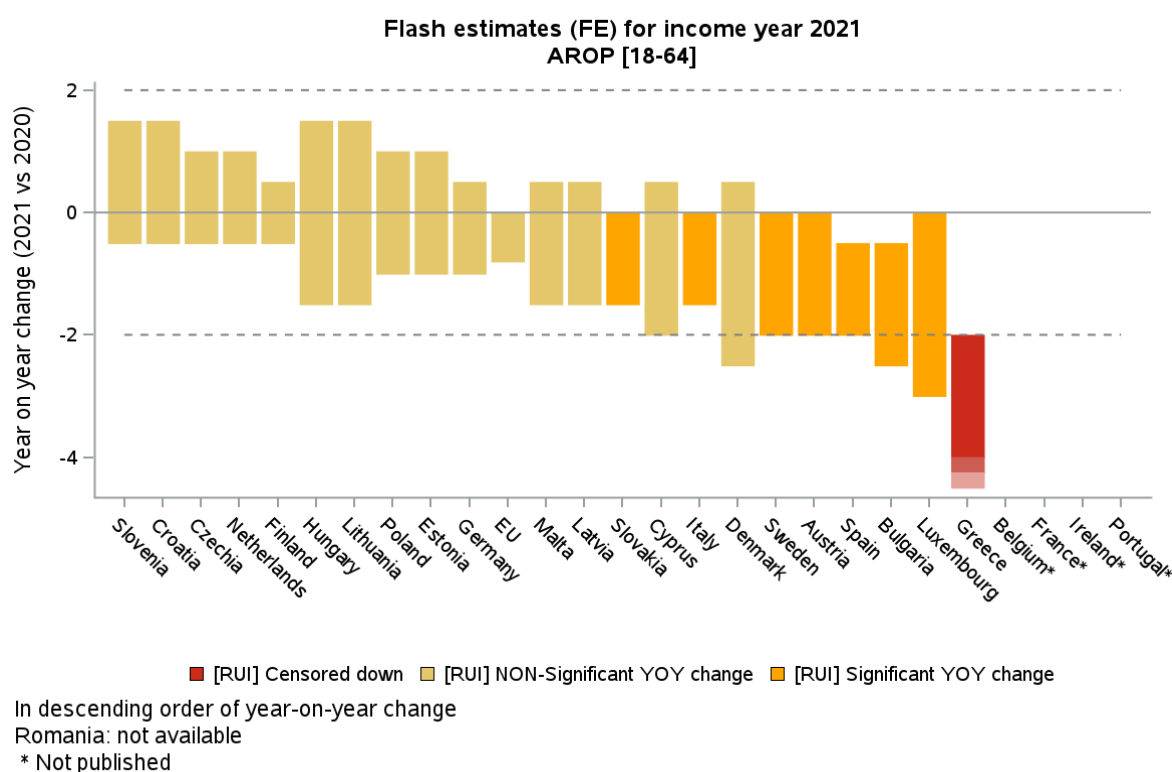
**Figure 2: FE 2021 (RUI) – ALL countries available, median**



**Figure 3: FE 2021 (RUI) – ALL countries available, QSR**



**Figure 4: FE 2021 (RUI) – ALL countries available, AROP for age group 18-64**



## 7. Main messages for the FE 2021

The results below refer to the yearly change 2020-2021 and present the main developments for the income distribution in 2021<sup>12</sup>:

- After the effects of the pandemic in 2020, in 2021 early estimates show in general positive trends compared to the previous year. FE 2021 show an *overall increase of the equivalised disposable income* across the distribution for all countries. In general, FE 2021 at EU level shows a larger increase for the lower deciles and this translates into a slight (non-significant) decrease of AROP and AROP 18-64. These estimated changes are supported by main trends in employment situation in the Labour Force Survey (EU-LFS) and the evolution of the gross disposable income in sector accounts. It is important to note also that there is a large heterogeneity across countries and age groups.
- To assess the effects on inequalities and poverty indicators, further elements need to be considered. The relative evolution of different sub-groups is supported by detailed information on the labour market changes and the simulation of policies via EUROMOD to support workers and households. AROP is estimated to decrease significantly for the following countries: Austria, Bulgaria, Greece, Spain and Sweden. In general, it is related to a larger increase estimated in the left part of the income distribution than in the rest of the

