EUROMOD Online User Manual

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Summary

EUROMOD Online is a web platform that provides a simplified and user-friendly access to the EUROMOD microsimulation model. It allows the implementation of simple reforms on the Personal Income Tax (PIT), Social Insurance Contribution (SIC), Family Benefits and more recently, Inflation and Consumption Tax (CT) systems of the European Union (EU) Member States, and delivers their corresponding fiscal and distributional impacts. The current version runs on EUROMOD version J1.0+ and simulates the tax-benefit systems in force in 2024. Previous years are also available (2018 – 2023). Years 2018 and 2019, run on EUROMOD version I2.0+, year 2020 on version I3.0+, year 2021 on version I4.0+, year 2022 on version I5.0+ and year 2023 on version I6.0+.

The EUROMOD microsimulation model is a static tax-benefit calculator that covers all the EU Member States. It enables researchers and policy analysts to simulate reforms of PIT, SIC and benefits, and to compute the budgetary and personal income implications of those reforms, based on microdata and existing national tax and benefit codes. The model allows for standardised analysis across EU countries´ tax and benefits systems.

EUROMOD was managed, maintained and developed by the Institute for Social and Economic Research (ISER) at the University of Essex, starting in 1996. Since 2021, the Fiscal Policy Analysis Unit of the Joint Research Centre is responsible of the update and maintenance of EUROMOD. EUROMOD is developed in collaboration with national experts who update the tax and benefit coding and provide reports on the tax and benefit system of each country, including the validation of the model against national statistics.

The European Commission Joint Research Centre adopted the EUROMOD model for its tax modelling activities since March 2013.

The web platform, EUROMOD Online, is also developed and maintained at the Joint Research Centre in Seville. Following authorisation, EUROMOD Online can be accessed via EU Login at https://euromod-web.jrc.ec.europa.eu/euromod-online/. The EU Login account can be easily created during the registration process if needed. Questions or suggestions can be sent at JRC-EUROMOD-ONLINE@ec.europa.eu.

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1. Overview of the EUROMOD microsimulation model

EUROMOD is a microsimulation model of all EU countries Personal Income Taxes (PIT), Social Insurance Contributions (SIC) and Family benefits. EUROMOD allows the simulation of tax and benefit reforms and provides their fiscal/macro impact – through the use of statistical weights, defined by EUROSTAT – as well as indicators on their distributional impact, by household/individual groups according to socio-economic variables of interest, e.g. level of income for analysing equity impact, at-risk-of-poverty, etc. EUROMOD can be used to analyse the first-round fiscal impact of tax and benefit reforms on government budgets and on disposable income, as well as the effect of contributions and social insurance regulations. When specific simulations are not feasible, some elements are taken directly from the input datasets and included in the concept of disposable income.

EUROMOD is a static model, i.e. simulations abstract from potential behavioural reactions. The essence of the model is to provide counterfactual analysis of the budgetary and disposable income direct impact of tax and benefit reforms. Examples of possible reforms are changes in the tax rates or in the definition of the tax base and changes in entitlement conditions for pensions and benefits. The implementation of such reforms can be done in a very precise manner, since the tax and benefit systems in EUROMOD reflect very closely the existing tax and benefit codes of the EU Member States. The model generates disposable individual and household income, applying countries' tax-benefit codes and calculating theoretical benefit entitlements and tax liabilities. Importantly, the EUROMOD model directly embeds the interactions between the tax code and benefit system, which are generally absent from other models.

The microdata behind EUROMOD for 2024 systems come from the European Union Statistics on Income and Living Conditions (EU-SILC) and Household Budget Surveys (HBS). EUROMOD takes some variables directly from the underlying EU-SILC data, such as demographic and labour market characteristics, gross market income and other incomes (pensions, incomes from other households, etc.), as well as some expenditures (housing costs including mortgage, life insurance payments, etc.).[1] EUROMOD simulates PIT and SIC liabilities and benefit entitlements to contributory and non-contributory social benefits, applying tax–benefit systems' rules. The simulations run on several alternative input microdata sets depending on the simulated policy year. The current version of the EUROMOD Online, system for 2024, uses datasets from 2022, where reported incomes correspond to 2020. Previous systems (2018-2022) use datasets from year t-2. While demographic and labour market characteristics remain the same, uprating factors are used to bring the income values from the survey reference period up to the level of the year in which the tax and benefit system is coded. These uprating factors are typically index variables taken from Eurostat or national statistical offices such as the consumer price index, earnings increase or other legal variations in benefit amounts.

