DISTRIBUTION OF INCOME AND CONSUMPTION FOR THE HOUSEHOLD SECTOR

EUROSTAT CENTRALISED EXERCISE – METHODOLOGICAL NOTE

(EDITION 2023)

BACKGROUND

The analysis of distributions of income, consumption and wealth (ICW) is crucial to determine the material well-being of different household groups and individuals. Within the ICW project, the work stream on household distributional accounts aims at reconciling national accounts (NA) statistics for the household sector with aggregates obtained from household surveys.

This note presents the approach for Eurostat's centralised exercise.

METHODOLOGY

The Eurostat centralised exercise aims at compiling distributional results for household income and consumption aligned with NA totals. It is based on sector accounts data as well as micro data from the European statistics on income and living conditions (EU-SILC) and the household budget survey (HBS).

In the exercise, income data was compiled for the reference years 2015-2020. The consumption distribution is derived from the 2015 and 2020 HBS waves:

- In 2015 HBS wave, data collection year coincided with the reference year for 21 countries. The other countries collected HBS data as follows: 2013 (DE), 2014 (BE, HR) and 2016 (LT, FI).
- In 2020 HBS wave, data collection year coincided with the reference year for 15 countries. The other countries collected HBS data as follows: 2018 (DE, SI), 2019 (HR, LV) and 2021 (LT). The HBS data for 2020 for CY and MT were extrapolated from 2015 HBS wave using price coefficients for final consumption expenditure. No 2020 HBS data were reported or extrapolated for SE. 2020 HBS wave data for FI, IE and PT are expected in 2024.[1]

[1] Estimates could not be compiled due to missing/limited source data in the following cases:
- Consumption – no HBS data for CH, NO, IS;
- Operating surplus, gross - due to missing micro data for 'imputed rent' for DE, RO (2016) and PL
- Taxes on wealth – due to missing micro data for 'wealth taxes' for BE (2015-2019), IE (2015-2018), LU (2015-2019), AT, CH, NL and NO
- No micro (EU-SILC) data for NO (2020).
- No NA data for IS for all income items. Limited number of NA income items for MT.
- No NA data for BG for 2018-2020 for all income items. No NA data for RO for 'Other current transfers, received'. No NA data for 'Operating surplus, gross' for CH.

Other country-specific issues:
- PT: the distributional results cover both private and institutional households
- CZ and FR: following country's request, only own national results are included in the publication.
- LU: consumption results are not included in the publication: the default domestic concept of household final expenditure is considered to provide biased distributional results for consumption due to high share of cross-border final consumption expenditure.

Item breakdown

Gross disposable household income is composed of 10 aggregate items listed in Table 1. Some individual survey variables were combined to achieve conceptual correspondence with the NA items, the quality of conceptual correspondence, however, varies across variables. An indication of the conceptual comparability for income items is provided in Table 1.

Table 1 Correspondence between EU-SILC and national accounts income items

Item	**EU-SILC**		**National Accounts**		**Indicative assessment of conceptual link**
	Code	***Description***	***Code***	***Description***	
Operating surplus, gross	HY030G	Imputed rent	B2G	Operating surplus, gross	Low
Mixed income, gross	PY050G HY170G	Cash benefits or losses from self-employment Value of goods produced for own consumption	B3G	Mixed income, gross	Medium
Property income (received)	HY090G HY040G	Interest, dividends, profit from capital investments in unincorporated business Income from rental of a property or land	D4/ resource	Property income, received	Medium/ Low
Property income (paid)	HY100G	Interest repayments on mortgage	D4/use	Property income, paid	Low
Wages and salaries (received)	PY010G PY020G	Employee cash or near cash income Non-cash employee income	D11/resource	Wages and salaries	High
Social benefits, other than STiK (received)	HY050G HY060G PY090G PY100G PY110G PY120G PY130G PY140G HY070G	Family/children related allowances Social exclusion not elsewhere classified Unemployment benefits Old-age benefits Survivor' benefits Sickness benefits Disability benefits Education-related allowances Housing allowances	D62/ resource	Social benefits, other than social transfers in kind	High
Other current transfers (received)	HY080G	Regular inter-household cash transfer (received)	D7/ resource	Other current transfers, received	Low
Taxes on wealth (paid)	HY120G	Regular taxes on wealth	D59	Other current taxes	Low
Households' social contributions (paid) and taxes on income	HY140G	Taxes on income and social contributions	D51/use D613/use D614/use	Taxes on income Households' actual social contributions Households' social contributions supplements	High
Other current transfers (paid)	HY130G	Regular inter-household cash transfer (paid)	D7/use	Other current transfers, paid	Low/No

