

EUROMOD TECHNICAL NOTE SERIES

EMTN 4.1

EUROMOD Hypothetical Household Tool (HHoT) - User manual

Katrin Gasior and Kakia Chatsiou

December 2019



EUROMOD Technical Note Series

This series includes documents and papers about EUROMOD or specific uses of it that are suitable for sharing with model users or others interested in technical background and for citing in papers using EUROMOD. It complements the EUROMOD Working Paper Series which mainly contains substantive papers making use of EUROMOD for research or policy analysis, prior to final publication elsewhere.

If you would like to submit a Technical Note to the series please send to euromod@essex.ac.uk.

The Technical Note series includes documents that are regularly updated and this is reflected in the numbering and, where relevant, revision information in the following table:

Title	How revised?	EMTN No.	Date of revision
EUROMOD Hypothetical Household Tool (HHoT) – User manual	First version for Technical Note series	4.0	December 2017
	Updated	4.1	December 2019

Citation

Please cite this document as Katrin Gasior and Kakia Chatsiou, 2019, EUROMOD Hypothetical Household Tool (HHoT) – User manual, EUROMOD Technical Note EMTN 4.1, Colchester: Institute for Social and Economic Research, University of Essex.

Editorial Note

The Hypothetical Household Tool (HHoT) has been developed by Katrin Gasior, Chrysa Leventi, Kostas Manios, Olga Rastrigina, Pasquale Recchia and Holly Sutherland at the University of Essex and Tim Goedemé, Tine Hufkens, Natascha Van Mechelen and Gerlinde Verbist at the University of Antwerp as an application of the EUROMOD software. The development of the application was supported by the InGRID (Inclusive Growth Research Infrastructure Diffusion) project funded by the European Commission's 7th Framework Programme under the 'Capacities' heading and involved 17 European partners. EUROMOD is maintained, developed, and managed by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. The process of extending and updating EUROMOD is financially

supported by the European Union Programme for Employment and Social Innovation 'Easi' (2014-2020). Comments are welcome and should be sent to euromod@essex.ac.uk.

EUROMOD

HYPOTHETICAL HOUSEHOLD TOOL

(HHoT)



USER MANUAL

Last updated: 10 December 2019

Katrin Gasior and Kakia Chatsiou

Contents

1	What is HHoT?	4
2	HHoT User interface	4
2.1	Getting started for the first time	5
2.2	The Ribbon HHoT Menu	8
2.2.1	Project	8
2.2.2	View	9
2.2.3	Wizard	9
2.2.4	Advanced Options	9
2.2.5	Statistics	10
3	Creating your hypothetical households	10
3.1	Defining household types	10
3.1.1	Adding/deleting a household type	11
3.1.2	Adding/deleting a household member	12
3.1.3	Selecting/unselecting household or individual	13
3.1.4	Defining the characteristics of household members	14
3.2	Defining and Editing Variables	16
3.2.1	Defining connection variables	16
3.2.2	Defining categorical variables	17
3.2.3	Defining numeric variables	17
3.2.4	Defining monetary variables	20
3.3	Filtering variables	20
3.4	Selecting countries or years	21
4	Generating the Hypothetical Data	22
5	Running EUROMOD with HHoT data	24
6	Additional HHoT functionalities	26
6.1	Saving and loading Hypothetical Household files	26
6.2	Generating Hypothetical Data using the HHoT Statistics Wizard	26
6.2.1	The 'Budget Constraints' Report	28
6.2.2	The 'Breakdown by Household Types' report	34
6.2.3	The 'Breakdown by Country/Year' report	35
6.2.4	Creating graphs and tables using the Statistics option	37
6.3	Advanced Options – Import	37
6.4	Advanced Options - Manage Settings	38
6.4.1	Manage Categories, Countries and Years	38
6.4.2	Managing basic variables	39

6.4.3	Managing advanced variables	41
6.4.4	Managing country-specific advanced variables.....	41
6.4.5	Managing derived variables.....	42
6.4.6	Managing a reference table.....	43
6.5	View - Show advanced variables	44
6.6	View - Show only/highlight changed values.....	45
	References	47

1 What is HHoT?

The Hypothetical Household Tool (HHoT) is a EUROMOD extension (plug-in) for designing hypothetical households and generating data according to the chosen household characteristics. This hypothetical household data can then be used to estimate the effects of taxes and benefits on household disposable income.

Traditionally, EUROMOD is used for analysing the distributive, labour market and budgetary impact of tax-benefit policies and policy changes. To do so, detailed and representative data on persons and households are required. With the HHoT extension, users can create their own hypothetical data, which allows them to better understand how policies work for households with specific characteristics, while giving them full control over the characteristics of interest (Gasior and Recchia 2019).

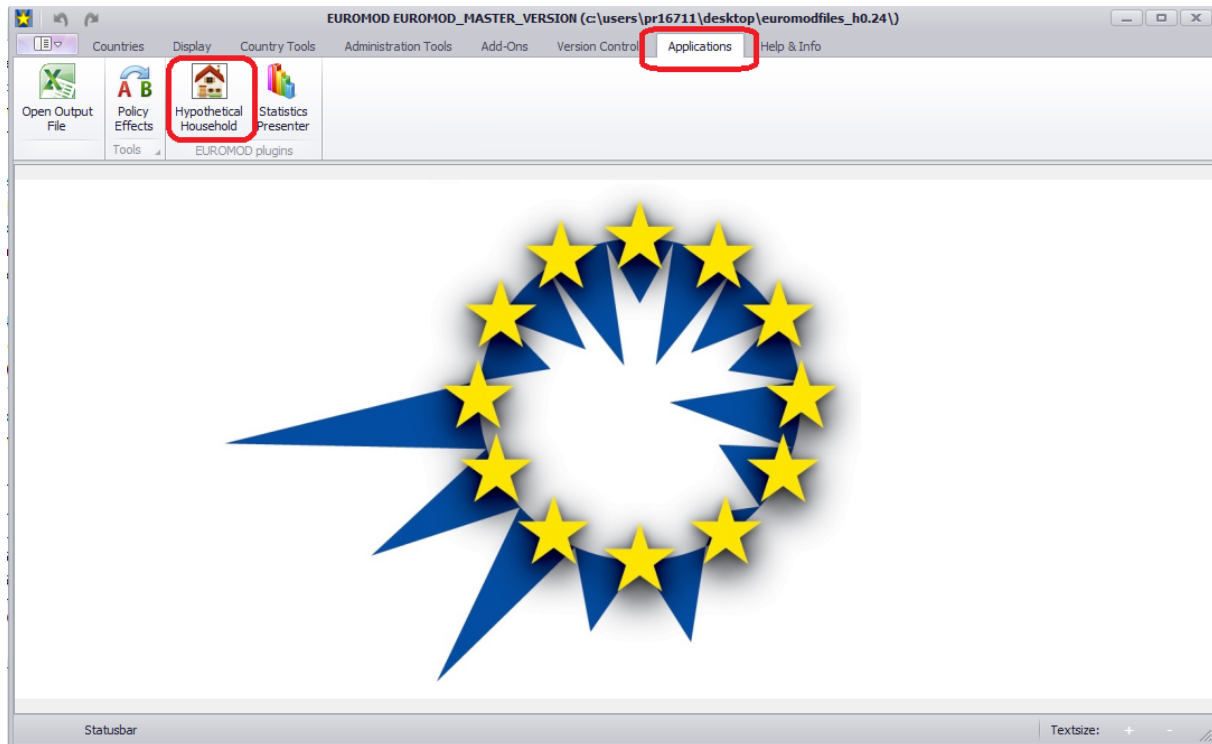
HHoT generates specified hypothetical household input datasets in the standard EUROMOD input data format, which can then be used with the EUROMOD software to perform tax and benefit microsimulations. The flexibility of the tool allows users to specify a broad spectrum of different hypothetical households. The specification of household composition and other characteristics is only limited by the scope of variables in EUROMOD input data¹. For example, three (or more) generation households can be included, as well as a variety of labour market statuses and income sources. HHoT allows users to compose, save, use and re-use their own database of hypothetical households.

Let's begin by exploring the HHoT User interface and trying to generate some hypothetical household data.

2 HHoT User interface

The HHoT plug-in can be accessed within the standard EUROMOD user interface. It can be found in the EUROMOD ribbon bar under *Applications* (Figure 1).

Figure 1. How to access HHoT through the EUROMOD interface



2.1 Getting started for the first time

If this is the first time you are running the plugin, the next step is to define the path where your HHoT project will be stored. In the dialogue box that appears, click on the 'Generate Example' button (Figure 2). Then provide a folder path where the HHoT project should be saved, along with a project name and click OK (Figure 3). EUROMOD automatically creates a folder using the Project Name and stores the following files in there:

- VariableSettings.xml: This includes information about the variable settings (see section 3.2)
- HouseholdData.xml: This includes information on each of the hypothetical households created using the HHoT tool. (see section 3.1)
- ReferenceTables.xml: This includes information on each of the reference tables included in the HHoT tool (see section 6.4)

If you have used HHoT before, the tool will open automatically the most recent project you loaded.

Figure 2. Using HHoT for the first time

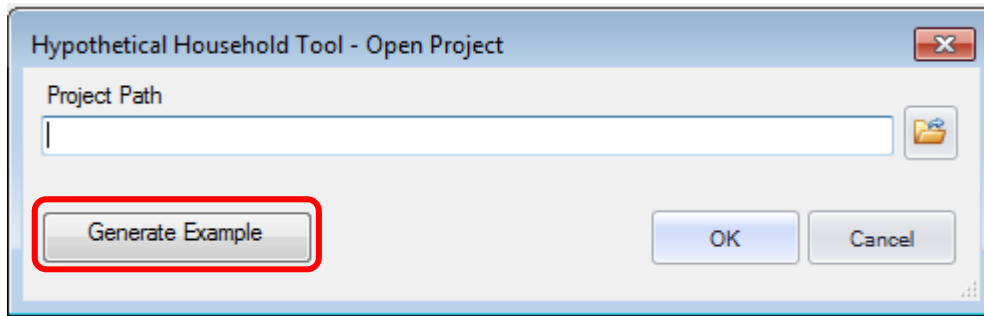
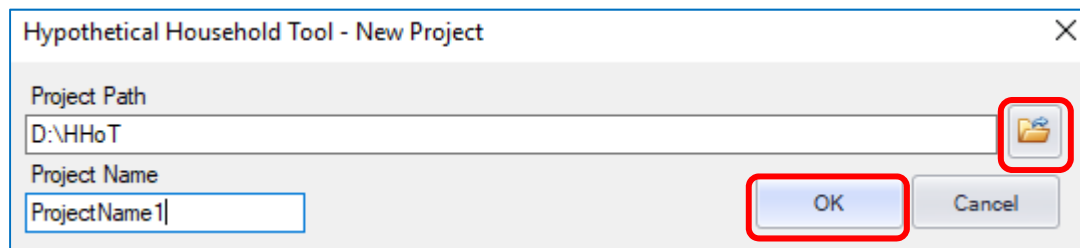


Figure 3. Selecting the HHoT project folder



The interface consists of the following elements (Figure 4):

- The ribbon bar (1)
- The left panel with the structure of the defined households (2)
- The main panel with the details of the individual household members (3)
- The top panel to select the countries and years for which input data will be generated (4)
- The Variable Filter bar (5) which allows you to filter the variables in (3) by a specific keyword
- The generate button (6) allows you to generate the hypothetical household data after you are happy with the parameters set up.

Figure 4. HHoT user interface

Hypothetical Household Tool - C:\Users\achats\Box\myBox\WorkBox\Datasets\EUROMOD\HHoT\Manual

Project View Wizard Advanced Options Statistics Help

☐ Select/Unselect all households
☒ Example Household
☒ Adult1
☒ Adult2
☒ Child1
☒ Child2

Countries: AT, BE, DE
 Selected countries: AT, BE, DE
 Years: 2013, 2014, 2015
 Selected years: 2013, 2014, 2015

Variable Filter:

Currently viewing: Example Household

	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2
partner	Adult2	Adult1		
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 peni	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

Please check the families and people that you wish to generate the Household Data for.

Generate

The next section presents the different elements of the HHoT interface in more detail, including pointers to more advanced functions accessible from the main interface.

