

The Hypothetical Household Tool (HHoT) in EUROMOD

EUROMOD Technical Session

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Hypothetical Household Tool (HHoT):

- Hypothetical household simulation
- Value added of HHoT
- How does it work?
- HHoT statistical wizard
- HHoT and the EUROMOD-JRC interface

Hypothetical Household Simulations

- HHoT: recent EUROMOD application.
- User-generated hypothetical households.
- Advantages of simulations based on hypothetical data:
 - No need of survey data.
 - Easier analysis based on simple cases.

HHoT: state-of-the-art model for hypothetical household simulations

- HHoT unique features:
- **1- Flexibility and user-friendliness:**
 - Flexibility in family characteristics: e.g. household composition, employment status, education level, wage level.
 - Examples: multi-generational households, households with members on sickness...

HHoT: state-of-the-art model for hypothetical household simulations

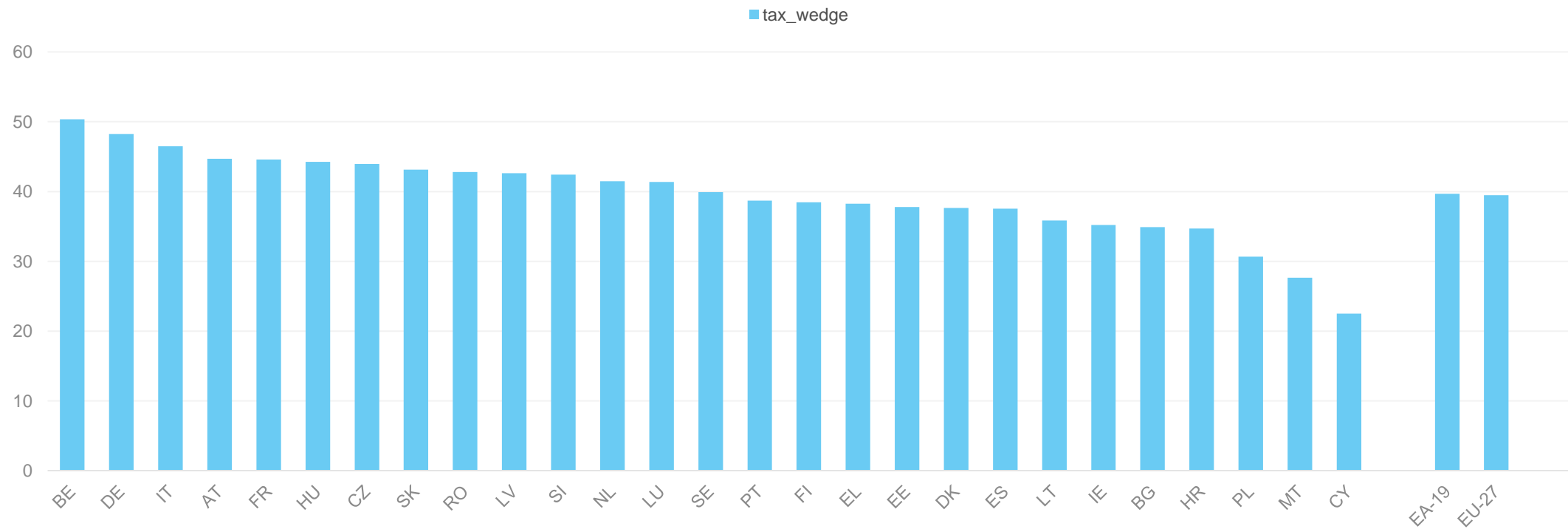
- **2- Full integration into EUROMOD framework, i.e.:**
 - regular and timely updates of policy rules
 - fully transparent policies and assumptions
 - validated systems
 - comparative framework that allows policy switches across countries
 - living model that benefits from extensions

HHoT: state-of-the-art model for hypothetical household simulations

- **3- Consistency and complementarity between microsimulations and HH simulations**
 - Hypothetical household (HH) simulations abstract from population composition: illustrative, simpler, but not for distributional analysis
 - Microsimulations: more complex, richer analysis of tax-policy reforms; analysis of budgetary impact and distributional effects
 - EUROMOD-HHoT allows combination of both types of analysis in a consistent way

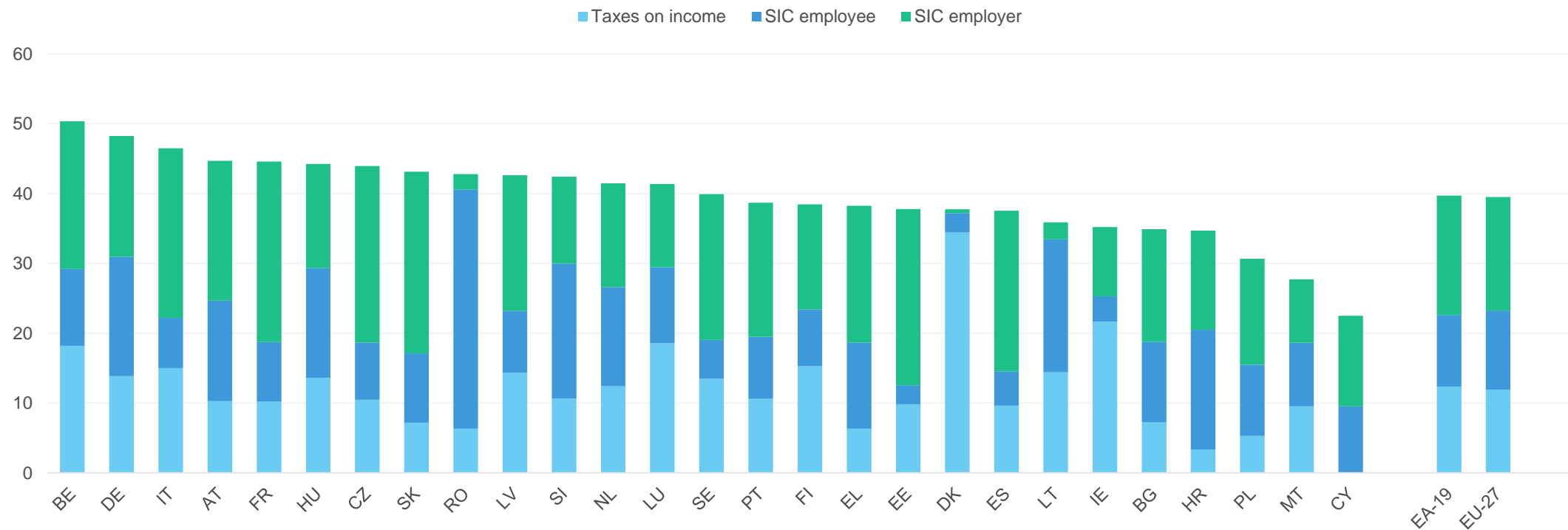
EU countries coverage

Tax wedge on labour for a single worker without children, 2020
(%)- 100% average wage; 2020, EU27



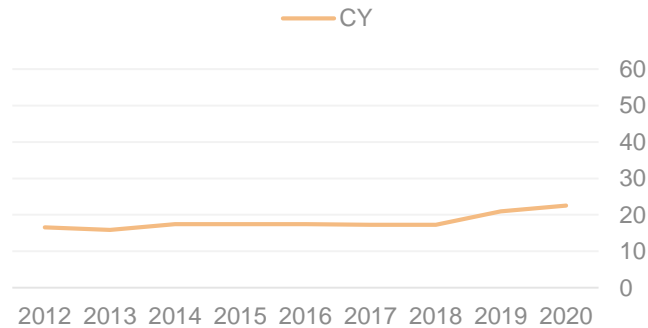
Decomposition across PIT/SIC/cash benefits

Decomposition of the tax wedge on labour (%), single worker - 100% average wage;
2020, EU27