For best possible coverage of the NA disposable income aggregate, the current exercise includes four survey variables that are available but not included into the definition of total disposable income from the micro (EU-SILC) perspective – 'Imputed rent' (HY030G), 'Interest repayments on mortgage' (HY100G), 'Non-cash employee income' (PY020G) and

'Value of goods produced for own consumption' (HY170G). In contrast, the exercise does not include two survey variables that are part of the disposable income (HY020) in EU-SILC but have no direct conceptual link to the NA definition of disposable income – 'Income received by people aged under 16' (HY110G) and 'Pension from individual private plans' (PY080G).

Conceptual comparability is much better for consumption items, since both social statistics and national accounts follow the classification of individual consumption according to purpose (COICOP). We thus distribute household account totals over income groups for each of the COICOP level 2 aggregates: food and non-alcoholic beverages (CP01); alcoholic beverages, tobacco and narcotics (CP02); clothing and footwear (CP03); housing, water, electricity, gas and other fuels (CP04); furnishings, household equipment and routine household maintenance (CP05); health (CP06); transport (CP07); communications (CP08); recreation and culture (CP09); education (CP10); restaurants and hotels (CP11); miscellaneous goods and services (CP12).

Adjustments to source data

Adjustments to source macro data (national accounts)

The NA figures have been adjusted by a country-specific factor to exclude the part of population that is not covered in the social surveys (mainly institutional households). In practice, this population adjustment coefficient has been derived as the ratio between the total population in the social surveys (calculated as the sum of weights in EU-SILC/HBS multiplied by the number of persons in the households) and the one corresponding to the NA concept for the purpose of per capita GDP figures.

Estimation of missing micro data for 'Imputed rent' (HY030G) for 2020

Since item 'Imputed rent' (HY030G) was not included in the EU-SILC reporting of reference year 2020, separate ad-hoc transmissions of national HY030G data from Belgium, Finland, Ireland and Spain were incorporated in the centralised results for 2020. For the remaining countries, the micro data for this variable were estimated based the previous year's data as follows:

- For the households living in own dwellings and included in the EU-SILC sample for both reference years 2019 and 2020, the corresponding micro data for HY030G for reference year 2019 were used.
- For each of the remaining households living in own dwellings, the mean for HY030G for reference year 2019 was applied.

Table 2 Population adjustment coefficients for income (left) and consumption (right)

Population adjustment ratio (EU-SILC population/NA population)

Country	2015	2016	2017	2018	2019	2020
Austria	0.995	0.989	0.984	0.985	0.986	0.987
Belgium	0.988	0.985	0.988	0.988	0.989	0.987
Bulgaria	0.997	0.999	0.998	0.998	0.998	0.998
Croatia	0.986	0.986	0.984	0.986	0.968	0.967
Cyprus	0.996	0.999	1.001	1.002	1.003	1.000
Denmark	0.996	0.995	0.994	0.993	0.993	0.994
Estonia	0.992	0.989	0.991	0.994	0.993	0.991
Finland	0.986	0.986	0.985	0.985	0.986	0.986
Germany	0.997	0.993	0.987	0.987	0.989	0.990
Greece	0.984	0.987	0.980	0.982	0.981	0.981
Hungary	0.982	0.982	0.982	0.981	0.980	0.984
Ireland	1.000	1.000	1.000	1.000	1.012	1.008
Italy	1.004	1.003	1.004	1.004	0.996	0.992
Latvia	0.983	0.982	0.985	0.985	0.985	0.985
Lithuania	0.994	0.993	0.993	0.997	1.000	1.006
Luxembourg	1.012	1.005	0.966	0.972	0.963	0.951
Malta	0.994	0.993	0.997	0.999	1.001	0.984
Netherlands	0.987	0.989	0.988	0.989	0.989	0.987
Norway	0.995	0.987	0.990	0.992	1.001	n.a.
Poland	0.975	0.972	0.960	0.958	0.966	0.977
Portugal	0.998	0.998	0.999	0.999	1.001	1.000
Romania	0.999	0.999	0.999	0.999	0.998	0.992
Slovakia	0.968	0.968	0.984	0.985	0.988	0.988
Slovenia	0.977	0.979	0.976	0.981	0.984	0.990
Spain	0.990	0.991	0.992	0.996	0.995	0.990
Sweden	1.005	1.007	1.006	1.005	1.005	1.002
Switzerland	0.990	0.989	0.988	0.988	0.987	0.987