2.2 The Ribbon HHoT Menu

The ribbon menu (Figure 5) provides different options for the user from creating a new project, saving a project, changing view options, changing default variable values as well as generating statistics using the hypothetical household data.

Figure 5. HHoT menu ribbon

Hypothetical Household Tool - C:\Users\achats\Box\myBox\WorkBox\Datasets\EUROMOD\HHoT\Manual

Project View Wizard Advanced Options Statistics Help

☐ Select/Unselect all households

☒ Example Household

- ☒ Adult1
- ☒ Adult2
- ☒ Child1
- ☒ Child2

Please check the families and people that you wish to generate the Household Data for.

Countries: AT, BE, DE **Years:** 2013, 2014, 2015

Selected countries: AT, BE, DE
Selected years: 2013, 2014, 2015

Variable Filter:

Currently viewing: Example Household

	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2
partner	Adult2	Adult1		
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)	200	0	0	0
INCOME				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earnings	0	0	0	0
BENEFIT/PENSION				
Main contributory old-age pension	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

Generate

2.2.1 Project

Clicking on 'Project' will open the project options. From this menu you can:

- create a new HHoT project ('New')
- open an existing HHoT project ('Open')
- save progress in the current HHoT project (overwrites the current project file in the current project folder) ('Save')
- save existing open HHoT project with a new name (in a new location and with a new project name) ('Save as')

2.2.2 View

Clicking on 'View' opens the View project options. Selecting a household from the panel on the left and clicking on each of these options in turn, shows (or hides) variables and values in the main panel as follows:

- 'Show Advanced Variables'. To start with, the main panel shows only the basic variables. This option will show the advanced variables. For more information see section 6.5. Unselecting this option will hide the advanced variables.
- 'Show Derived Variables'. Selecting this option will show derived variables i.e. the variables for which the value depends on the specified value of another variable for more information see section 6.4. Unselecting this option will hide the derived variables.
- 'Show only changed values'. This option compares the current Household member value for a variable, with the default value in the variable settings. If any of the members has a non-default value, the row is shown.
- 'Highlight changed values'. This option is similar to the 'Show only changed values' option but highlights values different from the default settings.

Note: Basic variables do not have default values and thus will always be highlighted or shown when the above view options are selected.

2.2.3 Wizard

Clicking on the 'Wizard' ribbon will open the HHoT wizard. The wizard allows you to automatically generate graphs based on the specified households and the selected countries and years for various statistic types from a single window. The Wizard is discussed in more detail in section 6.2.

2.2.4 Advanced Options

Clicking on the 'Advanced Options' ribbon menu item, will let you define advanced options for the following two types of options:

- 'Import': this will let you import households, variables and reference tables from other projects. You will need to specify the path where the project is saved.
- 'Manage Settings (Figure 8)': this option will let you manage settings for different types of elements in the HHoT tool, such as categories, countries, years, basic variables, advanced variables, advanced country-specific variables, derived variables, reference tables.

More details on the different advanced options are available in sections 6.3 and 6.4.

2.2.5 Statistics

Clicking on the 'Statistics' menu ribbon item, will let you load EUROMOD output files that you have already generated based on hypothetical household data and produce some basic statistics, namely:

- a 'Break down per Household Type': this creates bar charts showing the income by household type disaggregated by income types for each system (country/year).
- a 'Break down per Country/Year': this creates bar charts showing the income by country and system disaggregated by income types for each selected household.
- a 'Budget Constraints' report: this creates a table and graph of disaggregated income for a specific household type, given a range in the earnings.

The reports generated are the same as the ones output when using the Wizard - see section 6.2 more details.

3 Creating your hypothetical households

The first step when working with hypothetical data is to specify certain parameters (Figure 6), namely:

- (1) define your household types (see section 3.1)
- (3) define the household members' characteristics living in these households (see page 12)
- (2) select the system (countries and years) you are interested in using (see page 21)

3.1 Defining household types

Household types can be defined using the left panel (Figure 6– 1). When the user opens HHoT, the plug-in already contains an example household (two adults and two children).

Figure 6. HHoT user interface

Hypothetical Household Tool - C:\Users\achats\Box\myBox\WorkBox\Datasets\EUROMOD\HHoT\Manual

Project View Wizard Advanced Options Statistics Help

☐ Select/Unselect all households
☒ Example Household
☒ Adult1
☒ Adult2
☒ Child1
☒ Child2

Countries: AT, BE, DE
 Selected countries: AT, BE, DE
 Years: 2013, 2014, 2015
 Selected years: 2013, 2014, 2015

Variable Filter:

Currently viewing: Example Household

	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2
partner	Adult2	Adult1		
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
INCOME				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earnings	0	0	0	0
BENEFIT/PENSION				
Main contributory old-age pension	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

Please check the families and people that you wish to generate the Household Data for.

Generate

It is also possible to download a set of example households from the web (<https://www.euromod.ac.uk/using-euromod/user-resources/hhot-manual-households>).

These are the hypothetical households used in Gasior and Recchia (2019) to compute HHoT baseline indicators and provide a starting point for the generation of hypothetical household data. See section 6.1 for more information on how to load a hypothetical household .xml file.

3.1.1 Adding/deleting a household type

To add a new household type, click on the 'Add Household' button (1) as shown on the left part of Figure 7 – 1. The adjacent button (2) deletes the selected household.

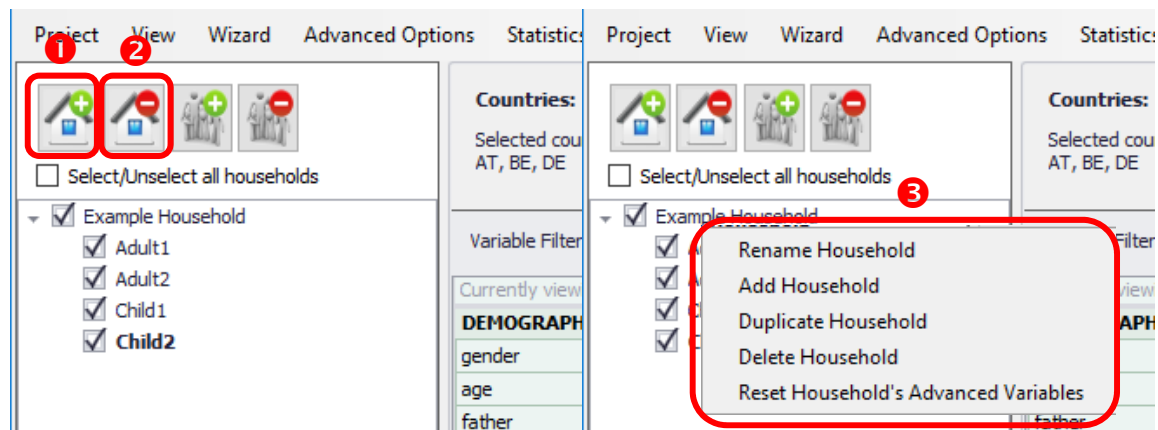
Alternatively, household types can be added/deleted by right-clicking on an existing household type (Figure 7 - 3). This action opens a context menu that allows for several options, such as renaming, adding, duplicating or deleting a household type. The option 'Duplicate Household' copies an existing household type and the newly generated twin household type can then be revised. The last option allows the resetting of the household's advanced variables (see page 41).

You can modify the name of each household type by double left-clicking on the current name and revising it (e.g. Single2C for a single parent with two children) or using the context menu

as mentioned before. The name of the household is stored in the HHoT created dataset as a string variable called “sft_h”. It can be used to identify the specific household in the dataset and is also used by the wizard (see section 6.2).

The order of households can be changed by clicking on a household and dragging it up/down.

Figure 7. Add/delete a new household type

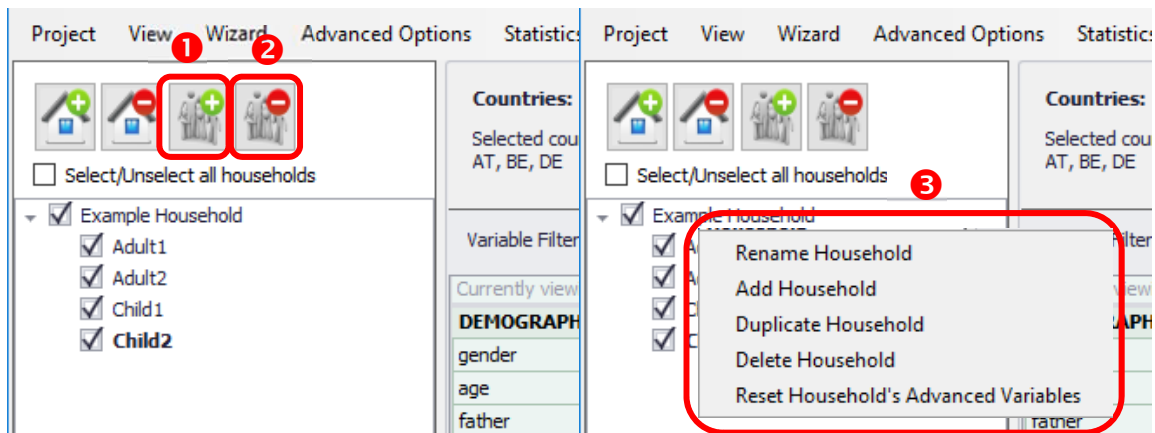


3.1.2 Adding/deleting a household member

To add a new household member, click the ‘Add Person to Household’ button (Figure 8 - 1) as shown on the left part of Figure 8. The adjacent button serves to delete a household member (Figure 8 - 2). Similar to household type, household members can also be added by right-clicking on an existing household member (Figure 8 - 3). This action opens a context menu that allows for several options, such as renaming, adding, duplicating or deleting a household member. The last option allows the resetting of the selected member’s advanced variables (see section 6.4 for more information on advanced variables). Note that this option does not reset household-wide variables but only the individual ones.

The user can modify the name of each household member by double left-clicking on the current name and editing it or using the context menu as mentioned before. Like the household type also the order of household members can be changed by dragging members up/down.

Figure 8. Add/delete a new household member

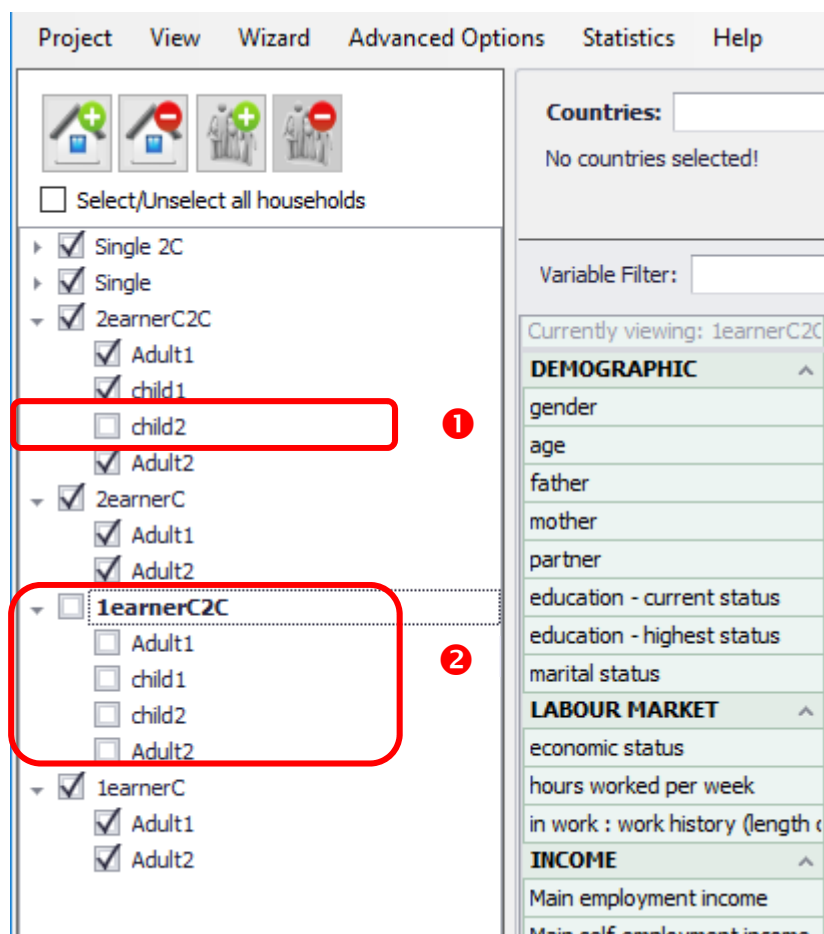


3.1.3 Selecting/unselecting household or individual

The user can create several household types but can then select which households will be generated. The same is true for individual household members. Each household and individual have a checkbox on its left that allows the user to select or unselect by ticking/unticking the box (Figure 9). If a household is unselected (2), all the individuals in the household will be automatically unselected. An unselected individual or household will no longer be shown in the main panel and will not be included in the generated HHoT dataset.