For the simulation of consumption taxes in 2024 systems, the model needs to be run with extended EUROMOD input files. They consist of the core EUROMOD input files based on EU-SILC or National SILC, extended with new variables (household-level income shares of expenditures by product) imputed from EU/National-HBS. The semi-parametric method implemented for the imputation follows the methodology developed by Akoğuz et al (2020). These extended EUROMOD files contain all the variables included in the standard EUROMOD input files plus the income shares of each consumption category included in HBS. The number of additional variables depends on the granularity

[1] Typically each country system is covered for year t-1 in June of year t.

available in HBS, and it varies across countries). This database is an extension of the core EUROMOD input database, and so it is based on the same sample (i.e., same identifiers "idperson" and "idhh" to identify persons and households, respectively) and contains the same variables plus the income shares of expenditure (xs_* variables).

The model validation is made by comparing EUROMOD simulations with national estimates. The model validation exercise and further details of the extended input dataset are available in the EUROMOD Country Reports.[2] In most cases, the national tax and budget authorities or national statistical institutes provide the national estimates. The aggregate estimates for expenditure and number of recipients of each benefit (and revenue and number of taxpayers of each tax) are compared with the same information from external sources (e.g. administrative statistics and national microsimulation models, whenever available). Considering budgetary variables, the EUROMOD estimates are in general close to the national estimates in the case of PIT and employees' SIC, although in certain cases, especially in small Member States, the discrepancy can be significant. The worst replication is generally obtained for SIC paid by the self-employed. However, the replication of national estimates for households' disposable income and at-risk-of-poverty indicators is, in general, fairly good. The validation is also revised backwards when more recent datasets become available, reflecting socio-economic conditions in a more reliable way.

Discrepancies between the EUROMOD baseline and national statistics may come from different sources. One is survey income underreporting (respondents participating in the survey might not recall exact amounts of some type of incomes received or taxes paid, and usually declare net amounts, more easily memorized) and difficulties in capturing the top part of the income distribution. Moreover, although sampling weights are used to ensure that the sample is representative for the whole population, for some countries weights account only for demographic population characteristics, but not for distribution of various income components. Another important source of discrepancy derives from the non-take-up of social benefits or from tax evasion. EUROMOD baseline results do not comprehensively take these into account, though some approximations are available in the full model and in some countries. In countries characterised by high rates of benefit non-take-up (among others, Belgium, France, Greece, Ireland and Romania) a simple correction can be included in EUROMOD by considering the take-up proportions reported in external statistics. In countries where tax evasion is widespread (among others, Bulgaria, Greece and Italy), a simple correction is included in order to split income sources (generally employment and self-employment income) recorded in the survey into a first component which is assumed to be reported to the tax authority and in a residual component which is assumed to be partially evaded. In the full model, these corrections for benefit non-take-up and tax evasion are documented in the country reports and can be “switched off” or adapted by the users. The corrections for tax evasion and benefit take-up are not yet available in EUROMOD Online. Finally, although being very detailed, this microsimulation model is a simplification of existing tax policy rules. For example, because of complexity some tax credits cannot be simulated or can be simulated with some underlying assumptions (i.e., commuters tax credit in Austria cannot be fully simulated as it also depends on the distance between living and working place); simulation of property taxes sometimes requires information on houses' market values; maternity leave benefits, although

[2] These country reports also contain background information on the tax-benefit system, a detailed description of all tax-benefit components simulated in EUROMOD, a general overview of the input data (including information on sample quality, weights, data adjustment, imputations and assumptions) and an extended explanation of the validation process.

simulated in most cases under certain assumptions, would require information on in-work history and contributory periods from previous year; etc.

2. EUROMOD Online: a user-guide

2.1. General description

EUROMOD Online is a web application developed in Java, using Oracle database and secured using EU Login authentication, which provides a simplified access to EUROMOD and allows the analysis of the fiscal and distributional impacts of tax reforms. EUROMOD Online utilises the full tax-benefit rules stored in EUROMOD, allowing the user to simulate non-complex reforms of PIT, SIC, Family benefits, and for 2024 systems, also Inflation and Consumption Taxes, without prior knowledge of EUROMOD.[3] Although the user can only change a limited number of parameters, the full version of EUROMOD runs behind, leading to interactions between policies.[4] After EUROMOD Online runs, the user gets several aggregated indicators summarising the results of the simulated reform, which are produced using the Statistics Presenter included in EUROMOD Statistics tools and exported to Microsoft Excel workbooks. However, the user cannot access the EU-SILC-based output microdata, since a specific authorisation is required.