<sup>12</sup> It is important to note that the flash estimates and EU-SILC values used throughout the paper always refer to income year and not the survey year.

spectrum. In fact, a general increase of disposable income does not lead automatically to a decrease of the risk of poverty. In Croatia, Czechia and Slovenia FE show an increase. This evolution must be read in the light of the relative movement of the median income and the at-risk-of-poverty threshold (ARPT), which is the reference for the AROP. If the median income moves without a proportional increase in the lower part of the distribution, more people may fall below the threshold, leading to the observed increase in AROP.

- In 2021, FE show rather stable trend in income inequalities, as measured by the quintile share ratio. This can be explained by the joint movement of the deciles, i.e., by non-particularly unbalanced changes along the different parts of the income spectrum. The general income increase in 2021 and the simulated policies implemented after the COVID-19 pandemic lead to a rather stable situation in most countries.
- Eurostat is also publishing the FE for AROP by main age groups and in-work poverty. These can help to support significant changes in AROP with more detailed information on particular sub-groups that can have a different evolution than the general population. AROP for the working age (18-64) is estimated to decrease or remain stable for most countries. This is related primarily to the positive trends on the labour market, the gradual reduction in partial unemployment and estimated increases in market incomes.
- In several countries the pensions increase to a lesser extent than the at-risk-of-poverty threshold (mainly driven up by increases in wages) and therefore AROP 65+ is estimated to increase. However, in the current context, estimates should be interpreted with caution as the uncertainty is much higher and, in particular, the estimates for AROP 65+ showed a very high volatility. This is particularly relevant for cases when small changes in ARPT can lead to very large variations in AROP 65+; e.g., when the median income for the group 65+ is close to ARPT<sup>13</sup>. FE on breakdowns is not published when considered unreliable and too volatile in the current conditions. The most affected indicator is the AROP 65+, not published for several countries.

## 8. How to improve the flash estimates?

The report contains not only the estimated changes for the target year but also a few elements on the estimation process, auxiliary sources used to support the analysis of the figures and their reliability. It is meant to put the basis for a constructive dialogue for further improving the methodology and the dissemination of these indicators.

To help Eurostat improve these experimental statistics, users and researchers are kindly invited to give us their [feedback](#):

- Would you have comments or suggestions for improvements of the methods applied for this flash estimate exercise, i.e., based on either microsimulation or current income?
- Are there any other factors Eurostat should consider?

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<sup>13</sup> Several countries showed a high volatility for AROP 65+ related to the relative movement between ARPT and median income for 65+: BE, BG, CY,CZ, DK, EE, IE, HR, LT, LV, MT, NL, SE and SI.

- What other indicators or breakdowns could be useful as early warnings on trends in income distribution and poverty?
- Are there other indicators Eurostat should analyse for policy purposes?
- Is the rounded uncertainty interval clear and easy to understand? How to improve it? Would point estimates be desirable in the future?

Further developments could be envisaged, also following the feedback from users and stakeholders:

- Improve further the dissemination format, mainly by using a prediction interval based on the calculation of both model error and sample standard deviation;
- use of more recent EU-SILC files for microsimulation so that to minimise the impact of revisions and breaks in series but as well to improve the model;
- take into account more detailed and consistent input data to capture distributional effects.

## Annex 1: Standard deviation and significance

As mentioned, the RUI is based on thresholds dependent on the standard deviation in EU-SILC, which is country and indicator specific. It is important to note that is also communicated if the change is statistically significant. At this stage, the sampling error is considered for the significance of the change. In countries with large standard deviations, higher values of yearly changes are more likely to be considered not statistically different from zero.