It is also possible to select/unselect all household types using the checkbox at the top.

Figure 9. Unselecting an individual (1) or a whole household (2) using the check-box



3.1.4 Defining the characteristics of household members

You can define the basic characteristics of each household member in the main panel (Figure 6 – 3). Only the selected household types are shown in the main panel. To modify a household, left-click on the name of a household or one of its members in the left panel (Figure 6 – 1). The name of the household currently shown in the main panel is mentioned in the very top-left cell of the table (e.g. “Currently viewing: Example Household” above “Demographic” in Figure 10).

Each column represents one household member. The rows show the characteristics of each household member. The basic characteristics are classified into six categories:

- Demographics
- Labour market characteristics
- Income components
- Benefits/pensions
- Assets
- Expenditures

Additional characteristics can be defined using advanced variables (see section 6.4).

Figure 10. Main panel of the HHoT interface

Currently viewing: Example Household (sid_h: 143230940)				
	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC ^				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2
partner	Adult2	Adult1		
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 in months)	200	0	0	0
INCOME ^				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earnings	0	0	0	0
BENEFIT/PENSION ^				
Main contributory old-age pension	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

If you hover the mouse on any of the variable descriptions in the main panel, a tooltip will show the variable name associated to each characteristic (see for example Figure 11: hovering over 'age' variable shows that the name of the age variable is 'dgn' in all countries):

Figure 11. Hovering over the 'age' variable

Currently viewing: Example Household (sid_h: 143230940)				
	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC ^				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2

Variable used:
dgn in all countries

Variables can be defined on two different assessment levels: *individual* and *household*.

An individual variable can have different values for each household member while a household level variable has the same value for all the persons in the household.

Users can identify if a variable is defined at individual or household level using the manage variables option and looking at the relative table (see section 6.5). Sometime users have to be very careful about this difference when it is derived from a EUROMOD convention. For example, in Figure 12 the variable for tenure (*amrtn*) is defined at the household level and assumes the same value for all household members by default, while variable rent cost (*xhcr*) is defined at the individual level and it is usually assigned only to the head of the household.

Figure 12. Variables defined at a household (tenure) and individual level (rent).

Variable Filter: re				
Currently viewing: Example Household (sid_h: 143230940)	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC				
education - current status	Not in education	Not in education	Lower Secondary	Primary
INCOME				
Main employment income	1000	0	0	0
Main self-employment income	0	0	0	0
employment : previous earnings	0	0	0	0
ASSETS				
main residence : tenure	Rented	Rented	Rented	Rented
EXPENDITURE				
housing cost : rent	250	0	0	0

In HHOT, characteristics of households and household members are specified using three types of variables: connection variables, categorical variables and numeric variables.

3.2 Defining and Editing Variables

3.2.1 Defining connection variables

Connection variables determine the **relationships** between household members (defining parents and partners).

In Figure 13, shows another example of a hypothetical household, where the partner of Adult1 is defined as Adult2 and Adult1 as the partner of Adult2. Adult1 is defined as the mother of both children and Adult2 as the father of both children. Furthermore, Adult3 is defined as Adult2's widowed mother, giving an example of a three-generation family.

Figure 13. Defining connection variables

Variable Filter:					
Currently viewing: learnerC2C	Adult1	child1	child2	Adult2	Adult3
DEMOGRAPHIC					
gender	Female	Male	Male	Male	Female
age	40	6	4	40	70
father		Adult2	Adult2		
mother		Adult1	Adult1	Adult3	
partner	Adult2			Adult1	
education - current status	Not in education	Primary	Pre-school	Not in education	Not in education
education - highest status	Lower Secondary	Not completed p...	Not completed p...	Lower Secondary	Lower Secondary
marital status	Married	Single	Single	Married	Widowed
LABOUR MARKET					
economic status	Employee	Pupil/Student	Pupil/Student	Inactive	
hours worked per week	40	0	0	0	0
in work : work history (length c	120	0	0	0	0

3.2.2 Defining categorical variables

A categorical variable is a variable that assigns an individual to a particular group or nominal category (e.g. gender, 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.

You can define (or change) the value of a categorical variable by left-clicking on the current value and using the combo-box editor. In Figure 14, for example, the user can choose between different options to define Adult1's current educational status.

Figure 14. Defining categorical variables

Variable Filter:

Currently viewing: learnerC2C Adult1 child1 child2 Adult2

	Adult1	child1	child2	Adult2
DEMOGRAPHIC				
gender	Female	Male	Male	Male
age	40	6	4	40
father		Adult2	Adult2	
mother		Adult1	Adult1	
partner	Adult2			Adult1
education - current status	Not in education	Primary	Pre-school	Not in education
education - highest status	Not in education	Not completed p...	Lower Secondary	Lower Secondary
marital status	Pre-school	Single	Married	
LABOUR MARKET				
economic status	Primary			
hours worked per week	Lower Secondary			
in work : work history (length)	Upper Secondary			
	Post Secondary			
	Tertiary			
INCOME				
Main employment income	0%-200% of Av...	0	0	0

3.2.3 Defining numeric variables

Most variables are numeric variables (e.g. incomes). All numeric variables can be set either as single values or ranges by using a specific amount or as percentages based on a reference table (see 6.4.6)

You can define (or change) the value of a numeric variable by left-clicking on the current value and using the Numeric Variable Editor (see Figure 15 for an example for employment income). The Numeric Variable Editor offers various options.

Defining a specific value for a numeric variable

To define a specific value for a numeric variable, the user just adds the amount in the 'Starting Value' field while all other fields can be ignored. HHoT will generate one household with a household member who will be assigned the specified amount. In Figure 15, the individual has a main employment income of 1,800 Euros. Note that in this specific example, the checkbox

'Ending value' is unticked and 'Step' is not required. See the specific section in 3.2.3 *Defining a numeric variable using a range* to learn more about this option.

Figure 15. Defining a specific value for a numeric variable

The screenshot shows a software interface with a list of variables on the left and a dialog box on the right. The variables are grouped into categories: LABOUR MARKET (economic status: Employee, hours worked per week: 40, in work : work history (length of time): 120), INCOME (Main employment income: 1800, Main self-employment income, employment : previous earnings), BENEFIT/PENSION (Main contributory old-age pension), ASSETS (main residence : tenure), and EXPENDITURE (housing cost : rent, housing cost : other). The dialog box is titled 'Value' and 'Reference' with radio buttons. The 'Value' radio button is selected. The 'Starting Value' is set to 1800, 'Ending Value' is 200, and 'Step' is 1. The dialog box is highlighted with a red border.

Using a reference table for a numeric variable

It is possible to define a numeric variable using percentages of a reference value, e.g. 80% of the average employment income, where the average employment income is defined in the relevant reference table and the starting value is specified as a percentage (Figure 16). Note that in this specific example, the checkbox 'Ending value' remains unticked and 'Step' is not required. See the following section on how to use a range to learn more about this option.

The reference values are stored in a reference table (see section 6.4.6 *Managing a reference table*). It is useful if one wants to create the same households for different countries with different levels of income or for different years taking into account changes in values over time. In this case, the monetary value would look up the country/year specific value in the relevant reference table.

Figure 16. Numeric Variable Editor in HHoT using a reference table

The screenshot shows the 'LABOUR MARKET' section with 'economic status' set to 'Employee', 'hours worked per week' at 40, and 'in work : work history (length of time)' at 120. The 'INCOME' section shows 'Main employment income' set to '80% of Average Employment Income'. A red box highlights the 'Numeric Variable Editor' dialog box, which has 'Reference' selected and 'Average Employment Income' chosen from the dropdown. The 'Starting Value' is 30%, 'Ending Value' is 200%, and 'Step' is 1%.

Defining a numeric variable using a range

In both previous cases, it is also possible to refer to a range of values by filling in a starting and ending value. If the user defines a range, the hypothetical household is automatically copied for each specified step of the indicated range when generating the EUROMOD input file. In Figure 17, HHoT will create 31 households with Adult1 having employment income from 0 Euro to 3,000 Euros per month, with a step of 100 Euros (first household where Adult1 earns 0, second household where Adult1 earns 100, up to the 31st household where Adult1 earns 3,000).

Figure 17. Using a range for a Numeric Variable in HHoT

The screenshot shows the 'INCOME' section with 'Main employment income' set to '0-3000' and a value of 67. A red box highlights the 'Numeric Variable Editor' dialog box, which has 'Value' selected and 'Average wage OECD' chosen from the dropdown. The 'Starting Value' is 0, 'Ending Value' is 3000, and 'Step' is 100.

Similarly, it is possible to define a range using a reference table. In Figure 18, we created 11 households with Adult1 having employment income from 100% to 200% of the average employment income with a step of 10%.

Figure 18. Numeric Variable Editor in HHoT using a reference table

INCOME			
Main employment income	100%-200% ...	0	0
Main self-employment income			
employment : previous earnings			
BENEFIT/PENSION			
Main contributory old-age pension			
ASSETS			
main residence : tenure			
EXPENDITURE			
housing cost : rent			
housing cost : other			

☐ Value
 ☒ Reference

Average Employment...

Starting Value: %

☒ Ending Value: %

Step: %

Note: You should be careful when using ranges for more than one field/individual in the same household as the number of generated households can grow exponentially. If the first example above is applied to two individuals of the same household, the number of generated households would rise to $31 \times 31 = 961$, while a third person would take it to almost 30,000!

3.2.4 Defining monetary variables

Finally, regarding monetary variables, it is important to note that the generated input file has no currency information. However, the HHoT datasets specified within the EUROMOD country models use the Euro as the default currency and the reference tables that are provided refer to Euros. Thus, you must specify a different currency in the respective EUROMOD country model before running it if the values in HHoT are meant to refer to a national currency different from Euro. A second characteristic of monetary variables is that all income and expenditure variables are expressed in average monthly terms.

Note however, that even if the HHoT dataset is specified as Euro, the country output may still be in national currency. This is something to keep in mind when loading HHoT statistics, especially in cross-country comparisons. The wizard has an option for “produce all output in Euro”, but manual statistics use whatever you manually produced in EUROMOD.

3.3 Filtering variables

The Variable Filter can be used to quickly search/filter through the variables in the main panel. Figure 19 shows an example using the keyword ‘inc’, which reduces the displayed variables to those with the characters ‘inc’ in their description.

It is also possible to filter using the EUROMOD variable name instead of the description, such as ‘dag’ for age, or ‘yem’ for employment income. The full lists of the basic, advanced and derived variables with their acronyms and descriptions can be found in the menu, under ‘Advanced Options’/‘Manage Variables’/....

Figure 19. Filtering variables

Countries: IT, PT, RO, SE, ... Years: 2014

Selected countries: IT, PT, RO, SE, SK, UK Selected years: 2014

Variable Filter: **inc**

Currently viewing: Single2C (id)

	Adult1	child1	child2
INCOME			
Main employment income	0%-200% of N/A	0	0
Main self-employment income	0	0	0

3.4 Selecting countries or years

At the top panel (Figure 20), you can select the countries and years for which hypothetical data will be generated using two drop-down menus. You can select a country (1) or a year (2) using the check-box in the respective drop down-menu. You can confirm or cancel the selection by clicking on the buttons 'OK' or 'Cancel' respectively.

Figure 20. Selecting countries (1) and years (2)

Hypothetical Household Tool - D:\Home\achats\HHoT\Project1

Project View Wizard Advanced Options Statistics Help

☐ Select/Unselect all households

☒ **Example Household**

- ☒ Father
- ☒ Mother
- ☒ Kid
- ☒ kid2

Countries: (Select All) [AT] [BE] [BG] [CY] [CZ] [DE]

Years: 2013, 2014, 2015

Selected years: 2013, 2014, 2015

Currently viewing: DEMOGRAPHY

	Kid	kid2
gender	Female	Male
age	30	14

The same hypothetical households are generated for all policy years and countries selected. Note that to generate hypothetical household input data, at least one country and one year need to be selected.