Currently, users can run simulations for policy years 2024, and 2018 to 2023. However, results from different years should not be compared between them. Comparison across years would violate ceteris paribus assumption as the aggregate results would reflect not only the changes in tax parameters, but also would encompass year to year changes in income amounts and tax-benefit policies and changes in demographic and labour market characteristics, if different input datasets are used.

As a general rule, the user can modify most parameters related to PIT, SIC, Family benefits, Inflation and Consumptions taxes (where available).

EUROMOD Online can be accessed at https://euromod-web.jrc.ec.europa.eu/euromod-online/. Once logged, the user will have access to the map shown in Figure 1, where the country of interest has to be chosen. For each country the user has a set of modifiable parameters classified in different categories, as illustrated in Figure 2 for the case of Slovenia. Once the user changes these parameters and submits them, the system will run EUROMOD and compute several tables which will be available for download or to be sent to the email that was provided by the user during the creation of the EU Login account.

[3] Up to now EUROMOD Online does not allow simulating reforms on all the benefits. Regarding PIT and SIC, the options offered are necessarily limited to maintain the tool user-friendly. Examples of reforms that can be simulated with the full model but not with EUROMOD Online include changes in the definition of income lists (aggregations of monetary variables used to calculate tax bases or means-tests for benefits), changes in the definition of assessment units (individuals, households or other groupings of individuals) and policy swapping between countries (effects on country A of adopting a policy measure currently effective in country B).

[4] For instance, a change in SIC may affect PIT (because the contributions are deductible from the tax base) or benefits (because they may affect income concept taken into account in the means-test).