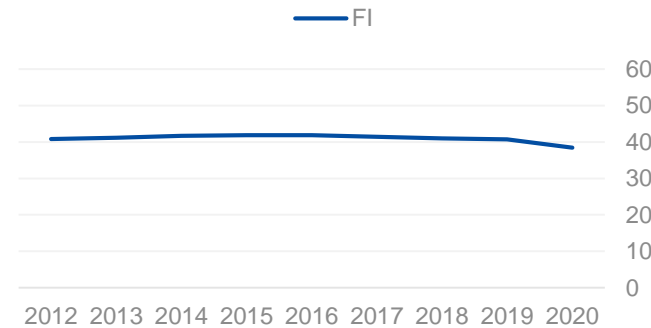


Analysis of trends

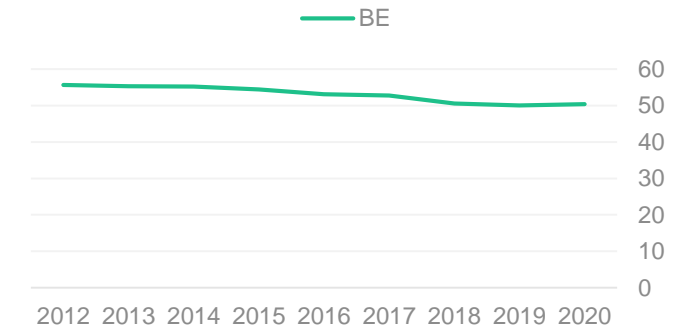
Evolution tax wedge (%), single worker -
100% average wage; 2012-2020



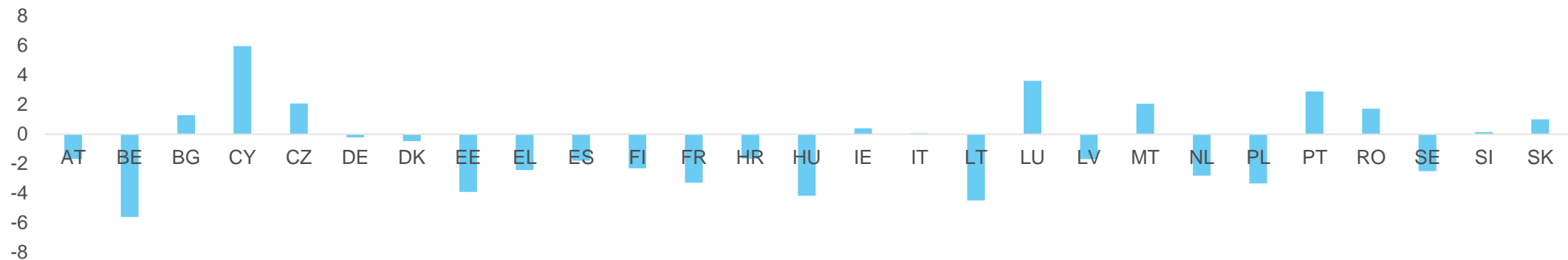
Evolution tax wedge (%), single worker -
100% average wage; 2012-2020



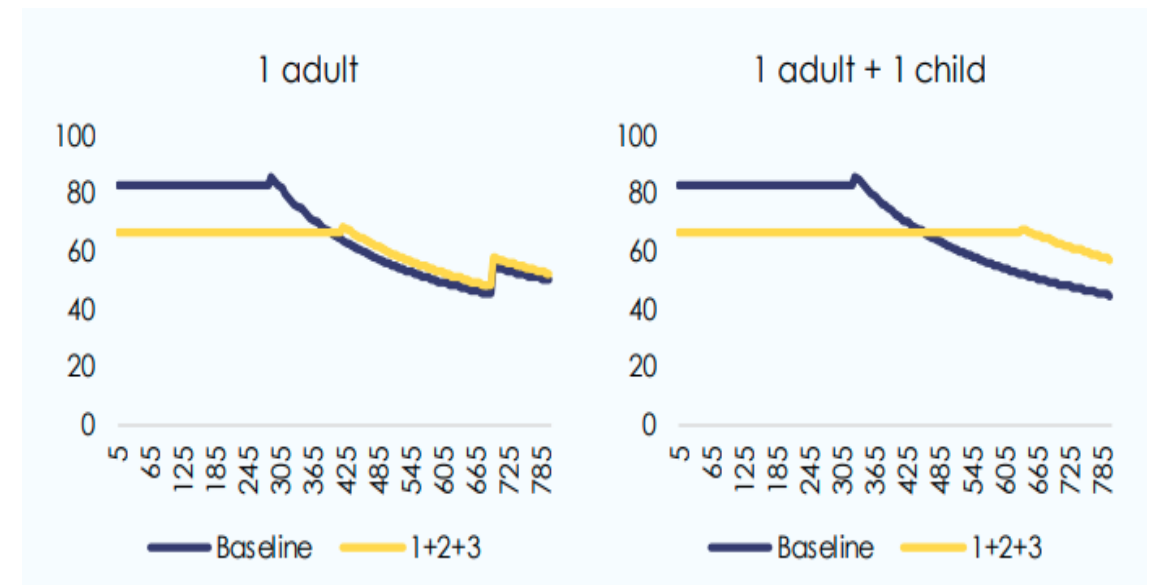
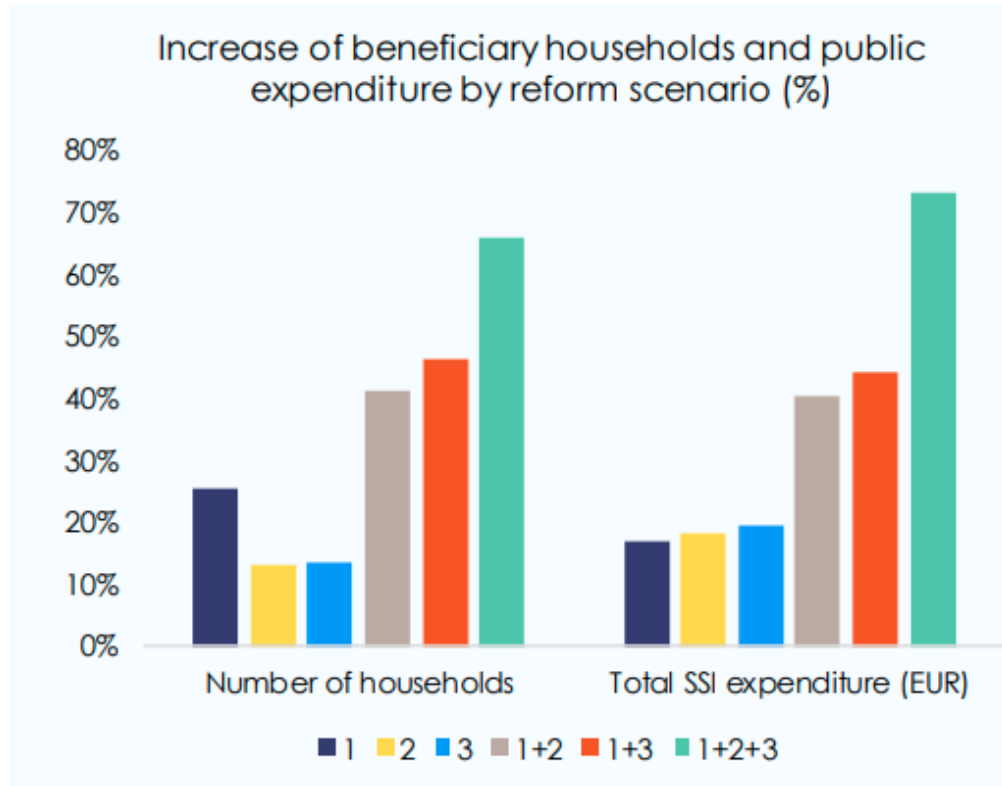
Evolution tax wedge (%), single worker -
100% average wage; 2012-2020



Tax wedge on labour for a single worker without children, average wage: 2020-2012 change in pps