HHoT generates a separate input file for each selected country-year combination. You can select from all EU Member States and policy years from 2009 onwards or may also add new years and countries. See section 3.4 on how to add countries and years in HHoT.

4 Generating the Hypothetical Data

Once all basic variables are filled in, the user can generate the Hypothetical Data, i.e. the EUROMOD input data to be used for tax-benefit policy simulations, by using the 'Generate' button (Figure 21).

Figure 21. The 'Generate' Button

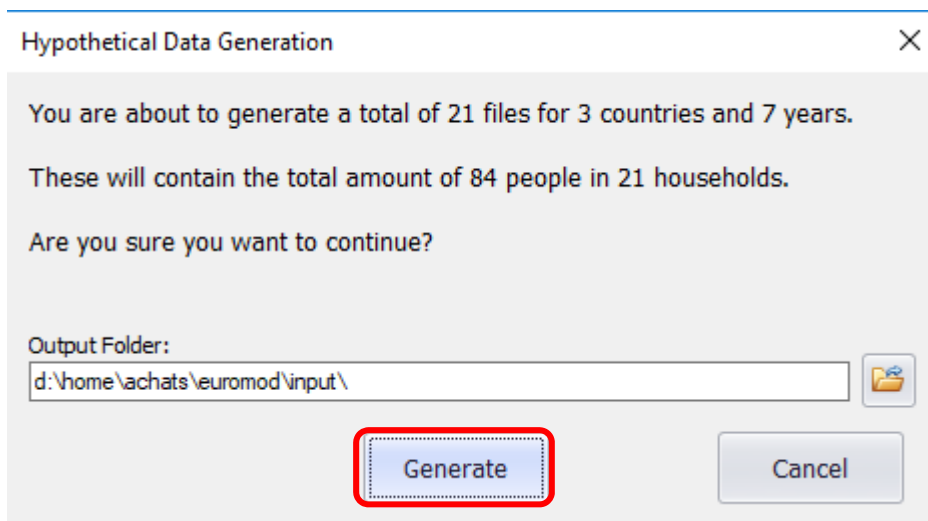
The screenshot shows the Hypothetical Household Tool (HHoT) interface. The title bar reads "Hypothetical Household Tool - C:\Users\achats\Box\myBox\WorkBox\Datasets\EUROMOD\HHoT\Manual". The interface includes a menu bar with "Project", "View", "Wizard", "Advanced Options", "Statistics", and "Help". On the left, there is a "Project" pane with icons for adding, removing, and selecting households, and a list of "Example Household" members: Adult1, Adult2, Child1, and Child2, all of which are checked. Below this list is a note: "Please check the families and people that you wish to generate the Household Data for." The main area contains settings for "Countries" (AT, BE, DE) and "Years" (2013, 2014, 2015, 2016, 2017, 2018, 2019). A "Variable Filter" is also present. The central table displays data for the "Example Household" across four columns: Adult1, Adult2, Child1, and Child2. The table is divided into two sections: "DEMOGRAPHIC" and "LABOUR MARKET". The "DEMOGRAPHIC" section includes variables like gender, age, father, mother, partner, education - current status, education - highest status, and marital status. The "LABOUR MARKET" section includes economic status. The "Generate" button is highlighted with a red box at the bottom center of the interface.

	Adult1	Adult2	Child1	Child2
DEMOGRAPHIC				
gender	Male	Female	Male	Female
age	40	30	14	7
father			Adult1	Adult1
mother			Adult2	Adult2
partner	Adult2	Adult1		
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

The next screen asks you to confirm the output folder (Figure 22). By selecting multiple countries and years, and specifying ranges in the case of numeric variables, the number of generated hypothetical households can be very high. Therefore, this dialog box reports the number of households and observations that are going to be created. It also lets you select the output folder where the HHoT input datasets will be stored. The default HHoT output folder corresponds to the EUROMOD input folder of the currently opened project.

Again, click on Generate to generate.

Figure 22. The 'Generate' Button



HHoT confirms generating the hypothetical datasets (Figure 23 and Figure 24):

Figure 23. Generating data

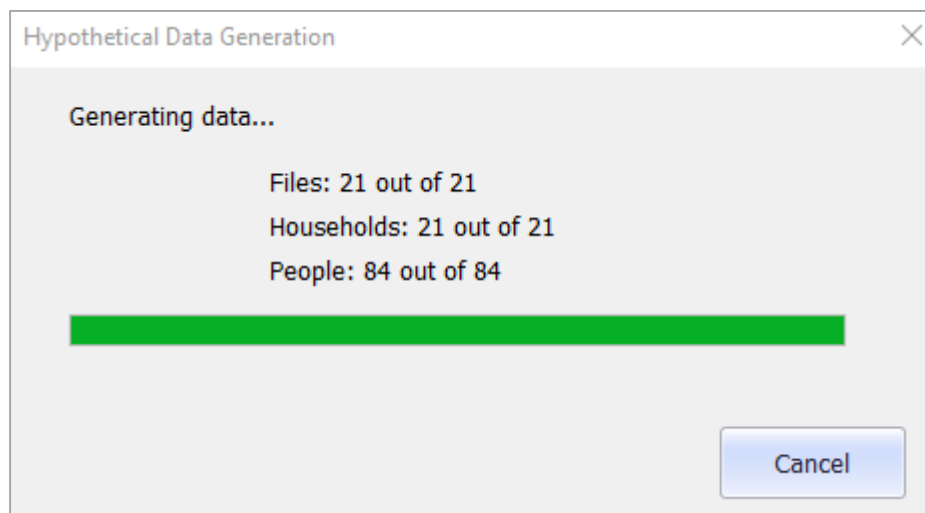
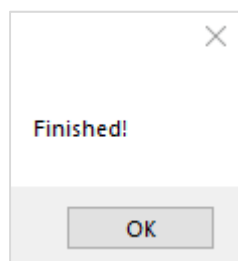


Figure 24. Generation finished



HHoT generates hypothetical data in separate .txt files for each selected policy year and country. The standard input files generated are named 'cc_YYYY_hhot.txt' where cc stands for the country acronym and YYYY for the year (e.g. 'IT_2018_hhot.txt' is the hypothetical data

file generated for Italy for policy year 2018). The input files include all hypothetical households and members that are selected (checked) in the main panel and contain all household characteristics, labour market information and other input variables needed in EUROMOD to simulate the tax-benefit policies. EUROMOD treats these HHoT input datasets like the regular microdata input files.

5 Running EUROMOD with HHoT data

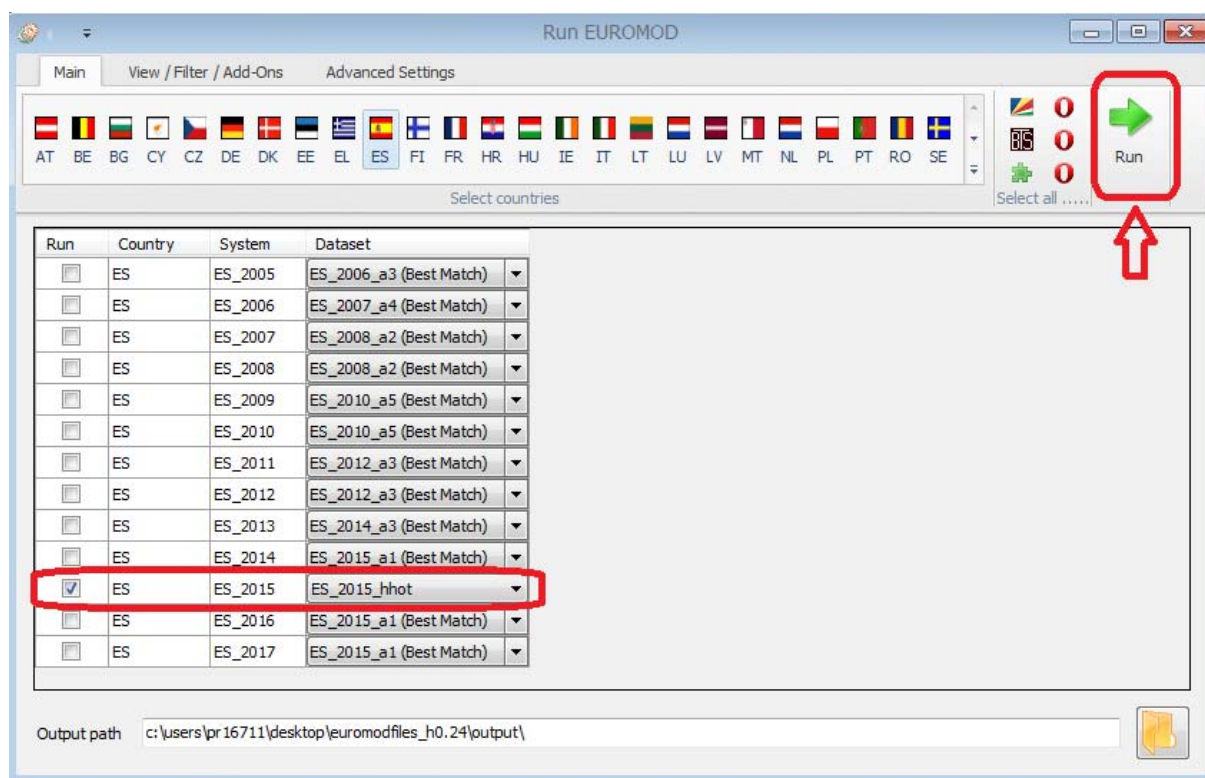
Once the hypothetical household datasets have been created and stored in the EUROMOD input folder, it is possible to run the model using the HHoT datasets as if they were regular microdata.

You can follow the usual EUROMOD procedure to run the model (see EUROMOD help file under the section ‘Working with EUROMOD’/‘Running EUROMOD’) and select the policy systems and the relevant HHoT dataset from the list of available datasets. For example, Figure 25 shows how to run the Spanish 2015 system with the relevant HHoT dataset.

Note: As mentioned before, the default currency defined for HHoT input datasets in EUROMOD is EURO. Users might consider changing this in case they use a different currency when specifying monetary variables in HHoT. However, one needs to be careful as hidden advanced variables might have default values specified in EURO. Furthermore, reference tables might be specified in EURO too.

Please note also that the ‘SetDefault’ policies within the EUROMOD country models only apply if the variable has not been generated in HHoT. Thus, default values specified in these policies might not be applied and the HHoT-generated values will be kept instead. After running EUROMOD using the generated hypothetical data files as input, the model produces output files that can be analysed with any statistical software package, or Excel. The output files are txt-files and include some of the variables created by HHoT (depending on the EUROMOD model settings), enhanced with the simulated tax liabilities, benefit entitlements and disposable income.

Figure 25. Running EUROMOD with HHoT data

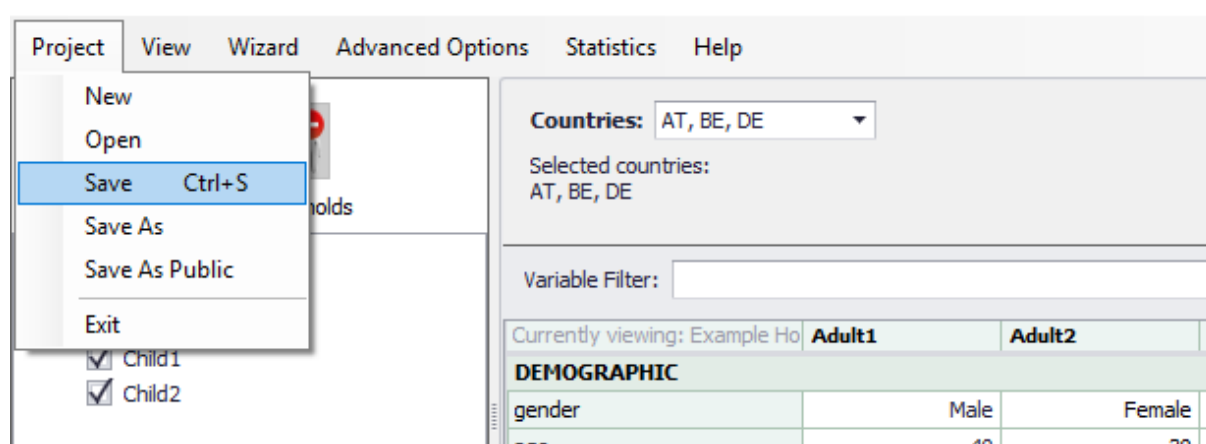


6 Additional HHoT functionalities

6.1 Saving and loading Hypothetical Household files

HHoT allows users to store the Hypothetical Household settings in the 'HouseholdData.xml' file. Therefore, it is also possible to load an .xml file previously saved. This is especially handy if the user needs to create different household types for different projects and prefers to manage them separately. The save/load menu can be accessed through the 'Project' option in the ribbon bar (Figure 26). For this example, our hypothetical household includes 'Adult1' who is the head of the household, 'Adult2' and two children 'Child1' and 'Child2'.