Figure 1: EUROMOD Online - country selection

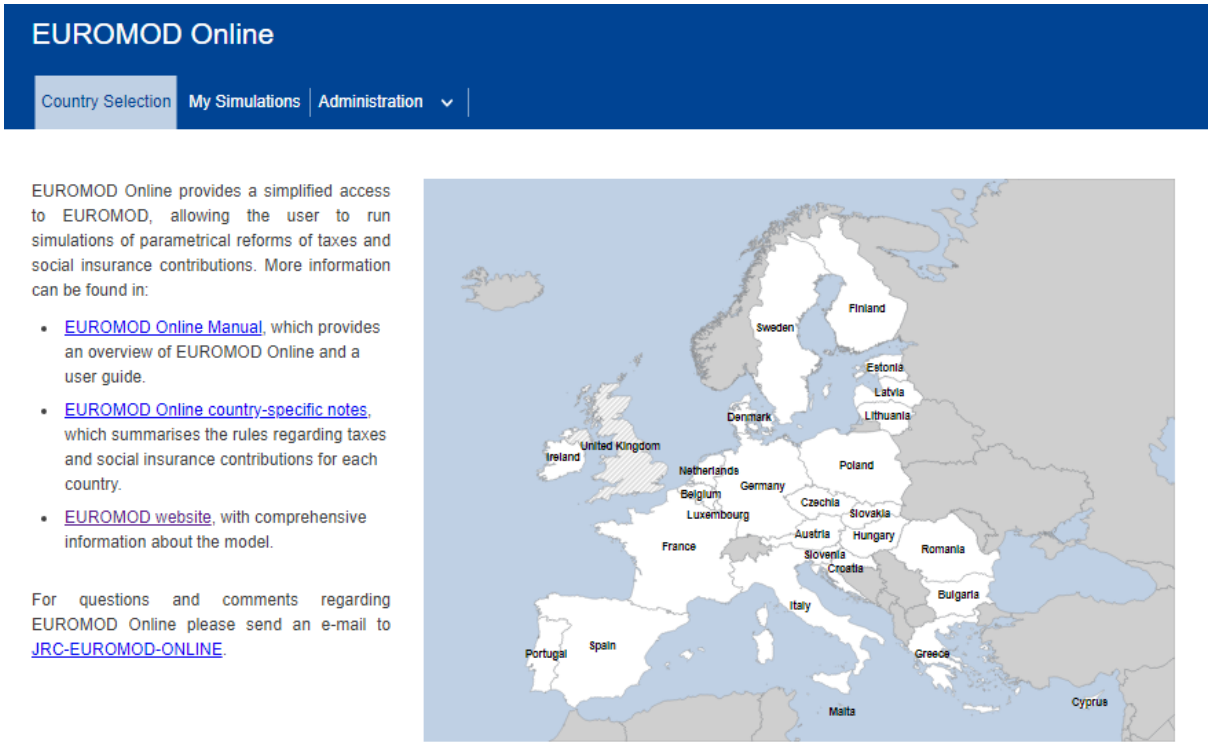
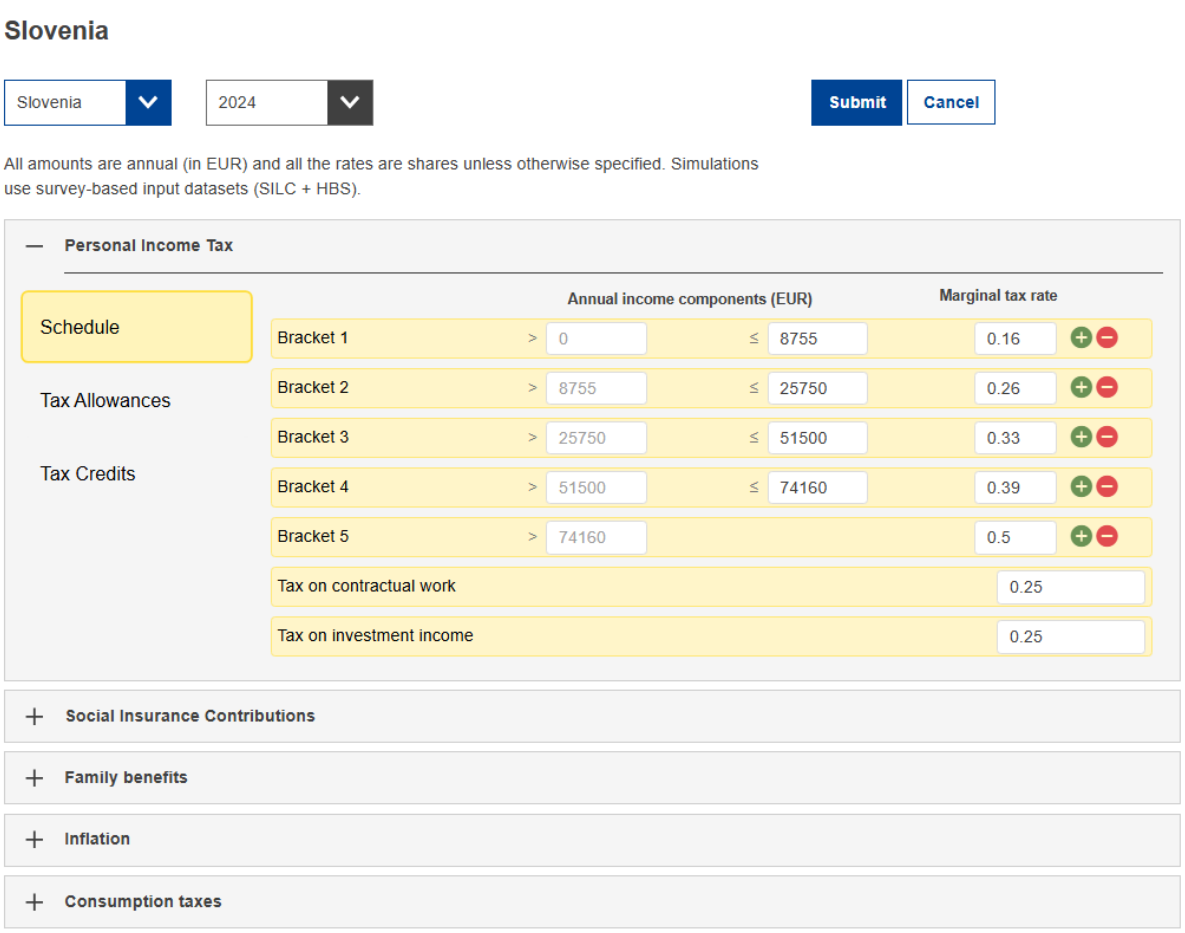


Figure 2: Example of country menu: Slovenia 2024 - Main menu



2.2. Sections description

Personal income tax includes the Schedule, where it is possible to change/add/remove rates and brackets. The number of brackets that can be added to each schedule may vary depending on the country. Additionally, due to technical limitations and to maintain the systems coherent, users may not be able to remove some of the brackets or they may only be allowed to add new brackets in specific places within the schedule.