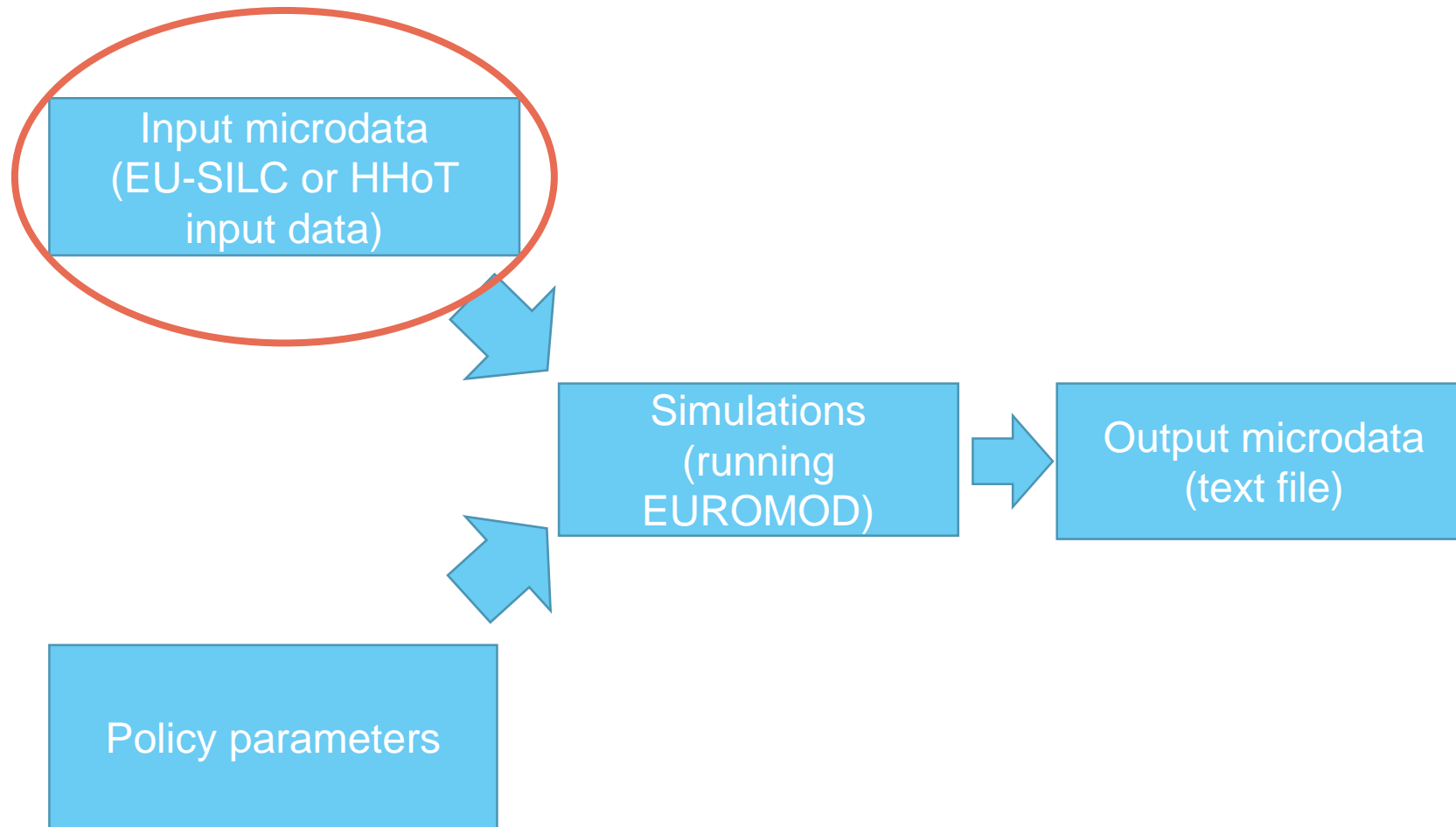


Complementarity with microsimulation on real data

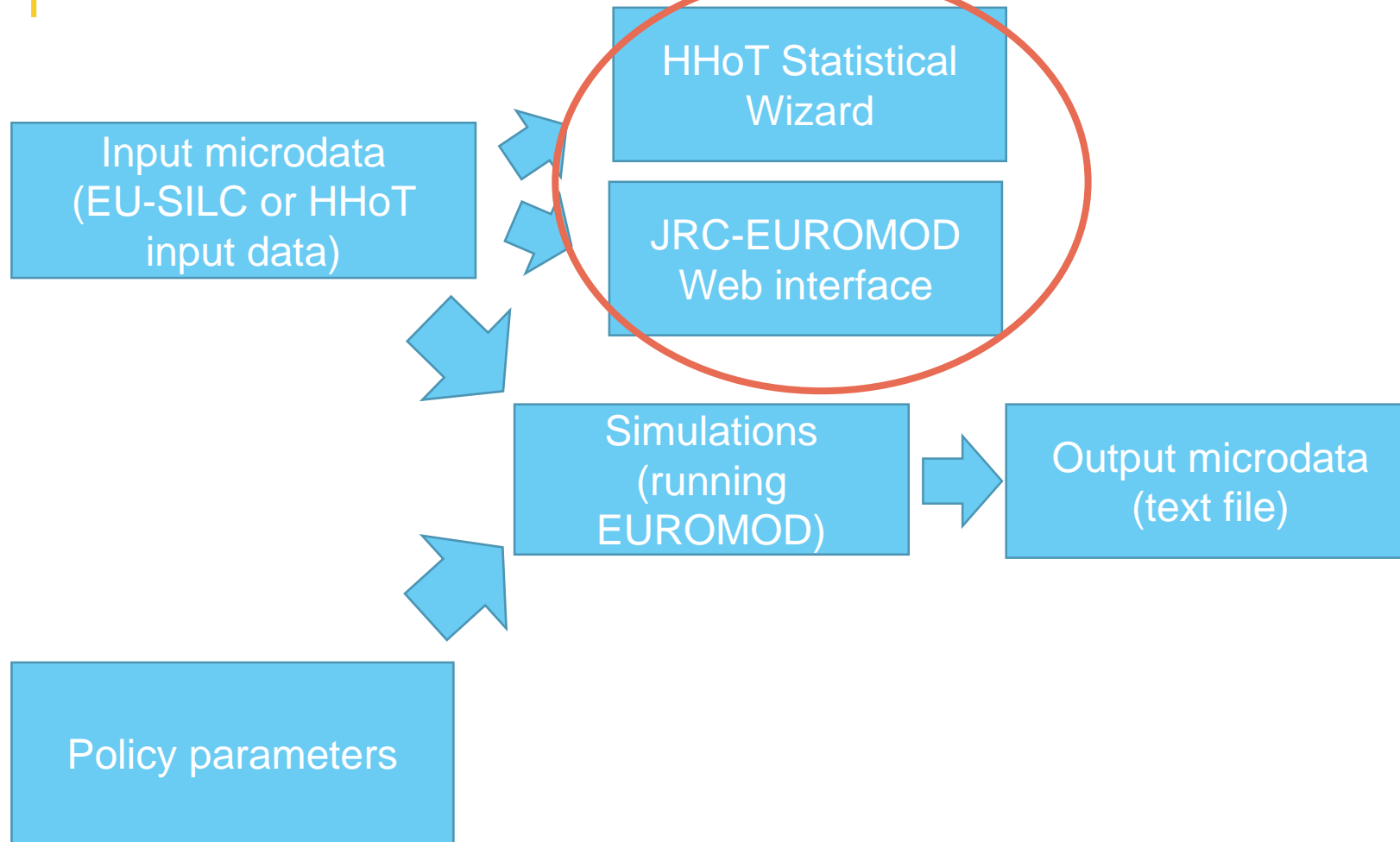


Source: European Commission, Joint Research Centre, based on the EUROMOD model. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020SC0507&from=EN>