Figure 26. Save/load Hypothetical Household settings

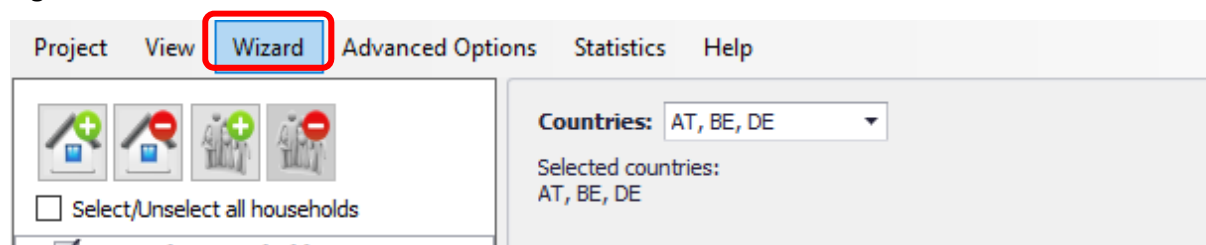


6.2 Generating Hypothetical Data using the HHoT Statistics Wizard

Once you have defined the hypothetical households, you can use the 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.

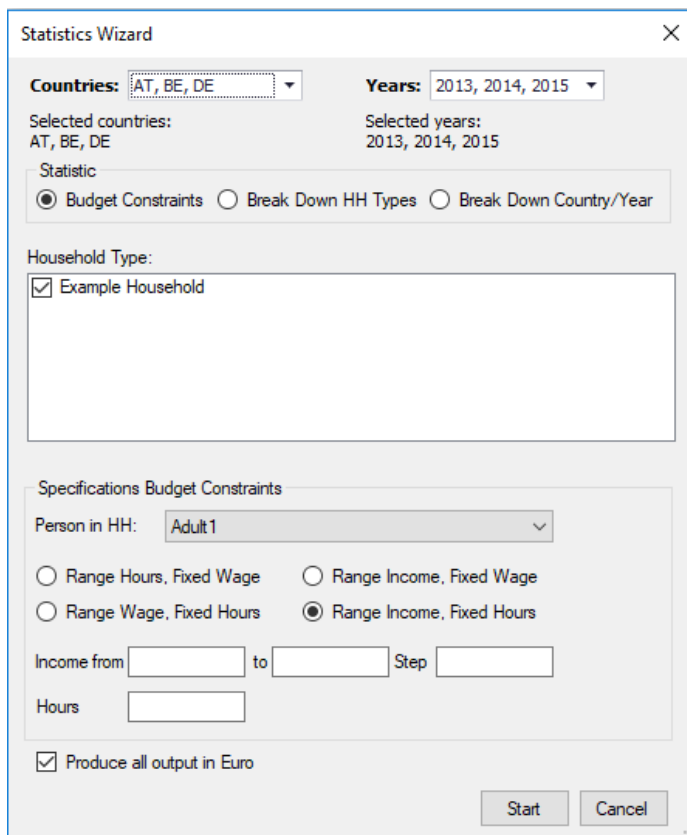
From the HHoT tool menu, click on 'Wizard' (Figure 27).

Figure 27. Statistics Wizard is located on the HHoT menu



This opens the HHoT Statistics Wizard (Figure 28). The countries and years we have loaded in the previous steps are already populated in the Wizard.

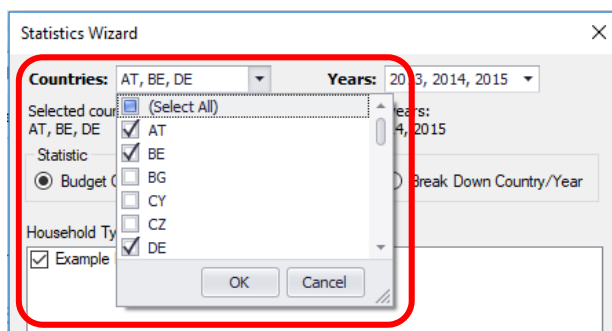
Figure 28. HHoT Statistics Wizard



The screenshot shows the 'Statistics Wizard' dialog box. At the top, there are two dropdown menus: 'Countries:' with 'AT, BE, DE' selected and 'Years:' with '2013, 2014, 2015' selected. Below these, the 'Selected countries:' field shows 'AT, BE, DE' and the 'Selected years:' field shows '2013, 2014, 2015'. The 'Statistic' section has three radio buttons: 'Budget Constraints' (selected), 'Break Down HH Types', and 'Break Down Country/Year'. The 'Household Type:' section has a checkbox for 'Example Household' which is checked. The 'Specifications Budget Constraints' section has a dropdown for 'Person in HH:' set to 'Adult1'. Below this are four radio buttons for different specifications: 'Range Hours, Fixed Wage', 'Range Income, Fixed Wage', 'Range Wage, Fixed Hours', and 'Range Income, Fixed Hours' (selected). There are input fields for 'Income from', 'to', and 'Step', and a 'Hours' input field. At the bottom, there is a checkbox for 'Produce all output in Euro' which is checked, and 'Start' and 'Cancel' buttons.

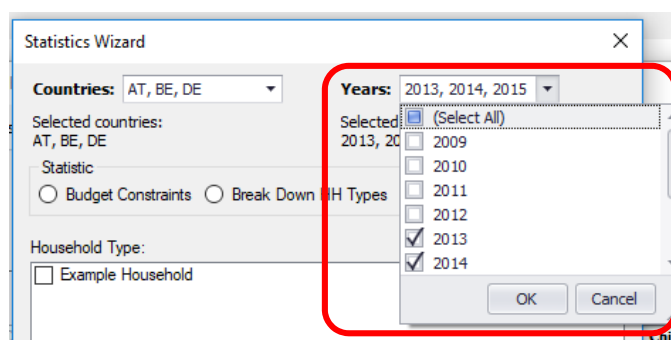
You can change the selected countries and years by clicking on the drop-down menu next to the selected countries (Figure 29). In the box that appears, tick the countries that you would like to generate HHoT input data. The same applies to the selection of years (Figure 30) you would like include in your analysis:

Figure 29. HHoT Statistics Wizard – selecting multiple countries



This screenshot shows the 'Statistics Wizard' dialog box with the 'Countries:' dropdown menu open. The dropdown menu is highlighted with a red rectangle. It shows a list of countries with checkboxes: 'AT', 'BE', 'BG', 'CY', 'CZ', and 'DE'. The 'Selected countries:' field above the dropdown shows 'AT, BE, DE'. The 'Years:' dropdown menu is also visible, showing '2013, 2014, 2015'. The 'Statistic' section has 'Budget Constraints' selected. The 'Household Type:' section has 'Example Household' checked. The 'Specifications Budget Constraints' section has 'Range Income, Fixed Hours' selected. The 'Income from', 'to', and 'Step' fields are empty. The 'Hours' field is empty. The 'Produce all output in Euro' checkbox is checked. The 'Start' and 'Cancel' buttons are at the bottom.

Figure 30. HHoT Statistics Wizard – selecting multiple years



Next, let's explore the different report types offered with the wizard. These include:

- The *'Budget constraints' report*, which displays how disposable income and its income components (original incomes, benefits, taxes and social insurance contributions) change with income levels/working hours/hourly wages (depending on the chosen setting);
- The *'Breakdown by Household Types' report*, which breaks down different types of income for each type of hypothetical household defined and each system run;
- The *'Break down (by) Country/Year' report* is similar to the 'Breakdown by Household Types' report but provides a break down by country/year rather than household type.

Note: The Wizard uses the household names specified in the HHoT user interface.

6.2.1 The 'Budget Constraints' Report

This report displays how disposable income and its income components (original incomes, benefits, taxes and social insurance contributions) change with changing income levels/working hours/hourly wages for each type of hypothetical household defined. In addition to defining the systems, selecting the 'budget constraints' option, will also activate the following elements (which are not available for other reports):

- The 'Household Type' box (Figure 31 – 1): Here check the hypothetical households defined in HHoT that you would like to include in your analysis.
- The 'Specifications Budget Constraints' fields (Figure 31 – 2) allow you to specify the range included in the budget constraints chart. You can select to:
 - range the hours, but keep the wage fixed (Figure 32 – 1)
 - range the wage, but keep the hours fixed (Figure 32 – 2)
 - range the income (average monthly earnings), but keep the wage fixed (Figure 32 – 3)
 - range the income (average monthly earnings), but keep the hours fixed (Figure 32 – 4)

The Wizard automatically calculates the third element based on the information of the other two elements, e.g. the average monthly earnings based on the number of hours and the hourly wage.

While the graph itself is based on the **household income** taking all household members into account, earnings of one member are varied by the Wizard. Thus, you need to specify the individual that the constraints apply to (from the ones defined in the specific household) i.e. in our case 'Adult1', 'Adult2', 'Child1' or 'Child2' (Figure 31 – 3).

Note: the income level of other household members will remain as specified in the HHoT interface or will be replaced by the average value in case a range of income levels is specified. In case of fixed working hours, this also includes cases with 0 hourly wages and 0 average monthly earnings.

Figure 33 shows you an example using the systems we used in the previous sections for the 'Example household' and some constraints on 'Adult1'. Note that leaving the 'Produce all output in Euro' box checked will produce amounts comparable across multiple countries, using the exchange rate information predefined in EUROMOD.

Figure 31. HHoT Statistics Wizard – Budget Constraints report: specifying constraints (person in Household)

☒ Budget Constraints ☐ Break Down HH Types ☐ Break Down Country/Year

Household Type:

☒ Example Household

Specifications Budget Constraints

Person in HH: Adult1 (dropdown menu showing Adult1, Adult2, Child1, Child2)

☒ Range Hours ☐ Range Wage

Hours from [] to [] Step []

Wage []

Figure 32. HHoT Statistics Wizard – Budget Constraints report: specifying constraints (hours, wage, income)

The figure displays four panels, each representing a different configuration of budget constraints in the HHoT Statistics Wizard. Each panel has a red border and a red circle with a number in the top right corner.

- Panel 1:** Shows 'Person in HH' as 'Adult1'. The selected option is 'Range Hours, Fixed Wage'. Fields for 'Hours from', 'to', and 'Step' are present, along with a 'Wage' field.
- Panel 2:** Shows 'Person in HH' as 'Adult1'. The selected option is 'Range Wage, Fixed Hours'. Fields for 'Wage from', 'to', and 'Step' are present, along with an 'Hours' field.
- Panel 3:** Shows 'Person in HH' as 'Adult1'. The selected option is 'Range Income, Fixed Wage'. Fields for 'Income from', 'to', and 'Step' are present, along with a 'Wage' field.
- Panel 4:** Shows 'Person in HH' as 'Adult1'. The selected option is 'Range Income, Fixed Hours'. Fields for 'Income from', 'to', and 'Step' are present, along with an 'Hours' field.