Tax allowances and tax credits can be found below the Schedule. For each of these two subsections, EUROMOD Online offers the possibility of changing amounts and thresholds in six categories: (1) personal, (2) family, (3) work-related, (4) housing, (5) education, and (6) health.[5]

In Social Insurance Contributions (SIC), rates, schedules and thresholds can be changed for employees, employers and self-employed.

EUROMOD Online enables users to modify rates and amounts related to Family benefits, which are categorized in three groups: 1) Family related benefits, 2) Childbirth related benefits and 3) Education related benefits.

Consumption Taxes include: Specific excises, Ad-Valorem Excises, VAT headline rates and VAT rates by product category. Modifying the VAT headline rates, will be automatically reflected in the VAT rates by product category in the products that have the corresponding rate (standard, reduced, zero, etc.). However, each product can also be modified independently. For the simulation of consumption taxes, the user can choose to apply three different behavioural assumptions: Constant Expenditure Shares (CES), Constant Income Share (CIS) and Constant Quantity (CQ). Only one behavioural assumption can be simulated at a time.

Simulation of inflation (prices) shocks is available only for 2024 systems, and it has to be enabled by the user, by sliding the switch to “Simulate Inflation”. Be aware that the latter simulation assumes constant quantities (CQ). This is in line with EUROMOD static modelling which represents a “morning-after” response where households ability to immediately adapt their consumption following a sudden price shock is limited.

Switching the inflation simulation (without changing the parameters) applies annual inflation rates by product category for the inflation of the latest quarter of last year (2023). Running this scenario and comparing the output to the baseline without inflation provides an estimation of the impact of the officially recorded inflation. The user can also simulate different inflation scenarios at COICOP level 1 (2 digits) categories by modifying the values listed in EUROMOD Online.

[5] Pension-related tax expenditures reforms are not offered in EUROMOD Online due to the complexity of simulating them as well as of interpreting their results.

2.3. Results

After full EUROMOD simulations are run, results are generated using the executable of EUROMOD's Statistics Presenter and saved in excel format. The user can choose to download the excel file or send it to the email specified in the EU Login account.

The results are organized in three sheets: 1) Main Aggregates, 2) Distributional and 3) Inequality and Proverty. Table 1. shows a brief description of each sheet and the list of tables that it contains. More information available inside the results excel sheet itself or in the built-in help of the Statistics Presenter in EUROMOD.

Table 1. Tables included in the results generated by EUROMOD's Statistics Presenter

Sheet name	Description	Tables
1. Main Aggregates	This sheet provides the simulated annual aggregate tax liabilities and benefit entitlements (government budget) as well as some of the main income/expenditure aggregates.	Table 1.1 Government revenues and expenditures budget: annual revenues and expenditures related to the tax-benefit system Table 1.2. Household income and expenditures Table 1.3 National Accounts calibrated estimates of consumption taxes and household expenditures.*
2. Distributional	This sheet contains basic descriptive statistics related to the distribution of income before and after the tax-benefit system across different population groups.	Table 2.1.a Mean household income (monthly) by decile groups Table 2.1.b Mean household income (monthly) by household type Table 2.2.a Mean equivalised income (monthly) by decile groups Table 2.2.b Mean equivalised income (monthly) by household type Table 2.2.c Mean equivalised income (monthly) by labour status Table 2.2.d Mean equivalised income (monthly) by sex Table 2.2.e Mean equivalised income (monthly) by age groups
3. Inequality and Poverty	This sheet contains statistics on basic income-based inequality and income-based poverty indicators before and after the tax-benefit system across different population groups.	Table 3.1 Income inequality indices Table 3.2.a Poverty indices Table 3.2.b At-risk-of-poverty rates, by household type Table 3.2.c At-risk-of-poverty rates, by labour status Table 3.2.d At-risk-of-poverty rates, by sex Table 3.2.e At-risk-of-poverty rates, by age group

* Included only when Inflation or Consumption Taxes are simulated

Although results are not saved in EUROMOD Online, it is possible to retrieve the simulation that was run to obtain such results by clicking on “My simulations” tab and selecting the last simulation listed.

“My simulations” section has all the simulations that have been run by the user. EUROMOD Online saves the parameters that have been modified on each simulation. It gives also the possibility to tag, delete and write a description to each simulation.

Results obtained with EUROMOD Online should be cited as "Source: author's calculations using EUROMOD Online". Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the estimates provided by EUROMOD Online.

EUROMOD Online is always under continuous development, with the aim of improving users' experience and provide them with additional simulation options and indicators. For any question or suggestion do not hesitate to contact us at JRC-EUROMOD-ONLINE@ec.europa.eu.

3. References

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