Structure of EUROMOD

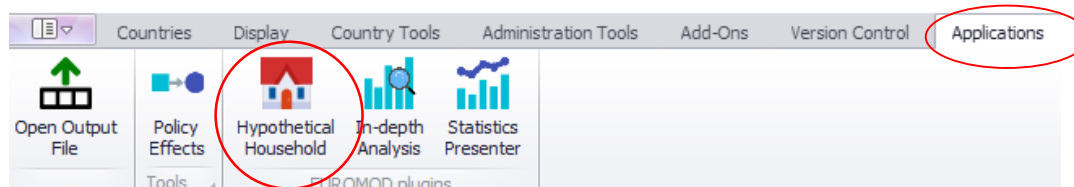


Structure of EUROMOD

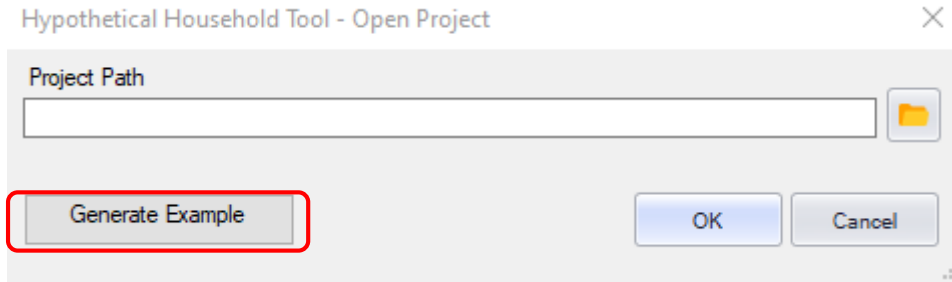


HHoT User interface

- HHoT accessible from the standard EUROMOD user interface

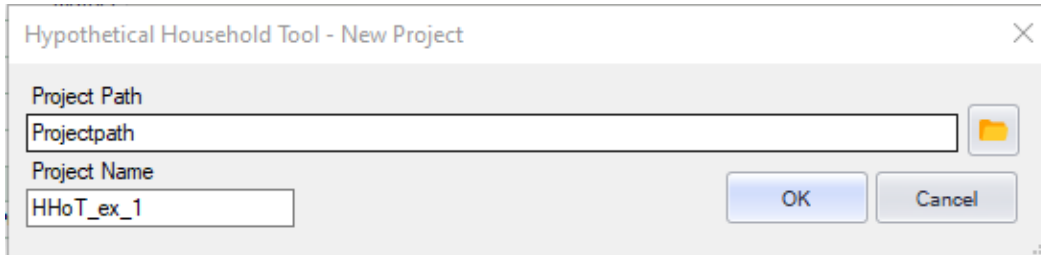


Getting started for the first time



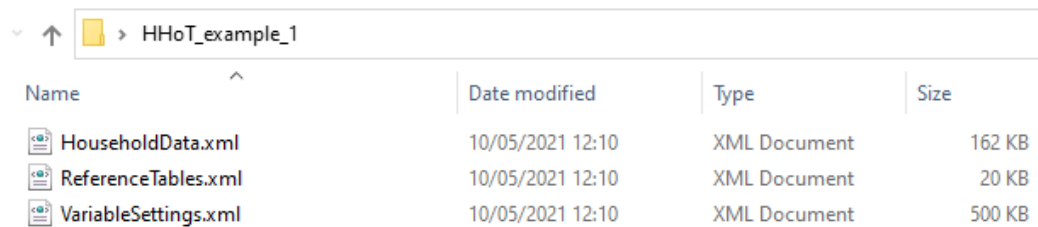
Getting started for the first time

- Project path
- Project name
- HHoT will remember this folder



The screenshot shows a dialog box titled "Hypothetical Household Tool - New Project". It contains two input fields: "Project Path" and "Project Name". The "Project Path" field has the text "Projectpath" and a folder icon button to its right. The "Project Name" field has the text "HHoT_ex_1". At the bottom right of the dialog are "OK" and "Cancel" buttons.

Getting started for the first time



Name	Date modified	Type	Size
HouseholdData.xml	10/05/2021 12:10	XML Document	162 KB
ReferenceTables.xml	10/05/2021 12:10	XML Document	20 KB
VariableSettings.xml	10/05/2021 12:10	XML Document	500 KB

- EUROMOD creates a folder using the Project Name and stores the following files in there:
- VariableSettings.xml
- HouseholdData.xml
- ReferenceTables.xml
- Next time, HHoT will open this project automatically

HHoT user interface

The screenshot shows the HHoT user interface with the following components highlighted by numbered red boxes:

- 1**: The ribbon bar at the top containing 'Project', 'View', 'Wizard', 'Advanced Options', 'Statistics', and 'Help'.
- 2**: The 'Defined households' section on the left, including icons for household types and a list with 'Example Household' selected.
- 3**: The 'Details of the household members' table, which displays demographic and economic data for four members: Father, Mother, Kid, and Kid2.
- 4**: The 'Selection countries and years' section at the top right, showing 'Countries: AT, BE, CZ' and 'Years: 2017, 2019, 2020'.
- 5**: The 'Variable Filter' bar located below the country and year selection.
- 6**: The 'Generate' button at the bottom center of the interface.

Below the table, a message states: 'Please check the families and people that you wish to generate the Household Data for.'

- The ribbon bar (1)
- Defined households (2)
- Details of the household members (3)
- Selection countries and years (4)
- The Variable Filter bar (5)
- The generate button (6)

Existing household type

Variable Filter:

Currently viewing: Example Household

	Father	Mother	Kid	kid2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Father	Father
mother			Mother	Mother
partner	Mother	Father		
education - current status	Not in education	Not in education	Lower Secondary	Primary
education - highest status	Post Secondary	Post Secondary	Lower Secondary	Primary
marital status	Married	Married	Single	Single
LABOUR MARKET				
economic status	Employee	Inactive	Pupil/Student	Pupil/Student
hours worked per week	40	0	0	0
in work : work history (length of time)	200	0	0	0

- First step is to define the household type we are interested to create data for.
- plug-in already contains an example household

Existing household type

Currently viewing: Example Ho	Father	Mother	Kid	kid2
DEMOGRAPHIC ^				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Father	Father
mother			Mother	Mother
partner	Mother	Father		
education - current status	Not in education	Not in education	Lower Secondary	Primary
education - highest status	Post Secondary	Post Secondary	Lower Secondary	Primary
marital status	Married	Married	Single	Single
LABOUR MARKET ^				
economic status	Employee	Inactive	Pupil/Student	Pupil/Student
hours worked per week	40	0	0	0
in work : work history (length c	200	0	0	0
INCOME ^				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earning	0	0	0	0
BENEFIT/PENSION ^				
Main contributory old-age pen:	0	0	0	0
ASSETS ^				
main residence : tenure	Rented	Rented	Rented	Rented
EXPENDITURE ^				
housing cost : rent	250	0	0	0
housing cost : other	0	0	0	0

- basic characteristics for each household members.
- Columns are household members.
- By default only basic variables displayed.

Existing household type

Currently viewing: Example Ho	Father	Mother	Kid	kid2
DEMOGRAPHIC ^				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Father	Father
mother			Mother	Mother
partner	Mother	Father		
education - current status	Not in education	Not in education	Lower Secondary	Primary
education - highest status	Post Secondary	Post Secondary	Lower Secondary	Primary
marital status	Married	Married	Single	Single
LABOUR MARKET ^				
economic status	Employee	Inactive	Pupil/Student	Pupil/Student
hours worked per week	40	0	0	0
in work : work history (length c	200	0	0	0
INCOME ^				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earning	0	0	0	0
BENEFIT/PENSION ^				
Main contributory old-age pen:	0	0	0	0
ASSETS ^				
main residence : tenure	Rented	Rented	Rented	Rented
EXPENDITURE ^				
housing cost : rent	250	0	0	0
housing cost : other	0	0	0	0

- The basic characteristics are classified into six categories:
 - Demographics
 - Labour market characteristics
 - Income components
 - Benefits/pensions
 - Assets
 - Expenditures

Numerical variables

- Most variables are numeric variables (e.g. incomes).
- Numeric Variable Editor to change value or set range.

in work : work history (length c	200	0	0	0
INCOME				
Main employment income	1000	0	0	0
Main self-employment income				
employment : previous earning				
BENEFIT/PENSION				
Main contributory old-age pen:				
ASSETS				
main residence : tenure				
EXPENDITURE				
housing cost : rent				

<input checked="" type="radio"/> Value	<input type="radio"/> Reference	<input type="text"/>
Starting Value: <input type="text" value="1000"/>		
<input type="checkbox"/> Ending Value:	<input type="text" value="0"/>	
Step:	<input type="text" value="0"/>	

Numerical variables

in work : work history (years)				
200				
0				
0				
0				
INCOME				
Main employment income	1000	0	0	0
Main self-employment income				
employment : previous earning	<input checked="" type="radio"/> Value <input type="radio"/> Reference			
BENEFIT/PENSION				
Main contributory old-age pen:	Starting Value:	0		
ASSETS				
main residence : tenure	<input checked="" type="checkbox"/> Ending Value:	1000		
EXPENDITURE				
housing cost : rent	Step:	100		
housing cost : other				