Population adjustment ratio (HBS population/NA population)

Country	HBS 2015 wave	HBS 2020 wave
Austria	0.981	0.978
Belgium	0.995	0.968
Bulgaria	0.974	0.932
Croatia	1.003	0.968
Cyprus	0.996	0.947
Denmark	0.993	0.991
Estonia	0.990	0.990
Finland	0.989	n.a.
Germany	0.953	0.952
Greece	0.987	0.973
Hungary	0.982	0.985
Ireland	0.988	n.a.
Italy	1.004	1.006
Latvia	0.992	0.991
Lithuania	1.007	0.995
Luxembourg	n.a.	n.a.
Malta	0.952	0.822
Netherlands	0.990	0.991
Norway	n.a.	n.a.
Poland	0.989	0.991
Portugal	1.002	n.a.
Romania	1.002	1.002
Slovakia	1.001	0.988
Slovenia	0.981	0.986
Spain	0.990	0.990
Sweden	0.924	n.a.
Switzerland	n.a.	n.a.

Methods for micro-macro gap allocation

We used the following methods allocating the national account totals to individual households in the micro data.

Method M1 - Proportional allocation

The entire gap is distributed proportionally over households. The coefficient used for proportional upscaling by item corresponds to the micro-macro coverage rates calculated as the weighted sum of the micro data divided by the corresponding adjusted NA total. Micro data are then divided by the coefficient to reach the macro total. The hypothesis is that potential under-reporting or sampling errors are evenly distributed among the population. A proportional allocation of the data gap is appropriate when the micro data distribution is close to the "real" distribution of the underlying variable. This is the method mainly applied for consumption items (see Table 2 below) and for the following income items: ’Operating surplus, gross’, ‘Property income (paid)’, ‘Wages and salaries (received)’, ‘Social benefits, other than STiK (received)’ and ‘Households' social contributions (paid) and taxes on income’.

Method M2 - Pareto tail modelling (complemented by proportional scaling)

In the literature, the distribution of income (and even more so wealth) in the upper tail is often assumed to follow a power law, such as a Pareto distribution [2].

The complementary cumulative Pareto distribution function of income y is the following:

$1 - F(y) = (k/y)^{\alpha}$, where α>1, k>0

where k is the scale (threshold) parameter defining the segment that is assumed to be Pareto distributed, and α is the shape parameter.

We set the threshold for the "upper tail" to the 90th percentile of the distribution for each item. For all households above the threshold, the measured values are adjusted such that the tail distribution conforms to a Pareto distribution. After the Pareto top 10% adjustment the remaining gap by item is allocated to all households by simple proportional scaling to match the corresponding NA totals. We generally use this method for 'Property income (received)'.*N.B.: For a number of countries/items*[3] *the Pareto adjustment failed, since the non-zero micro values were concentrated above the 90th percentile. Then, proportional scaling was directly applied, producing identical results for M1 and M2 methods at the household level.*

The application of this semi-parametric method suggests an underrepresentation / underreporting of households with top incomes only, which could be appropriate in case of skewed distributions such as for example property income (received).

Methods M3.1 and M3.2 – Allocation of ascending/descending gap shares by decile

These approaches rely on a gap allocation at a meso-level. In the current exercise, they are applied to income deciles. Method M3.1 suggests undercoverage/underreporting of higher income groups and represents a 'to-the-top' allocation. In contrast, method M3.2 assumes an undercoverage/underreporting of low income households and comprises a 'to-the-bottom' allocation. The following shares have been defined in the application of the two sub-methods.

Method 3.1 by decile

decile	gap share,%
D1	0
D2	0
D3	4
D4	6
D5	8
D6	12
D7	14
D8	16
D9	18
D10	22

Method 3.2 by decile

decile	gap share,%
D1	22
D2	18
D3	16
D4	14
D5	12
D6	8
D7	6
D8	4
D9	0
D10	0

[2] In the current exercise, the Pareto tail modelling follows steps 1-4 of the approach presented in the paper by Törmälehto, V-M (2019), Reconciliation of EU statistics on income and living conditions (EU-SILC) data and national accounts, Eurostat, pp 30-31: https://ec.europa.eu/eurostat/documents/3888793/9959642/KS-TC-19-004-EN-N.pdf/cd90cd0f-ebcf-43b6-ab4b-c28bcdda4f46

[3] Mostly (but not only) for Regular inter-household cash transfers (EU-SILC) / Other current transfers (NA)

The meso-level gaps are subsequently distributed across the underlying households. In trying to avoid possibly distorting results, each household within the respective decile has been adjusted by an equal amount rather than proportionally to their initial relative contribution.