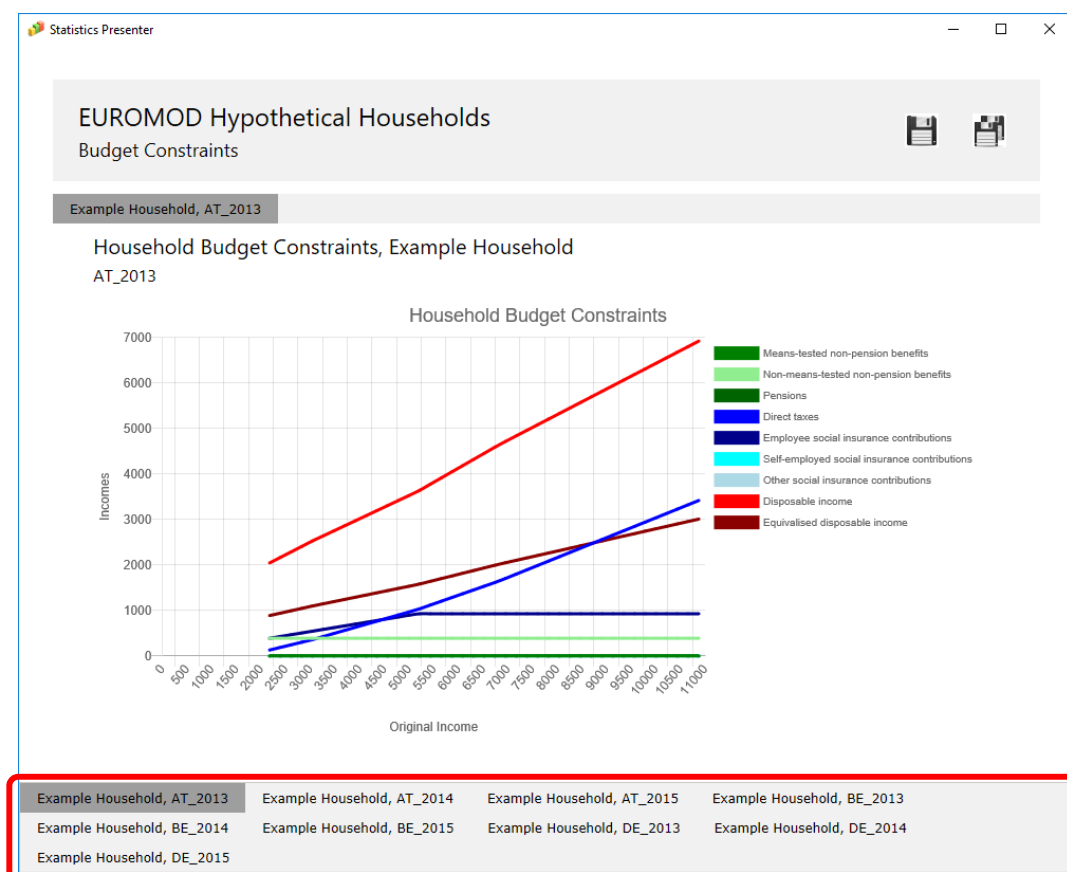
Figure 33. HHoT Statistics Wizard – Budget Constraints report: running with parameters

The screenshot shows the 'Statistics Wizard' window with the following settings:

- Countries:** AT, BE, DE
- Years:** 2013, 2014, 2015
- Selected countries:** AT, BE, DE
- Selected years:** 2013, 2014, 2015
- Statistic:** Budget Constraints (selected), Break Down HH Types, Break Down Country/Year
- Household Type:** Example Household (checked)
- Specifications Budget Constraints:**
 - Person in HH:** Adult1
 - Selected option:** Range Hours, Fixed Wage
 - Hours from:** 10, **to:** 50, **Step:** 1
 - Wage:** 50
- Produce all output in Euro:** (checked)
- Buttons:** Start, Cancel

Once you set all the necessary parameters, click on 'Start'. The Wizard will create hypothetical data for the hypothetical households you have defined and run EUROMOD in the background with the HHoT data as the Input data for the countries and years specified. It will then output the report as in Figure 34.

Figure 34. HHoT Statistics Wizard – Budget Constraints report: output via Statistics Presenter



Note that there is one graph/tab per household type per system – you can click through each and see the different graphs output. You can also save these reports to a separate (excel) file (Figure 35) which will include the graph as well as the underlying table (Figure 36). The export symbol saves only the current graph and its underlying table while the export all symbol saves all the graphs and underlying tables for all households, years and countries included in the wizard (see Figure 37 and Figure 38), using one sheet for each year/country combination.

Also keep in mind that results are presented on the household level. However, the table shows the income situation based on the varying characteristics of one household member income information of other household members constant. Thus, by remembering the varying characteristics one can easily calculate hourly wages, working hours and average monthly earnings for each household.

Figure 35. HHoT Statistics Wizard – Budget Constraints report: saving to excel

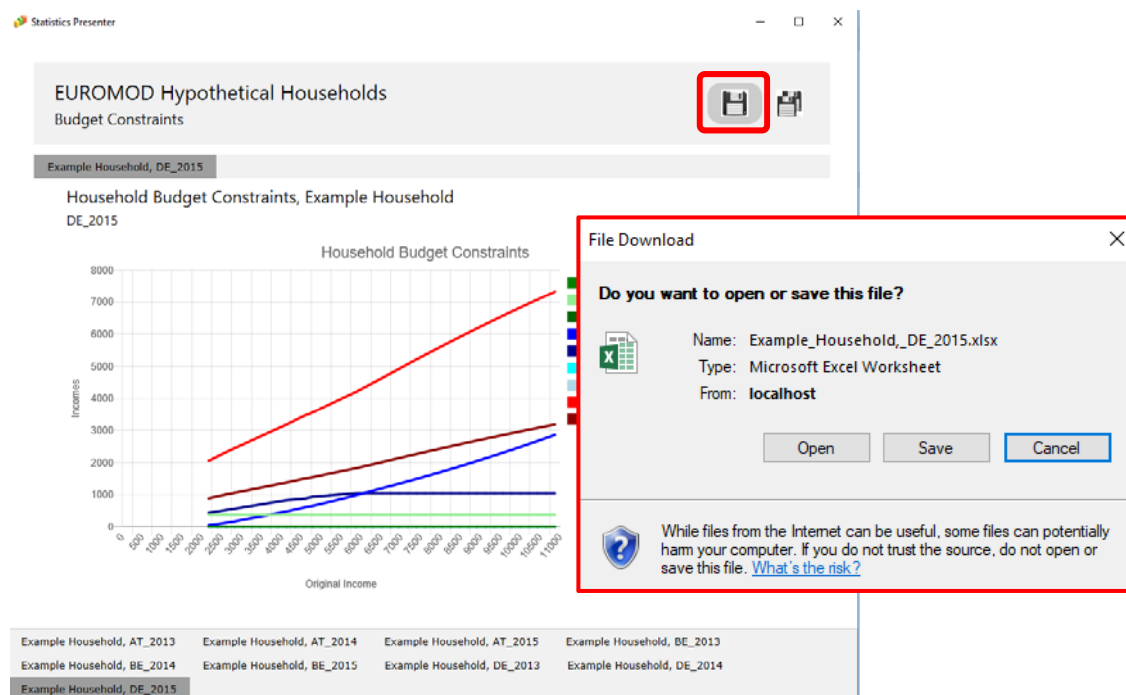


Figure 36. HHoT Statistics Wizard – Budget Constraints report: excel output

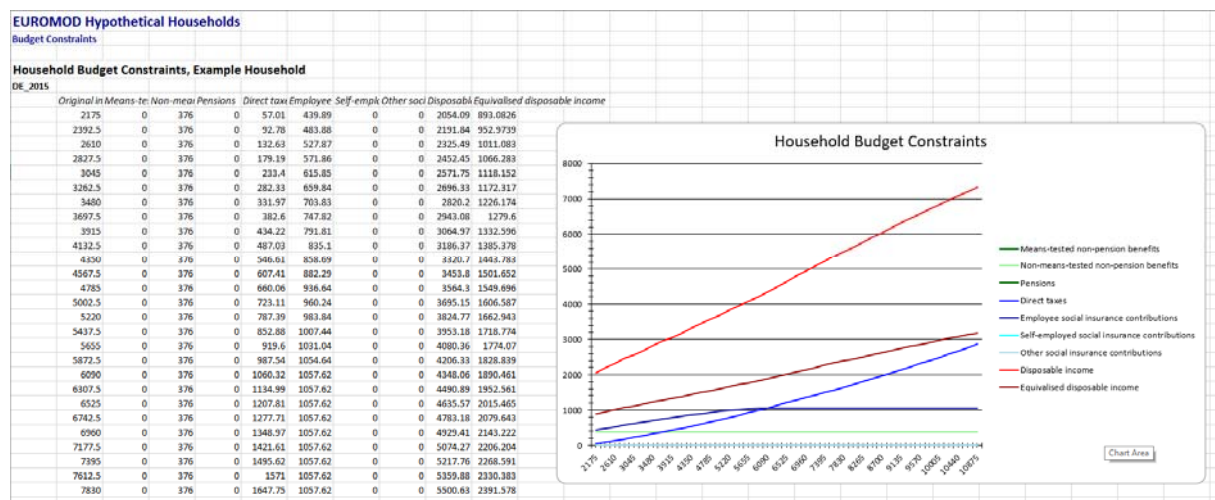


Figure 37. HHoT Statistics Wizard – Budget Constraints report: saving all in one excel

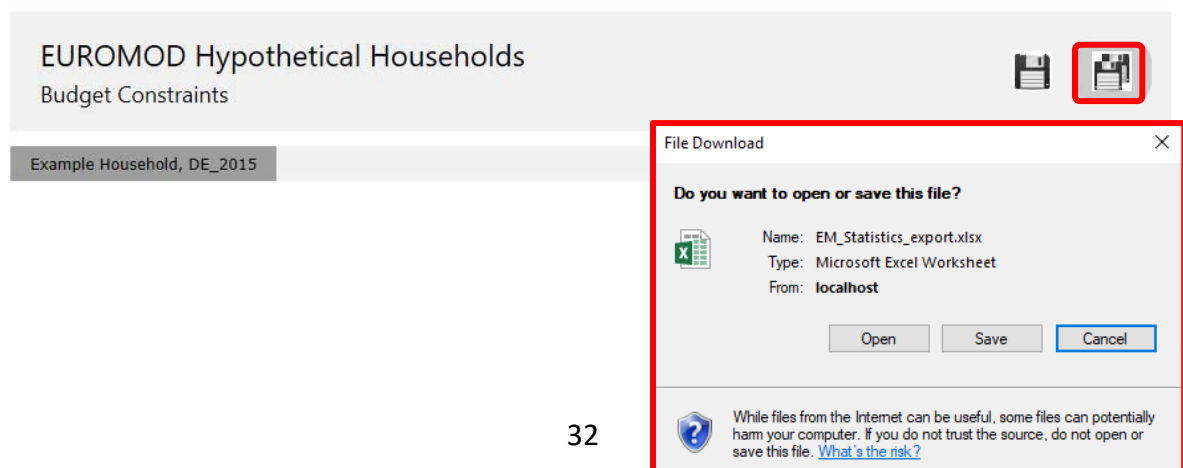
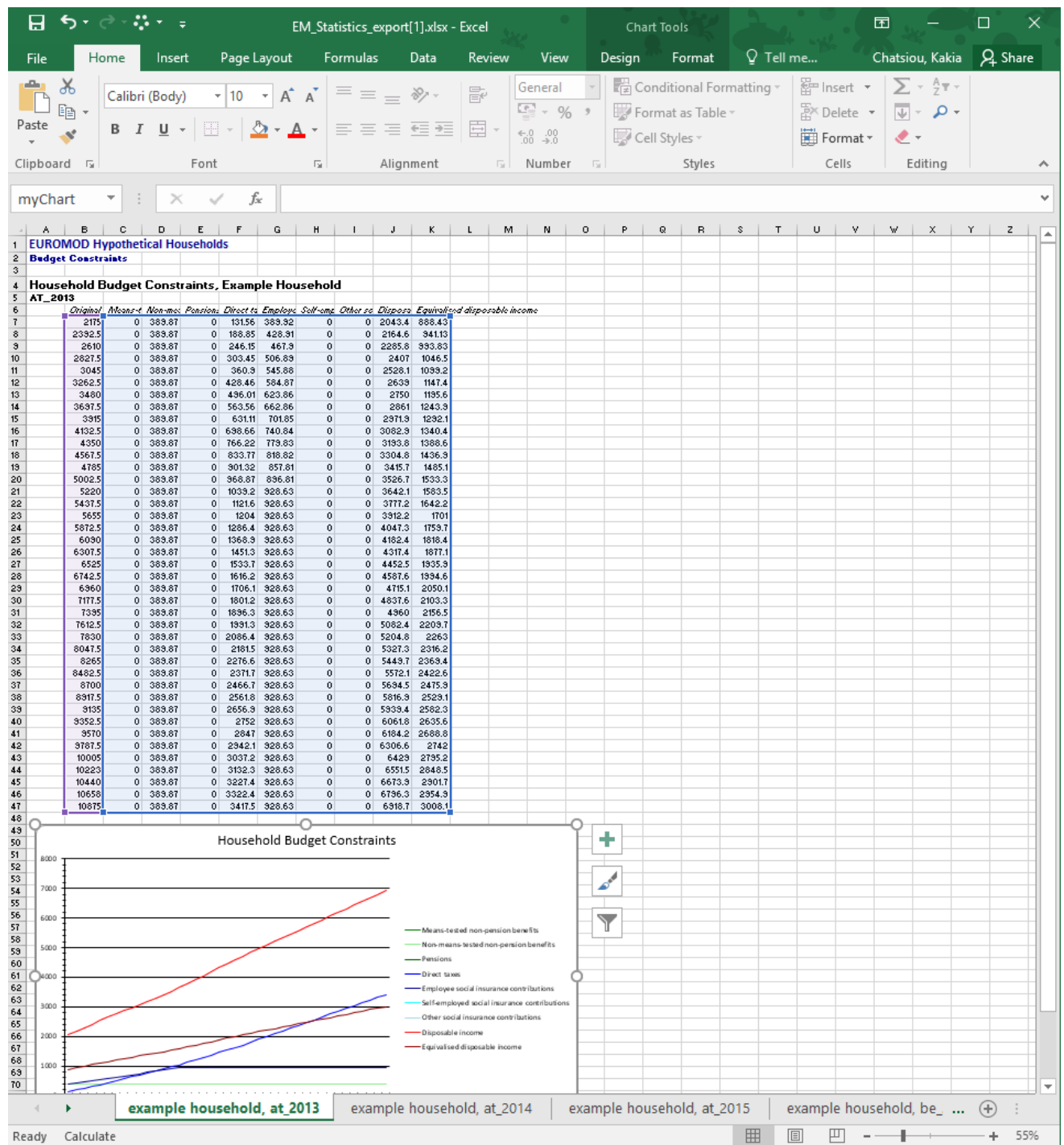