- Range of values by filling in a starting and ending value.
- The hypothetical household is automatically copied for each specified step

Numerical variables

- Case of Income, yem =1000, only one hh

	sft_h	sid_h	idhh	idperson	yem	
1	Example Household	143230940	1	101	1000	
2	Example Household	143230940	1	102	0	
3	Example Household	143230940	1	103	0	
4	Example Household	143230940	1	104	0	

Numerical variables

	sft_h	sid_h	idhh	idperson	yem
1	Example Household	143230940	1	101	0
2	Example Household	143230940	1	102	0
3	Example Household	143230940	1	103	0
4	Example Household	143230940	1	104	0
5	Example Household	143230940	2	201	100
6	Example Household	143230940	2	202	0
7	Example Household	143230940	2	203	0
8	Example Household	143230940	2	204	0
9	Example Household	143230940	3	301	200
10	Example Household	143230940	3	302	0
11	Example Household	143230940	3	303	0
12	Example Household	143230940	3	304	0
13	Example Household	143230940	4	401	300
14	Example Household	143230940	4	402	0
15	Example Household	143230940	4	403	0
16	Example Household	143230940	4	404	0
17	Example Household	143230940	5	501	400
18	Example Household	143230940	5	502	0
19	Example Household	143230940	5	503	0
20	Example Household	143230940	5	504	0
21	Example Household	143230940	6	601	500
22	Example Household	143230940	6	602	0
23	Example Household	143230940	6	603	0
24	Example Household	143230940	6	604	0
25	Example Household	143230940	7	701	600
26	Example Household	143230940	7	702	0
27	Example Household	143230940	7	703	0
28	Example Household	143230940	7	704	0

- With income defined as a range.
- Several households

Reference table

INCOME				
Main employment income	0-1000	0	0	0
Main self-employment income				
employment : previous earning	<input type="radio"/> Value <input checked="" type="radio"/> Reference			
BENEFIT/PENSION				
Main contributory old-age pen:	Starting Value:			
ASSETS	<input checked="" type="checkbox"/> Ending Value:			
main residence : tenure	Step:			
EXPENDITURE				
housing cost : rent				
housing cost : other				

- Use of reference values.
- The EU-silc average employment income are provided in the reference table.
- Advance option→ manage settings→ manage reference table
- Also range.

Other types of variables

- **Connection variables:** relationships between household members (defining parents and partners).
- **Categorical variables:** group or nominal category (e.g. education or economic status) and is implemented with a combo-box editor which provides a set of characteristics. The editor allows you to choose only one of several choices.

Advanced/derived variables

Hypothetical Household Tool - \\net1.cec.eu.int\jrc-services\SVQ-Users\paandre\Desktop\HHoT_example_1

Project View Wizard Advanced Options Statistics Help

☒ Show Advanced Variables
☒ Show Derived Variables
☐ Show only changed values
☐ Highlight changed values

countries: AT, BE, CZ Years: 2017, 2019, 2020
Selected countries: AT, BE, CZ Selected years: 2017, 2019, 2020

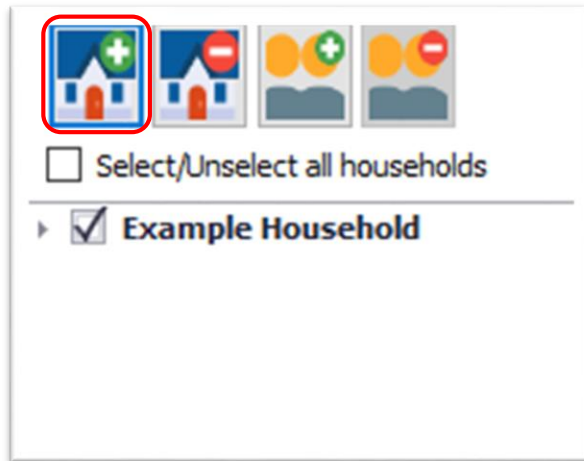
Variable Filter:

Currently viewing: Example Ho	Father	Mother	Kid	kid2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Father	Father
mother			Mother	Mother
partner	Mother	Father		
education - current status	Not in education	Not in education	Lower Secondary	Primary
education - highest status	Post Secondary	Post Secondary	Lower Secondary	Primary
marital status	Married	Married	Single	Single
region : nuts level 1 (drn1) [u]	Brussels	Brussels	Brussels	Brussels
region : nuts level 1 (drn1) [u]	Czechia	Czechia	Czechia	Czechia
region : nuts level 2 (drn2) [u]	Praha	Praha	Praha	Praha
citizenship (dcz) [used in AT]	Same country as...	Same country as...	Same country as...	Same country as...
disability (ddi) [used in all selec	No	No	No	No
disability : level (%) (ddlv) [us	0	0	0	0
municipality population (dmp) [>=100000	>=100000	>=100000	>=100000
consensual union (dcu) [used i	[default] --> 0	[default] --> 0	[default] --> 0	[default] --> 0
LABOUR MARKET				
economic status	Employee	Employee	Pupil/Student	Pupil/Student
hours worked per week	40	0	0	0
in work : work history (length c	200	0	0	0
collar (ld) [used in AT]	white collar worker	white collar worker	white collar worker	white collar worker
months worked in the last 24 m	12	12	12	12
months worked in the last 24 m	12	12	12	12
months worked in the last 12 m	6	6	6	6

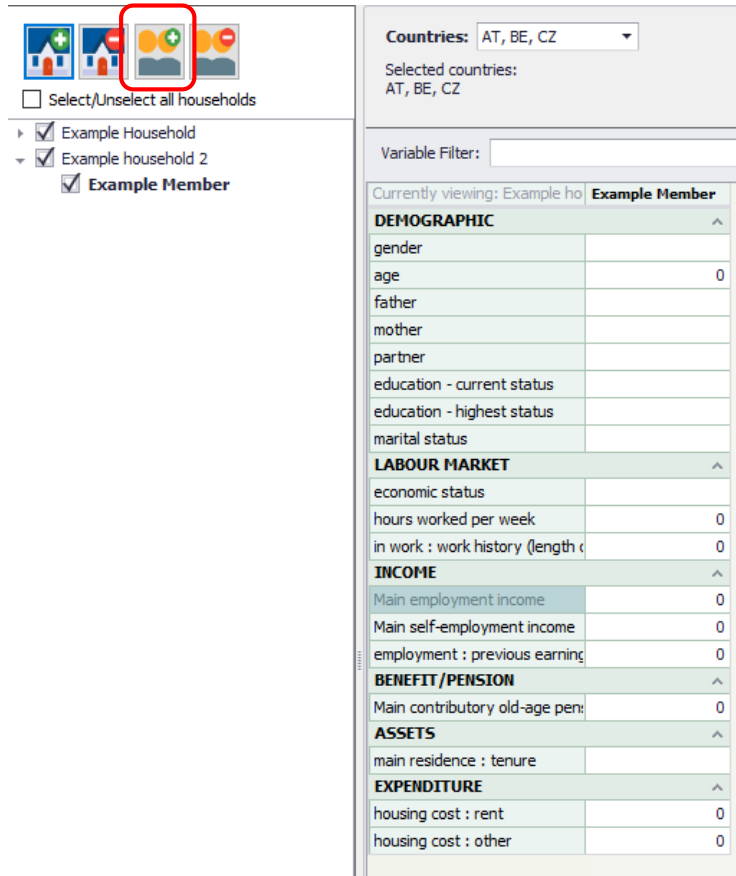
- **Advanced variables:** additional characteristics.
- **Derived variables:** value depends on another variable.
- view → show advanced/derived variable
- options → managed settings → manage advanced/derived variables

Adding/deleting a household type

- New types of households can be created



Adding household member



☐ Select/Unselect all households

☒ Example Household

☒ Example household 2

☒ **Example Member**

Countries: AT, BE, CZ

Selected countries: AT, BE, CZ

Variable Filter:

Currently viewing: Example ho **Example Member**

DEMOGRAPHIC	
gender	
age	0
father	
mother	
partner	
education - current status	
education - highest status	
marital status	
LABOUR MARKET	
economic status	
hours worked per week	0
in work : work history (length of)	0
INCOME	
Main employment income	0
Main self-employment income	0
employment : previous earnings	0
BENEFIT/PENSION	
Main contributory old-age pension	0
ASSETS	
main residence : tenure	
EXPENDITURE	
housing cost : rent	0
housing cost : other	0

- 'Add Person to Household' button.
- The user can modify the name of each household member by double left-clicking

Duplicating a household type

- A new household can be also be created by duplicating an existing one



New household

- Some basic characteristics missing!