We generally use this method for 'Mixed income, gross' and 'Taxes on wealth'.

Method 3.3 Modified ascending gap shares by decile (implemented for 'Other current transfers' as part of M4 Combined approach)

Two of the items with the lowest micro-macro conceptual correspondence (Table 1) are 'Other current transfers, paid/received'. The main conceptual difference for these items is the *non-life insurance premiums/claims*, which are covered in NA but have no corresponding variable in EU-SILC. The HBS data on *non-life insurance premiums* paid by households indicate a distribution that generally corresponds to the following shares by income decile that are used to distribute the micro-macro gap for 'Other current transfers, paid'.

Method 3.3 by decile ('Other current transfers')

decile	gap share,%
D1	4
D2	6
D3	7
D4	8
D5	9
D6	11
D7	12
D8	13
D9	14
D10	16

In the lack of micro data on *non-life insurance claims*, the same approach is applied to align the micro and macro data for 'Other current transfers, received'. The values of the gap by decile is subsequently distributed across the underlying households by an equal amount rather than proportionally to their initial relative contribution.

Method M4 Combined approach

Different gap allocation methods are likely to be appropriate for different income items. It might thus be best to combine different approaches. **In the current exercise, the Pareto-based results for 'Property income (received)', the M3.1 based results for 'Mixed income, gross' and 'Taxes on wealth', and the M3.3 based results for 'Other current transfers, paid/received' are combined with the proportionally scaled results for the other items into a disposable income aggregate.**

Application of methods by country

After consultation with the involved countries, the following methods were applied:

Table 3 Methods applied for each country in Eurostat's centralised exercise. Note that deviations from the default method M1 for consumption and M4 for income were only made on explicit request of countries.

	M1 Proportional	**M3.1 Ascending gap shares by decile**	**M4 Combined approach**
Income	EL		AT, BE, BG, CH, CY, DE, DK, EE, ES, FI, HR, HU, IE, IT, LV, LU, NL, NO, PL, PT, RO, SK, SE, SI
Consumption	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, HR, HU, IE, LV, MT, NL, PL, PT, RO, SK, SE, SI	LT [4]	

In addition to the above, the following countries opted for a different combination of methods by income item.

	M1 Proportional	**M2 Pareto**	**M3.1 Ascending gap shares by decile**	**M3.2 Descending gap shares by decile**	**M3.3 Modified gap shares by decile**
LT	Operating surplus, gross; Other current transfers (paid); Other current transfers (received); Taxes on wealth		Mixed income, gross; Property income (paid); Property income (received); Households' social contributions (paid) and taxes on income; Wages and salaries	Social benefits, other than STiK (received)	
LU	Households' social contributions (paid) and taxes on income; Wages and salaries; Social benefits, other than STiK (received); Property income (paid)	Operating surplus, gross; Property income (received)	Mixed income, gross		Other current transfers (paid); Other current transfers (received)
MT	Wages and salaries	Operating surplus, gross		Mixed income, gross	

[4] Except for items CP02 (M1) and CP04 (M3.2).

Clustering households

In line with the EG DNA guidelines and the SNA Update: Guidance note on Distribution of household income, consumption and wealth, households are clustered into household groups (deciles) based on *equivalised disposable income* according to 2008 SNA definitions using the OECD modified equivalence scale. It assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. This equivalisation is applied to take into account differences in the size and composition of households.

Income

First, the households are grouped into deciles based on the equivalised aggregate income derived as the sum of available EU-SILC variables corresponding to the NA definition of disposable income (see page 3). Then, the gap is allocated for each available item across households and a new total income variable is rebuilt at the micro level. Finally, the households are grouped into deciles based on the newly derived equivalised total income.

Consumption

The households are clustered according to the equivalised value of HBS variable HH09.9 Net income (total income from all sources including non-monetary components minus income taxes).

Sensitivity analysis

The choice of the gap allocation method may affect the income distribution across household groups significantly. This is why we perform a sensitivity analysis for total income/consumption. Distributional indicators (the Gini coefficient and D10/D1 ratio) are calculated both on the input micro data and on the results after gap allocation for comparison.