Figure 38. HHoT Statistics Wizard – Budget Constraints report: excel output



6.2.2 The 'Breakdown by Household Types' report

The second type of report is the 'Breakdown by Household Types' report, which provides information on different types of income (disposable, equivalised disposable, original), benefits (means tested non-pension and non means-tested non-pension), pensions, direct taxes and social insurance contributions (employee, self-employed, other) for each type of hypothetical household defined and each country/year run. The only options allowed for this report are the systems that will be used and whether the output will be in Euro (see previous section). Otherwise, all households selected in the HHoT interface are included in the report (Figure 39).

Figure 39. HHoT Statistics Wizard – Running the Breakdown by Household types report

Statistics Wizard

Countries: AT, BE, DE Years: 2013, 2014, 2015

Selected countries: AT, BE, DE Selected years: 2013, 2014, 2015

Statistic

☐ Budget Constraints ☒ Break Down HH Types ☐ Break Down Country/Year

Household Type:

☐ Example Household

Specifications Budget Constraints

Person in HH: Adult1

☐ Range Hours, Fixed Wage ☐ Range Income, Fixed Wage

☐ Range Wage, Fixed Hours ☒ Range Income, Fixed Hours

Income from [] to [] Step []

Hours []

☒ Produce all output in Euro

Start Cancel

Clicking on 'Start' will generate the hypothetical household data for the households defined in the tool, run the EUROMOD systems defined with the household data generated and output a graph as in Figure 40. It includes the results for all selected households side-by-side (in this case two household types). Again, graphs and underlying tables can be saved to Excel by clicking on the disc symbols.

Figure 40. HHoT Statistics Wizard – Breakdown by Household types report



6.2.3 The 'Breakdown by Country/Year' report

Very much like the 'Breakdown by Household types' report, this report provides information on different types of income (disposable, equivalised disposable, original), benefits (means tested non-pension and non means-tested non-pension), pensions, direct taxes and social insurance contributions (employee, self-employed, other) for each type of hypothetical household defined side-to-side for each country and year run.

The wizard lets you specify, in addition to the systems to run (Figure 41):

- which defined hypothetical households you would like to include in the analysis (just check the relevant boxes)
- if the amounts will be output in Euro (this helps when trying to compare across countries with different currency systems)

Figure 41. HHoT Statistics Wizard – Running the Breakdown by Country/Year report

Statistics Wizard

Countries: AT, BE, DE **Years:** 2013, 2014, 2015

Selected countries: AT, BE, DE Selected years: 2013, 2014, 2015

Statistic

☐ Budget Constraints ☐ Break Down HH Types ☒ Break Down Country/Year

Household Type:

☒ Example Household

Specifications Budget Constraints

Person in HH: [dropdown]

☒ Range Hours, Fixed Wage ☐ Range Income, Fixed Wage

☐ Range Wage, Fixed Hours ☐ Range Income, Fixed Hours

Hours from 10 to 50 Step 1

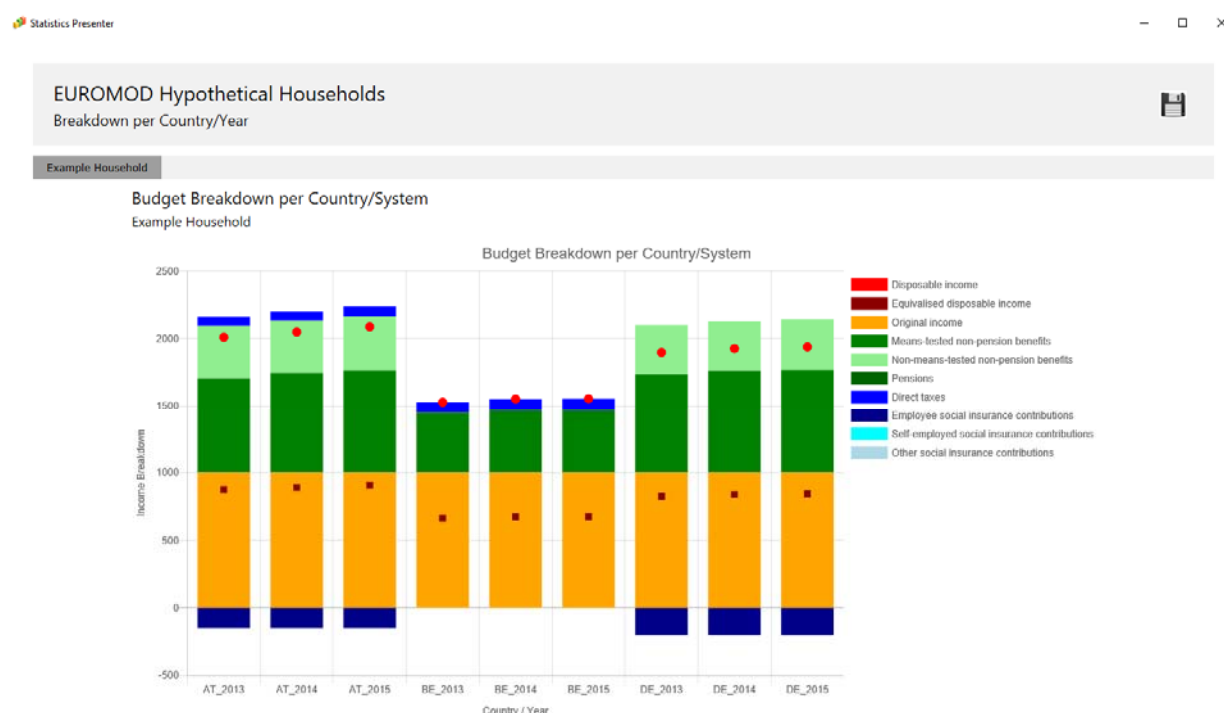
Wage 50

☒ Produce all output in Euro

Start Cancel

Clicking on 'Start' will generate the hypothetical household data for the households defined in the tool, run the EUROMOD systems defined with the household data generated and output a graph as in Figure 42 which can be saved to Excel.

Figure 42. HHoT Statistics Wizard – Breakdown by Country/Year report



6.2.4 Creating graphs and tables using the Statistics option

Alternatively, to the wizard, the “Statistics” option offers another tool for creating graphs. It can be used for already existing EUROMOD output files (i.e. based on HHoT input datasets after running EUROMOD).

Like the Wizard, the user has three options to choose from: break down per household type or per country/year and budget constraint charts. The tool reads the specified EUROMOD output file and asks the user to choose one of the households included in the file. The selection of households is based on the currently loaded HHoT project.

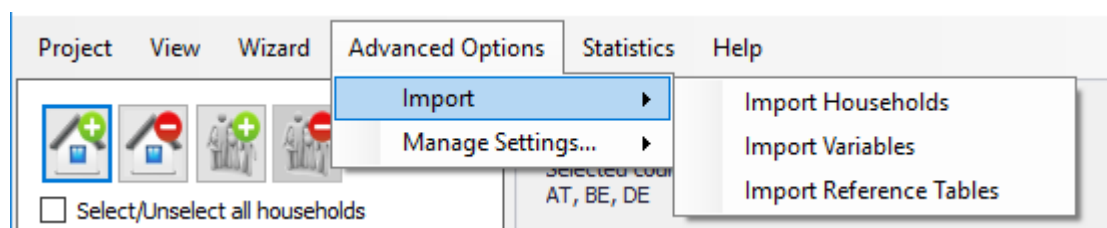
Note: Different from the Wizard, households need to be correctly specified in the EUROMOD output file for the statistics tool to produce sensible graphs. E.g. a budget constraint chart can only be produced for a household with varying income.

6.3 Advanced Options – Import

HHoT includes some additional options that can be accessed by using the ‘Advanced Options’ menu in the ribbon bar. The import option allows you to import household specifications, the variable file or reference tables from other projects (Figure 43).

Note: Remember that each HHoT project always consists of these three files and thus, the tool requires that all are stored within the same folder.

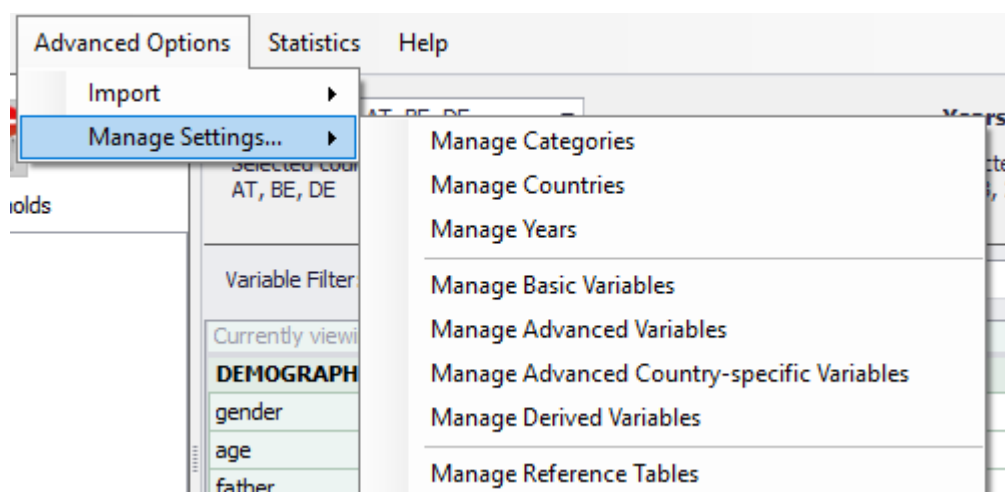
Figure 43. Advanced Options - Import



6.4 Advanced Options - Manage Settings

The manage settings sub-menu offers the possibility to change default settings and to introduce new countries, years or variables into HHoT (Figure 44).