Variable Filter:

Currently viewing: Example ho **Adult 1** **Child 1**

DEMOGRAPHIC		
gender		
age	0	
father		
mother		
partner		
education - current status		
education - highest status		
marital status		
LABOUR MARKET		
economic status		

Errors found

Missing values in 6 Basic Variables (gendermain residence :
tenureeducation - current statuseducation - highest statusmarital
statuseconomic status).

OK

Generate data

Hypothetical Household 1001 - \\net1.ccc.eu.int\jrc-services\svu-users\paandre\Desktop\HHoT_example_1

Project View Wizard Advanced Options Statistics Help

☐ Select/Unselect all households

☒ Example household 2

☒ Adult 1

☒ Child 1

Countries: AT, BE, CZ
Selected countries: AT, BE, CZ

Years: 2017, 2019, 2020
Selected years: 2017, 2019, 2020

Variable Filter:

Currently viewing: Example household

DEMOGRAPHIC	Adult 1	Child 1
Female	34	12
Male		
Adult 1		
Lower Secondary		
Tertiary		Primary
Single		Single
Employee		Pupil/Student
40		0
15		0
1000		0

Hypothetical Data Generation

You are about to generate a total of 9 files for 3 countries and 3 years.
These will contain the total amount of 18 people in 9 households.
Are you sure you want to continue?

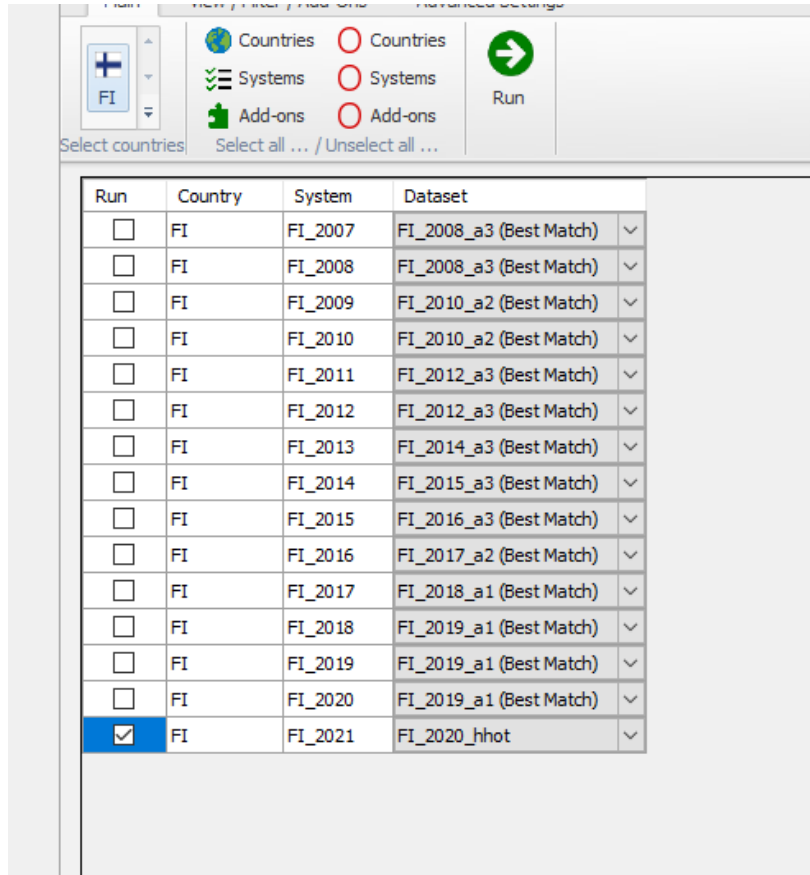
Output Folder:
c:\users\paandre\downloads\euromod_master_version_j3.40\input\

Generate Cancel

Generate

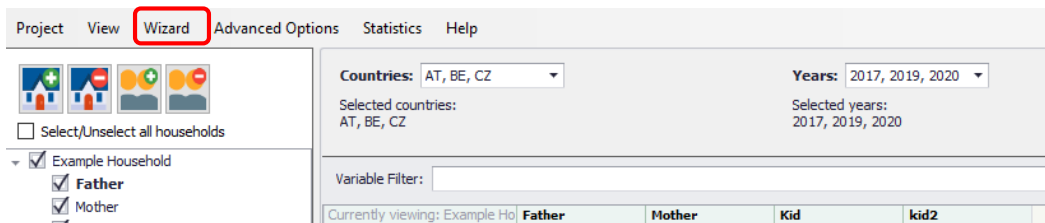
- You can select for which household types (only household 2), individuals, countries and years the data to be generated.
- By defaults, data is stored in the EUROMOD input data folder of the EUROMOD Project you started HHoT from.

Running EUROMOD with HHoT data



- HHoT data is generated with the name `cc_yyyy_hhot`.
- Each system since 2009 in EUROMOD has been tested and can be run with HHoT data for that year
- Selection possible in the run dialog

HHoT Statistics Wizard



- Statistics Wizard to create graphs and tables.
- The wizard uses the specified households, generates one or more HHoT input datasets,
- runs EUROMOD and creates graphs.

1) The 'Budget Constraints' Report

The screenshot shows the 'Statistics Wizard' dialog box with the following settings:

- Countries:** PT (Selected countries: PT)
- Years:** 2019 (Selected years: 2019)
- Statistic:** ☒ Budget Constraints (Other options: Break Down HH Types, Break Down Country/Year)
- Household Type:** ☒ Example Household
- Specifications Budget Constraints:**
 - Person in HH:** Father
 - ☐ Range Hours, Fixed Wage
 - ☐ Range Income, Fixed Wage
 - ☒ Range Wage, Fixed Hours
 - ☐ Range Income, Fixed Hours
- Wage from:** 0 **to:** 7 **Step:** 0.5
- Hours:** 40
- ☒ Produce all output in Euro
- Buttons:** Start, Cancel

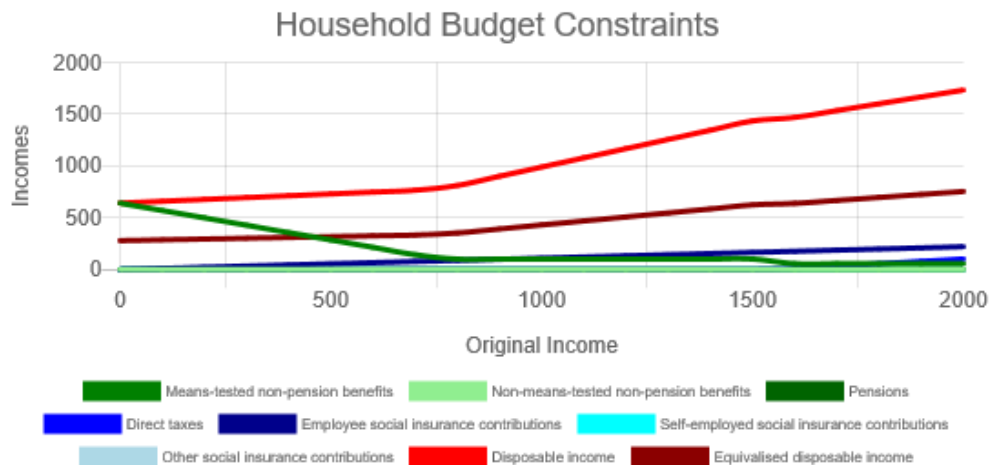
- budget constraints:
 - varying hours, wage fixed
 - Varying wage, hours fixed
 - Varying monthly earnings, fixed wage
 - Varying monthly earnings, fixed hours

1) The 'Budget Constraints' Report

EUROMOD Hypothetical Households Budget Constraints

Example Household, PT_2019

Household Budget Constraints, Example Household PT_2019



- Disposable income for increasing original income (yem, horizontal line)
- Components of disposable income shown
- The graph and underline data can be exported in Excel clicking on the floppy disk.