For the main inequality indicators, the usual calculation of Eurostat for the standard deviation of the net change<sup>14</sup> is used. It calculates the variance of the net change based on multivariate linear regression technique (Berger and Priam, 2016) that reduces non-linear statistics to a linear form and takes into account the overlap of samples between years. For deciles, Eurostat has developed a bootstrapping procedure for computing the variance of the estimates. 1000 subsamples of the EU-SILC dataset at the target year have been used, with each individual having a probability of  $\frac{w_j}{\sum_{j=1}^p w_j}$  to be drawn and where  $w_j$  denotes the sample weight of the  $j^{\text{th}}$  individual and the size of the subsamples being equal to the number of individuals in the EU-SILC dataset. Then all indicators of interest for each one of these replicated data sets are computed. The collection of computed indicators can then be used to obtain an estimate of the sampling distribution of the EU-SILC indicators (unweighted). The standard deviation of the change for deciles is likely to be overestimated, as it does not consider the overlap of samples between two consecutive years in EU-SILC. In the future, it is foreseen to apply the same estimation procedure as for AROP and QSR

Table 4 shows the significance bounds for all countries.

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<sup>14</sup> <http://ec.europa.eu/eurostat/documents/3888793/5855973/KS-RA-13-024-EN.PDF/cfef2973-4675-4df4-bf6d-e15ef1d3c060>

**Table 4. Range of values for which the YoY is not statistically significant – main indicators**

RANGE OF NON-SIGNIFICANT VALUES (YOY)								
Country	Year	AROP	QSR	D1	D3	MEDIAN	D7	D9
AT	2021	0.8%	0.2%	2.2%	1.6%	1.4%	1.6%	2.6%
BG	2021	0.8%	0.6%	4.6%	2.4%	1.8%	1.6%	4.2%
CY	2021	1.0%	0.4%	1.4%	1.4%	1.8%	1.8%	2.6%
CZ	2021	0.6%	0.4%	1.6%	1.2%	0.8%	1.2%	2.0%
DE	2021	0.4%	0.2%	1.8%	1.2%	1.0%	1.2%	1.4%
DK	2021	1.2%	0.6%	2.0%	1.6%	1.6%	1.4%	2.2%
EE	2021	0.6%	0.4%	2.4%	1.8%	2.2%	2.4%	2.2%
EL	2021	0.4%	0.6%	1.6%	1.0%	0.8%	0.8%	1.0%
ES	2021	0.6%	0.4%	2.8%	1.4%	1.2%	1.0%	1.6%
FI	2021	0.4%	0.2%	1.2%	1.0%	0.8%	0.8%	1.2%
HR	2021	0.4%	0.2%	3.0%	1.6%	1.6%	1.6%	2.0%
HU	2021	1.2%	0.4%	1.8%	1.4%	1.2%	1.6%	1.8%
IT	2021	0.2%	0.2%	2.0%	1.0%	1.0%	0.8%	1.2%
LT	2021	1.4%	0.6%	3.0%	3.2%	2.4%	2.8%	4.2%
LU	2021	1.4%	0.4%	2.4%	1.6%	1.8%	1.8%	2.0%
LV	2021	0.8%	0.4%	2.6%	2.6%	1.6%	1.8%	2.8%
MT	2021	0.8%	0.2%	2.4%	2.2%	2.2%	1.8%	2.8%
NL	2021	0.6%	0.4%	1.2%	1.0%	1.2%	1.0%	1.2%
PL	2021	0.8%	0.2%	1.8%	1.2%	0.8%	1.0%	1.8%
RO	2021	0.2%	0.4%	2.8%	1.8%	1.6%	2.0%	2.2%
SE	2021	0.6%	0.2%	2.0%	2.0%	1.4%	1.4%	1.8%
SI	2021	0.4%	0.2%	1.2%	1.2%	1.0%	1.0%	1.4%
SK	2021	0.6%	0.2%	2.0%	1.4%	1.2%	0.6%	1.4%



## Annex 2. Quality Assessment Framework (QAF)

FE are assessed on a specific quality framework developed together with the Member States and validated via a dedicated task force with the NSIs and the academic community. This QAF aims to provide a common platform to assess Eurostat and national estimates.

The QAF is composed of two parts:

- The quality assurance, that ensures that quality, is considered in the inputs and methods used in all the steps of the production, by analysing inconsistencies in the input data and performing several intermediate quality checks along the process. It is useful for identifying possible sources of error and ways of fixing them.
- The quality assessment, which includes A) an extensive ex-ante assessment of the plausibility of the flash estimates given the information available at the production stage and B) the ex-post assessment of the historical performance of different methods.

### A. Ex-ante quality assessment and validation

For *quality assessment and validation purposes*, the triangulation of different observed auxiliary sources was essential during the COVID-19 pandemic. Income early estimates were benchmarked against detailed labour market changes in the EU-LFS, additional targets from administrative data on beneficiaries of short-term schemes as well as macro-indicators such as the gross disposable income in National Accounts. In some cases, methodological adjustments were required to provide a coherent analysis of the current changes in important social and economic factors<sup>15</sup>.

Furthermore, bilateral consultations with the Member States are carried out before the estimates are published. The aim of the consultation is to collect feedbacks and comments on the plausibility of the results directly from the national statistical institutes, and in some cases, where available, to compare the results with national early estimates.

Therefore, there are four main steps in the plausibility analysis:

- 1) An analysis of the plausibility of the FE given the general evolution for related indicators on the labour market (employment, wages).
- 2) An analysis of the plausibility of the FE given changes in policies. These are calculated using the EUROMOD model and are supported with the analysis of the country reports by EUROMOD national teams<sup>16</sup>;
- 3) A comparison with the National Accounts data for gross disposable income and main income components at aggregated level (microsimulation countries only);
- 4) Additional national information provided by Member States (where available).

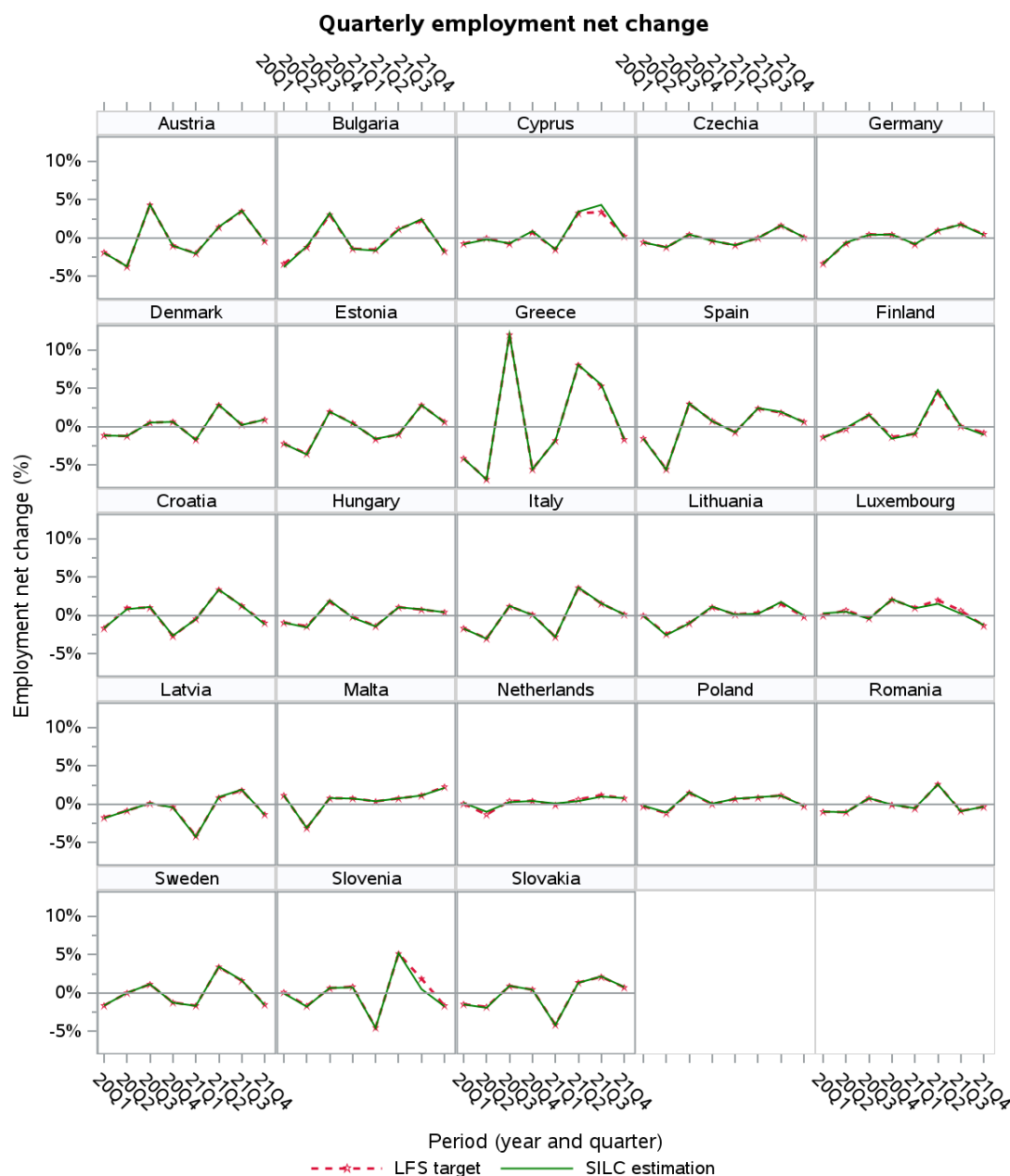
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<sup>15</sup> Such a multi-lateral consultation approach was, for instance, particularly successful for the registration of work compensation schemes during the pandemic. The comparison of hourly labour cost data, total wages and salaries and other labour statistics from the national EUROMOD teams were helpful to feed into the analysis of the changes to employment income during the COVID-19 crisis.