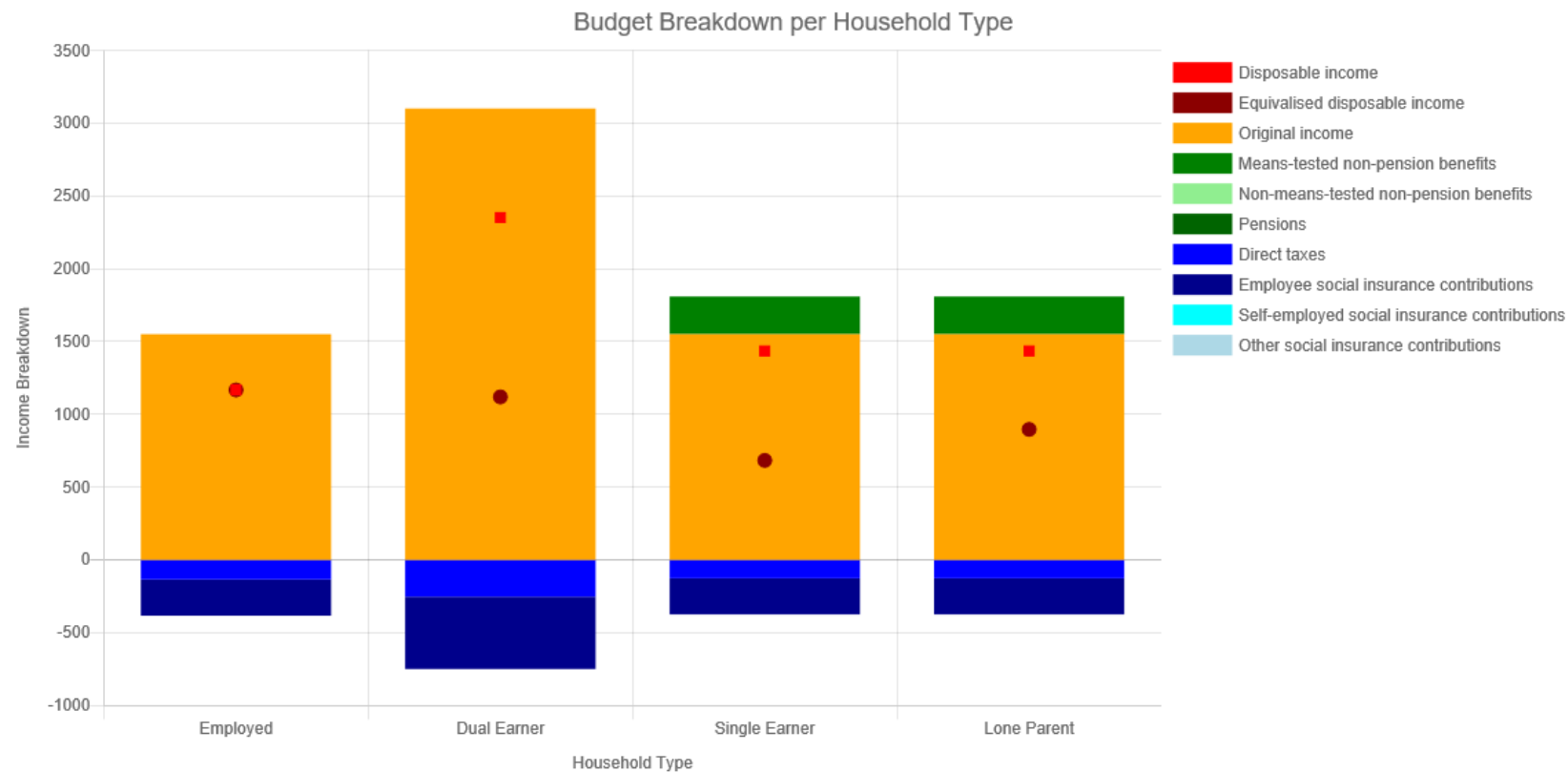
2)The 'Breakdown by Household Types' report

The screenshot shows the 'Statistics Wizard' dialog box. At the top, 'Countries' is set to 'EL' and 'Years' is set to '2019'. Below this, 'Selected countries' is 'EL' and 'Selected years' is '2019'. The 'Statistic' section has three radio buttons: 'Budget Constraints', 'Break Down HH Types' (which is selected and circled in red), and 'Break Down Country/Year'. The 'Household Type' section is also circled in red and contains four checkboxes: 'Employed', 'Lone Parent', 'Single Earner', and 'Dual Earner'. The 'Specifications Budget Constraints' section is partially visible, showing 'Person in HH' as a dropdown, and four radio buttons for 'Range Hours, Fixed Wage', 'Range Income, Fixed Wage', 'Range Wage, Fixed Hours', and 'Range Income, Fixed Hours' (which is selected). Below this, 'Income from' is '0', 'to' is '10000', 'Step' is '100', and 'Hours' is '40'. At the bottom, the checkbox 'Produce all output in Euro' is checked. The 'Start' button is circled in red, and the 'Cancel' button is next to it.

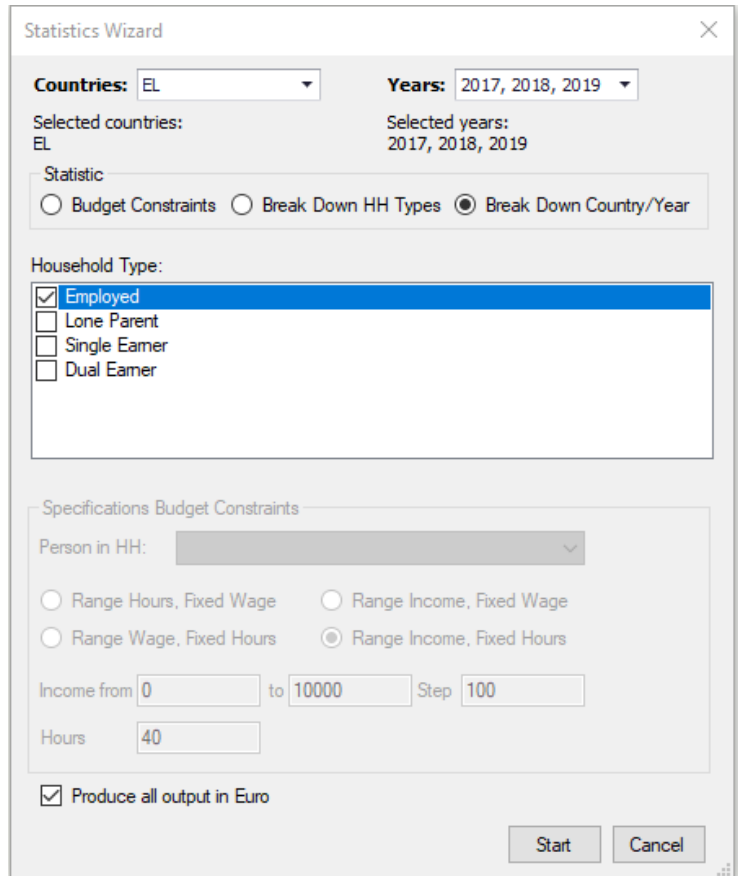
- Option 2: different type of Households budget as created in HHoT.