<sup>16</sup> The reports are available on-line at <https://euromod-web.jrc.ec.europa.eu/resources/country-reports>

## 1) Labour changes

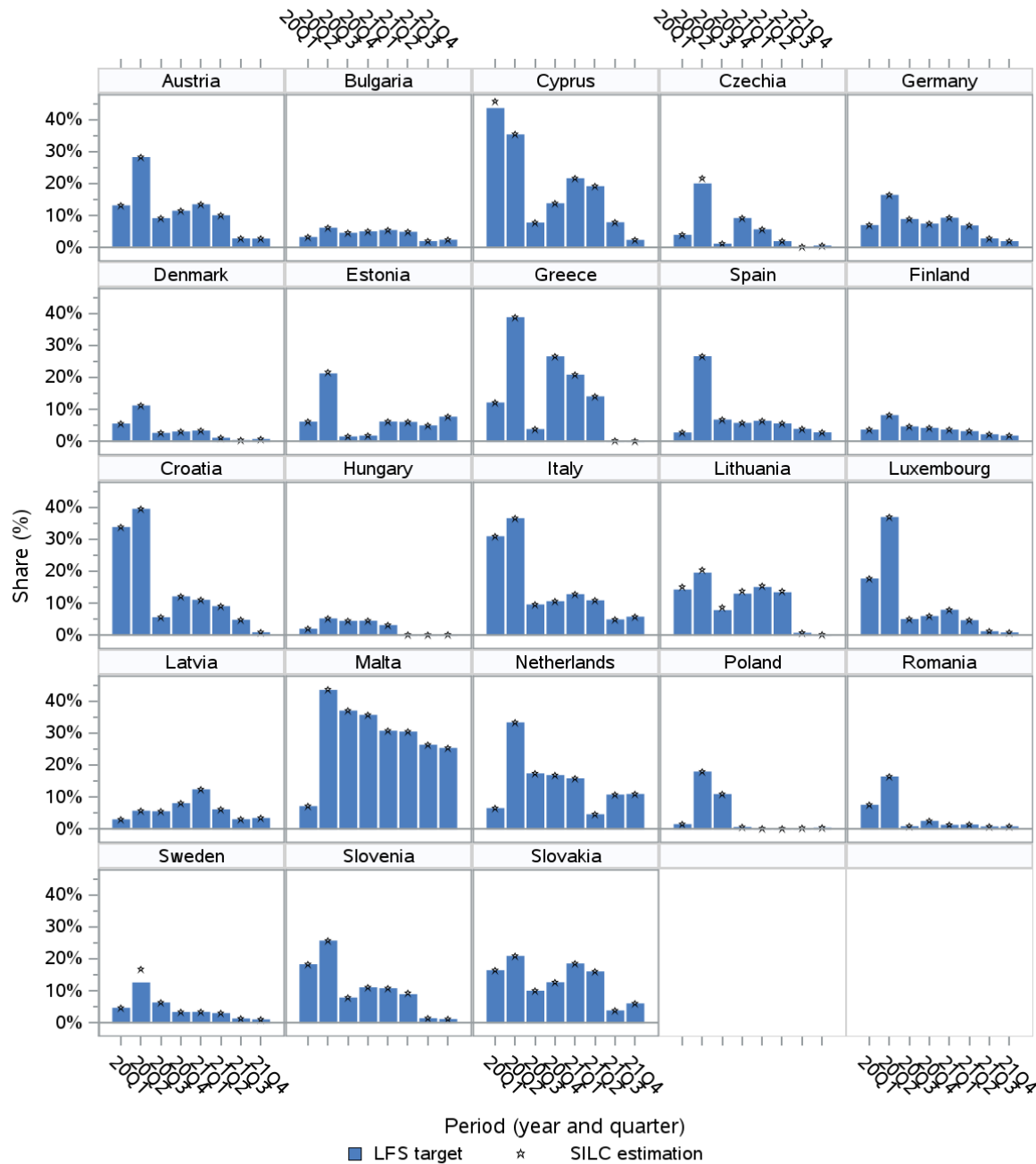
The adjustment for structural changes in labour force is done by simulating, in the latest EU-SILC file for microsimulation detailed net changes in employment from quarterly EU-LFS data. For FE 2021, due to changes in employment definition<sup>17</sup>, we used as targets break free adjustment on net employment changes by sex and age group. Further adjustments were done to include in the estimation additional relevant breakdowns such as activity sector and type of contract to better capture distributional effects. The chart below shows, at country level, the EU-LFS targets and how they are applied in EU-SILC. Therefore, we can see the infra-annual changes according to EU-LFS data and how well they are replicated into EU-SILC.



<sup>17</sup> For more information, please see [EU labour force survey - correction for breaks in time series - Statistics Explained \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

For the transition into/out partial unemployment or absent, a combination of different sources from administrative data and EU-LFS are used. The primary source contains ad-hoc monthly administrative data collection provided by Member States to Eurostat on the total number of jobs supported by governmental measures. These jobs in public and private sectors are financially compensated, at least partially, by government funds that may transit or not through the employer. These data are targets to simulate quarterly transition of workers into/out short-term work schemes. The chart below shows the share of persons absent or who worked less hours than usual in total employment according to above data sources and how well they are replicated into EU-SILC estimations.

### Share of absents and people who worked less hours than usual in total employment



## 2) Policy changes

EUROMOD contains most of the discretionary policy measures exceptionally introduced or activated by national government to address the COVID-19 economic challenges, in particular, policies to preserve jobs and stabilise the wages. During 2021, most of the European countries kept the temporary policies implemented to compensate the income losses due to the pandemic. Only for a few Member States the compensation schemes are not simulated (The Netherlands and Finland provide 100 % of compensation via extensions to ordinary labour schemes) or ended in 2021 (Poland). This year was characterised by an improved situation in the labour market, and therefore, by a reduced number of applicants to the temporary wage compensation schemes. Nevertheless, these policies were still in place and simulated for most of the countries and still a valid wage stabiliser.

The design of these compensation schemes differs by country:

- The compensations are paid solely by the State or both by the State and the firm (countries such as Austria, Bulgaria, Czechia, Denmark, Estonia, Lithuania, Poland, Sweden and Slovenia have a compensation paid by the firm simulated in EUROMOD).
- Employees receive either a fixed amount (Greece and Croatia) or a percentage of their employment income or net earnings (Austria) that replaces at least partially their employment income during the period that are unable to work. This percentage is often subject to a minimum (Cyprus, Estonia, Spain, France, Latvia, Slovenia and Slovakia) and/or maximum compensation. This amount can also differ if there are dependent children in the household (e.g., Spain).

Income support to self-employed individuals, such as lump-sum transfers or monetary compensation for the income losses, is simulated for a part of the countries (e.g., Belgium, Bulgaria, Cyprus, Czechia, Denmark, Greece, Spain, Finland, France, Italy, Lithuania, Latvia, Malta, Portugal, Croatia, Slovenia and Slovakia).

## 3) Comparison with National Accounts

Table 7 provides a comparative change in the magnitude for the yearly change of the total disposable income between the FE and the sector accounts<sup>18</sup>. The table includes only countries for which (1) microsimulation was used and (2) yearly or quarterly data is available for the sector household; non-profit institutions serving households (S14\_S15); if no data from the sector accounts are available the forecast by AMECO<sup>19</sup> is used. In 2021, in all the Member States, we observe an increase in total income. In general, the direction and magnitude in the FE and in National Accounts are very similar. In some cases, there are differences and these should be read taking into account the underlying comparability of income (trends) from EU-SILC and National Accounts. For more details on the latter, please see Eurostat centralised exercise on EU-SILC-National Accounts reconciliation<sup>20</sup>.

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<sup>18</sup> Source: Eurostat calculations- gross disposable income [nasq\_10\_nf\_tr and nasa\_10\_nf\_tr].

<sup>19</sup> AMECO is the annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs, it contains forecasts of several macro-economic indicators, it accessible on-line at the link [https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/macro-economic-database-ameco/ameco-database\\_en](https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/macro-economic-database-ameco/ameco-database_en)

<sup>20</sup> <https://ec.europa.eu/eurostat/web/experimental-statistics/ic-social-surveys-and-national-accounts>

**Table 7. Comparison with National accounts: evolution total disposable income**

Country	Magnitude*YOY Total income Flash estimate	Magnitude*YOY Total income National Accounts	Flag	
AT	↗	↗		
BG	↑		n.a.	
CY	↗	↗	(*)	
CZ	↑	↑		
DE	↗	↗		
DK	↗	↗		
EE	↗	↑	(*)	
EL	↑	↑		
ES	↗	↗		
FI	↗	↗		
HR	↗		n.a.	
HU	↑	↑		
IT	↗	↗		
LT	↑	↑	(*)	
LU	↗	→	(*)	
LV	↑	↑	(*)	
MT	↑		n.a.	
NL	↗	↑		
PL	↗	↗		
RO	↑	↑	(*)	Magnitude
SE	↗	↑		0%-2% →
SI	↑	↑		2%-5% ↗
SK	↑	↗	(*)	>5% ↑

(\*)AMECO forecast

4) In addition to the plausibility analysis, all Member States were consulted concerning the FE and in some cases, Eurostat received additional information based on national sources or models.

For more information on the models and nowcasting techniques please see also the [methodological note](#).

#### B. Ex-post assessment of historical performance

In general, during the first years of publication of FE, different methodologies were tested and benchmarked according to their historical performance. The historical performance is defined as the ability of FE to capture EU-SILC observed YoY changes and is mainly assessed based on mean absolute error (MAE)<sup>21</sup>. This was supported by a much more detailed analysis of income components and labour variables.