2)The 'Breakdown by Household Types' report

Budget Breakdown per Household Type



3) The 'Breakdown by Country/Year' report



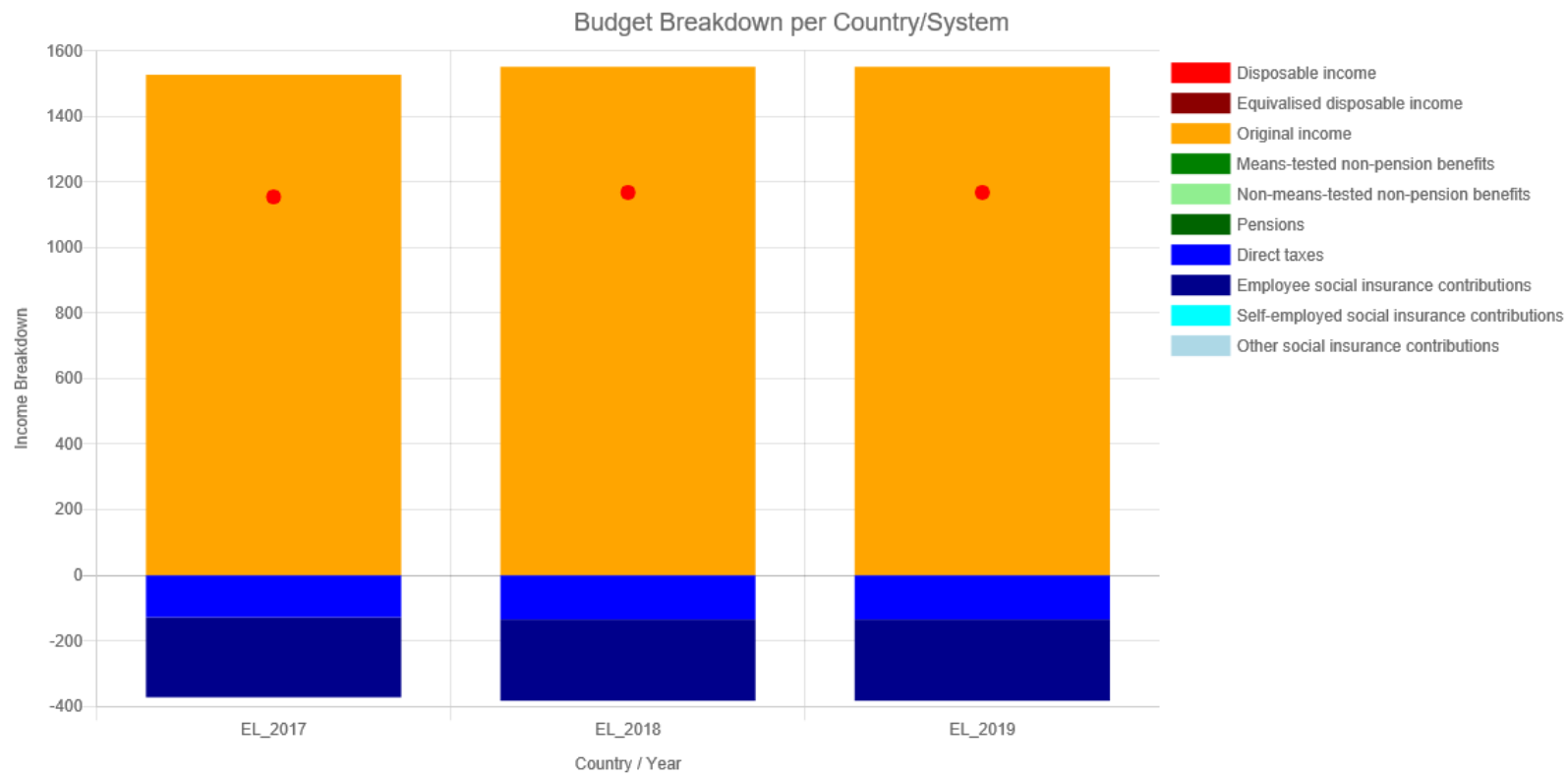
The screenshot shows the 'Statistics Wizard' dialog box with the following settings:

- Countries:** EL (Selected countries: EL)
- Years:** 2017, 2018, 2019 (Selected years: 2017, 2018, 2019)
- Statistic:** Break Down Country/Year (Selected)
- Household Type:** Employed (Selected), Lone Parent, Single Eamer, Dual Eamer
- Specifications Budget Constraints:**
 - Person in HH: (Dropdown menu)
 - Range Hours, Fixed Wage (Unselected)
 - Range Income, Fixed Wage (Unselected)
 - Range Wage, Fixed Hours (Unselected)
 - Range Income, Fixed Hours (Selected)
 - Income from: 0 to 10000 Step: 100
 - Hours: 40
- Produce all output in Euro:** (Checked)
- Buttons:** Start, Cancel

- Option 3: break down by country (this case only EL) and year (2017, 2018, 2019).

Breakdown by Country/Year

Budget Breakdown per Country/System
Employed



EUROMOD-HHoT available on the web-interface

Sweden

Sweden 2020

Select input data

☐ Survey microdata (SILC) ?

☒ Hypothetical data (HHoT) ?

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Simulations based on HHoT are experimental

Personal Income Tax

Schedule	Annual income components (SEK)	Marginal tax rate
Allowances Tax Credits	Bracket 1 > 0 ≤ 509299	0
	Bracket 2 > 509299	0.2
	Municipal tax	0.2072
	County council tax	0.1156
	Funeral tax	0.0023

Social Insurance Contributions

Medium-term impact of policy reforms

Country Notes

<https://euromod-web.jrc.ec.europa.eu/euromod-jrc-interface>

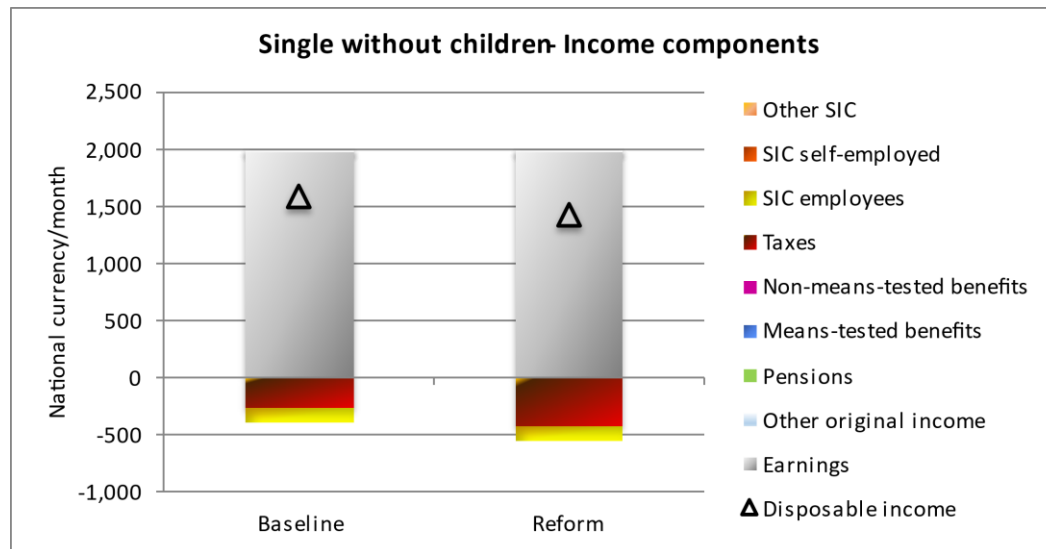
- Simplified online interface of EUROMOD that allows to run parametrical simulations on PIT and SIC reforms for all EU countries.
- Simulations can be now also run on a set of hypothetical households produced with HHoT.

EUROMOD-HHoT available on the web-interface

Main characteristics of the hypothetical households*				
Household composition	Adult 1	Adult 2	Child 1	Child 2
Single without children (1)	X			
One-earner couple without children (2)	X	X		
Two-earner couple without children (3)	X	X		
Single with two children (4)	X		X	X
One-earner couple with two children (5)	X	X	X	X
Two-earner couple with two children (6)	X	X	X	X
Main characteristics of household members	Adult 1	Adult 2	Child 1	Child 2
Gender	Male	Female	Female	Male
Age	40	40	13	7
Education - current status	Not in education	Not in education	Lower secondary	Primary
Education - highest status	Upper secondary	Upper secondary	Primary	n/a
Marital status	Single (1 & 4) / Married (rest)	Married	Single	Single
Salary (only source of income)	100% of EU-SILC average wage	150% of EU-SILC average wage (3 & 6) / 0 (2 & 5)	0	0
Main residence	Rented	Rented	Rented	Rented

- Set of households is fixed for the moment.

JRC EUROMOD-HHoT on the EUROMOD-JRC Interface



- Output is excel tables and graphs.
- Budget constrains, tax-wedges, marginal tax rates.
- In the future more flexibility.

Keep in touch



<https://euromod-web.jrc.ec.europa.eu/>



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Thank you



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