The FE are model based and rely on several assumptions and caveats so they cannot perfectly capture changes in the EU-SILC estimates. Although there are still limitations in the current methodology and

<sup>21</sup>  $MAE = \text{mean}(|e_y|)$  where  $e_y$  for deciles =  $YoY.REF_y - YoY.EST_y$  (or  $YoY$ ) =  $\frac{REF_y}{REF_{y-1}} - \frac{EST_y}{EST_{y-1}}$

its ability to replicate the changes in EU-SILC, it can provide an early indication of the direction of change.

Their accuracy depends on several factors that need to be considered:

- model errors and assumptions concerning the evolution of labour market income and simulation of social benefits;
- inconsistencies between different auxiliary sources that enter the estimation process and EU-SILC;
- the standard deviation of the target indicators which are based on surveys: the higher the variance of EU-SILC indicators, the lower the ability of the model to capture exactly the point estimate.
- breaks in the EU-SILC data series and revisions: in general, results for the microsimulation when simulating back are based on older files. Results improve for the last years, as more recent files are used for producing the flash estimates and with ongoing efforts to introduce disaggregated benefits in EU-SILC and to improve the precision of simulations in EUROMOD.

Finally, it is important to highlight that the uncertainty during COVID-19 pandemic is exceptionally high: not only there were significant changes in the methodology and data sources, but there were also inconsistencies between different input sources and across countries in the treatment of special measures simulated in our nowcasting process. A full ex-post analysis will follow when the EU-SILC data covering this period becomes available.

### Annex 3 - Data sources and availability

The data used in this report for the FE are based on Eurostat estimations. For microsimulation, the **information set** that entered includes the EUROMOD model combined with the latest EU-SILC users' database (UDB) microdata file and/or national EU-SILC microdata<sup>22</sup> available at the time of production.<sup>23</sup> This is enhanced with more timely auxiliary information from the reference period (2018) such as EU-LFS, Labour Cost Index and National Accounts, etc.

The data used for the target indicators for the income years 2012-2018 are primarily derived from data from [EU statistics on income and living conditions \(EU-SILC\)](#). The reference population is all private [households](#) and their current members residing in the territory of an EU Member State at the time of data collection. Persons living in collective households and in institutions are excluded from the target population.

#### Main tables

- [Income and living conditions \(t\\_iloc\)](#)

#### EU-SILC further information

- [Income, social inclusion and living conditions](#)
- [EU statistics on income and living conditions \(EU-SILC\) methodology](#)

#### EU-LFS further information

The EU-LFS is the largest EU sample survey covering the resident population aged 15 and over, in private households in the EU. It provides detailed quarterly and annual data on employment and unemployment, broken down along many dimensions. For in-depth information on EU labour force statistics please consult the below links:

- [Labour Force Survey \(EU-LFS\) data](#)
- [EU statistics on EU labour force – methodology](#)

For Romania current income from HBS<sup>24</sup> was used. Their HBS is organised as a continuous quarterly survey over a period of three consecutive months, based on a sample of 9 504 permanent dwellings, divided into monthly independent sub-samples of 3 168 permanent dwellings (per year the sample cover 38 016 households). Response rate is around 80% -85%.

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<sup>22</sup> UDB EU-SILC 2018-1: BE BG CY CZ DE DK EE EL ES HR IT LV LT HU PL PT SI FI

UDB EU-SILC 2018-2: MT

In addition, for CZ EE EL LV LT LU PL SI, additional national SILC variables were also used National SILC 2017: IT AT SK

<sup>23</sup> EU-SILC 2018 UDB. In the meantime, EU-SILC 2019 is available for most countries but not yet the UDB and the EUROMOD input file

<sup>24</sup> <http://statistici.insse.ro/shop/index.jsp?page=tempo2&lang=en&context=20>

The survey covered people with permanent residence in Romania, members of households in all counties and in Bucharest. Main variables collected are expenditures, incomes, endowment with durable goods and other demographic variables. The access to [metadata](#) regarding HBS is at the link:

<http://colectaredate.insse.ro/metadata/viewStatisticalResearch.htm?locale=en&researchId=4356>



## Annex 4 – References

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