Figure 44. Advanced Options – Manage Settings

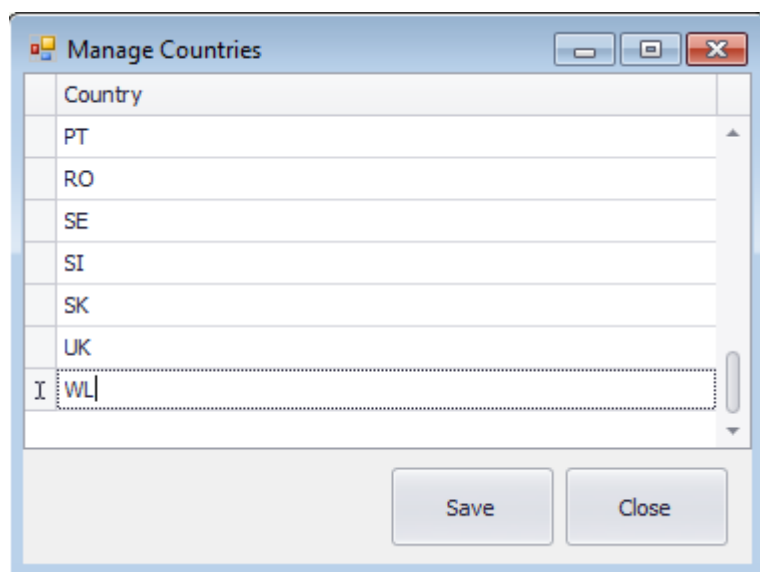


6.4.1 Manage Categories, Countries and Years

The user can introduce new categories for variables, countries and years under 'Advanced Options/Manage Settings/Manage Categories, Countries or Years'. This is for example needed if a new policy year is introduced in EUROMOD and one wants to generate hypothetical data for this year. These options show a table where it is possible to fill in a new category, country or year in the last row.

For example, Figure 45 shows the countries table where the user has added the new country Wonderland (WL). It is also possible to modify the name/acronym/value of an existing category/country/year, or to delete one by right clicking on the row.

Figure 45: Adding a country ('Wonderland' (WL))



6.4.2 Managing basic variables

By default, the main panel in HHoT only includes basic variables (i.e. variables that users need to fill in with values). The basic variables cover the main individual and household characteristics, such as age, gender, education, marital status, economic status, employment income, etc.

The 'Basic Variables Editor' (Figure 46) offers the possibility to edit the settings of each variable i.e. their name, category, description, type (numeric, categorical or connection), value range and text range (for categorical). The editor table can be opened under 'Advanced Options'/'Manage settings'/'Manage Basic Variables'.

Each variable has the following specifications, presented in columns:

- *Basic Name*: refers to the variable name that will be generated according to the EUROMOD naming conventions. Note that the same concept (e.g. Main employment income) may have been attributed to a different variable for each country ('yem' in most, but 'yemre' in Greece, 'yem00' in France etc.). All these country specific variable names can be seen if the user left-clicks on the '+' button next to the name of some basic variables (Figure 47).
- *Category*: refers to the subheading in the main panel of the HHoT interface
- *Description*: is the text that will be shown in the main panel
- *Variable Type*: specifies if the variable type is numeric, categorical or connection (see section 3.2)
- *Value Range/Text Range*: is only applicable for categorical variables and refers to the categories that are shown in the combo-box editor when one specifies the value. To

define the range of a categorical variable, each category has to be separated by the symbol # (e.g. in the example, gender will generate one of two possible values: 1 or 0 for Male or Female respectively). The value/text correspondence has of course to be coherent with the values that the EUROMOD model understands and expects.

- *Household Variable*: specifies variables that have the same information across all household members (e.g. tenure status of the main residence of the household). If this box is ticked, changes of variable for one household member will be copied automatically to all other household members too. Note that resetting an individual's advanced variables does not reset household-wide variables but only the individual ones (see 3.1.3 and 3.1.4)

Figure 46. Managing basic variables editor

Basic Name	Category	Description	Variable Type	Value Range	Text Range	Household Vari...	Comments
dgn	DEMOGRAPHIC	gender	Categorical	1#0	Male#Female	<input type="checkbox"/>	
dag	DEMOGRAPHIC	age	Numeric			<input type="checkbox"/>	
yem	INCOME	Main employm...	Numeric			<input type="checkbox"/>	
yse	INCOME	Main self-empl...	Numeric			<input type="checkbox"/>	
poa	BENEFIT/PENS...	Main contribut...	Numeric			<input type="checkbox"/>	
idfather	DEMOGRAPHIC	father	Connection			<input type="checkbox"/>	
idmother	DEMOGRAPHIC	mother	Connection			<input type="checkbox"/>	
idpartner	DEMOGRAPHIC	partner	Connection			<input type="checkbox"/>	
amrtn	ASSETS	main residence...	Categorical	2#3	Owned outrigh...	<input checked="" type="checkbox"/>	
dec	DEMOGRAPHIC	education - cu...	Categorical	0#1#2#3#4#...	Not in educati...	<input type="checkbox"/>	
deh	DEMOGRAPHIC	education - hig...	Categorical	0#1#2#3#4#5	Not completed...	<input type="checkbox"/>	
dms	DEMOGRAPHIC	marital status	Categorical	1#2#3#4#5	Single#Marrie...	<input type="checkbox"/>	
les	LABOUR MARKET	economic status	Categorical	0#2#3#4#5#...	Pre-school#E...	<input type="checkbox"/>	
lhw	LABOUR MARKET	hours worked ...	Numeric			<input type="checkbox"/>	
liwwh	LABOUR MARKET	in work : work ...	Numeric			<input type="checkbox"/>	
xhrt	EXPENDITURE	housing cost : ...	Numeric			<input type="checkbox"/>	
xhcot	EXPENDITURE	housing cost : ...	Numeric			<input type="checkbox"/>	

Save Close

Figure 47. Variable with different country-specific name

Basic Name	Category	Description	Variable Type	Value Range	Text Range	Household V...	Private	Comments														
dgn	DEMOGRAP...	gender	Categorical	1#0	Male#Female	<input type="checkbox"/>	<input checked="" type="checkbox"/>															
dag	DEMOGRAP...	age	Numeric			<input type="checkbox"/>	<input checked="" type="checkbox"/>															
yem	INCOME	Main employ...	Numeric			<input type="checkbox"/>	<input checked="" type="checkbox"/>															
<table border="1"> <thead> <tr> <th>Country Specific Variable Name</th> <th>Countries</th> </tr> </thead> <tbody> <tr> <td>yemre</td> <td>EL</td> </tr> <tr> <td>yem00</td> <td>FR</td> </tr> <tr> <td>yempj</td> <td>PL</td> </tr> <tr> <td>yemtx</td> <td>SI</td> </tr> <tr> <td>yemwg</td> <td>SK</td> </tr> <tr> <td>*</td> <td></td> </tr> </tbody> </table>									Country Specific Variable Name	Countries	yemre	EL	yem00	FR	yempj	PL	yemtx	SI	yemwg	SK	*	
Country Specific Variable Name	Countries																					
yemre	EL																					
yem00	FR																					
yempj	PL																					
yemtx	SI																					
yemwg	SK																					
*																						
yse	INCOME	Main self-em...	Numeric			<input type="checkbox"/>	<input checked="" type="checkbox"/>															

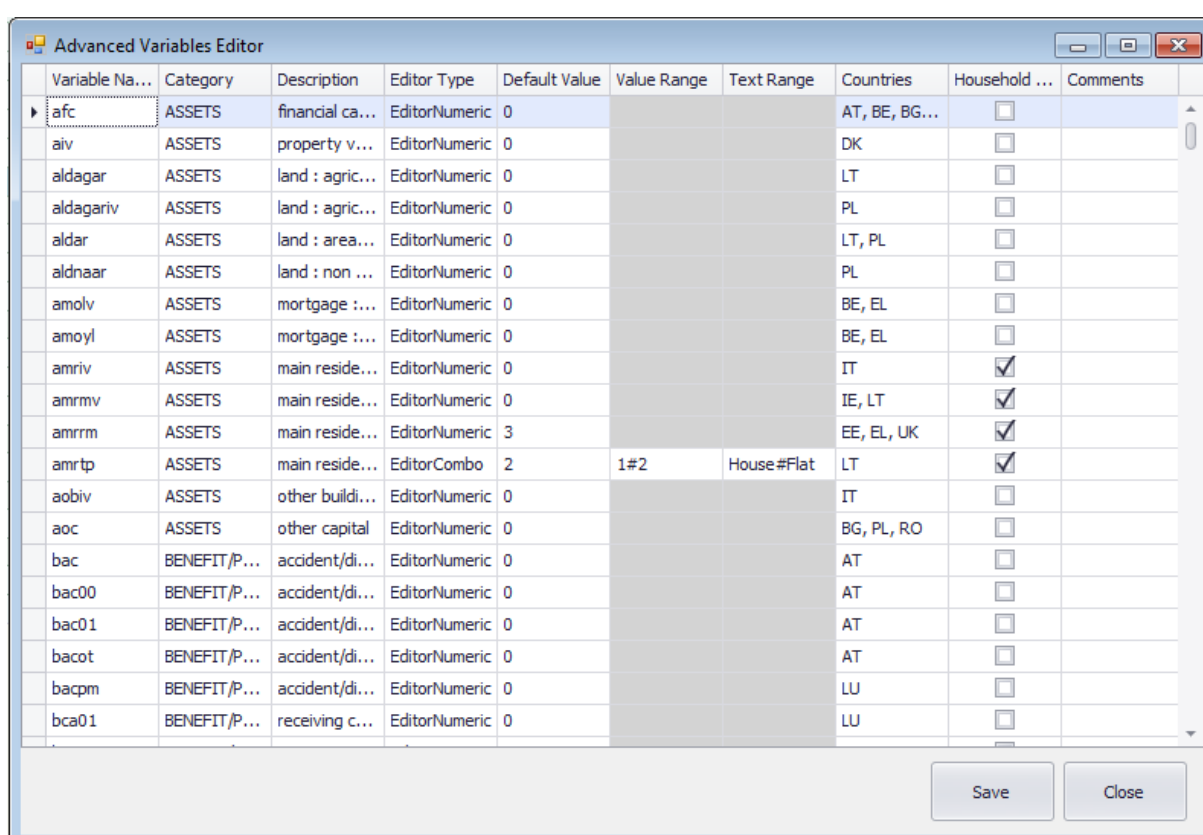
6.4.3 Managing advanced variables

The list of all advanced variables with their default values (Figure 48) is shown by selecting the 'Manage Advanced Variables' option under the 'Advanced Options'/'Manage settings' menu. Similar to the basic variables, the specifications of advanced variables can be changed using the 'Advanced Variables Editor'. The editor includes two additional columns compared to the basic variables editor:

The '*Default Value*' column offers the possibility to change the default values of advanced variables.

The '*Countries*' column specifies the countries for which the variable is available.

Figure 48. Managing advanced variables



Variable Na...	Category	Description	Editor Type	Default Value	Value Range	Text Range	Countries	Household ...	Comments
afc	ASSETS	financial ca...	EditorNumeric	0			AT, BE, BG...	<input type="checkbox"/>	
aiv	ASSETS	property v...	EditorNumeric	0			DK	<input type="checkbox"/>	
aldagar	ASSETS	land : agric...	EditorNumeric	0			LT	<input type="checkbox"/>	
aldagariv	ASSETS	land : agric...	EditorNumeric	0			PL	<input type="checkbox"/>	
aldar	ASSETS	land : area...	EditorNumeric	0			LT, PL	<input type="checkbox"/>	
aldnaar	ASSETS	land : non ...	EditorNumeric	0			PL	<input type="checkbox"/>	
amolv	ASSETS	mortgage :...	EditorNumeric	0			BE, EL	<input type="checkbox"/>	
amoyl	ASSETS	mortgage :...	EditorNumeric	0			BE, EL	<input type="checkbox"/>	
amriv	ASSETS	main reside...	EditorNumeric	0			IT	<input checked="" type="checkbox"/>	
amrmv	ASSETS	main reside...	EditorNumeric	0			IE, LT	<input checked="" type="checkbox"/>	
amrrm	ASSETS	main reside...	EditorNumeric	3			EE, EL, UK	<input checked="" type="checkbox"/>	
amrtp	ASSETS	main reside...	EditorCombo	2	1#2	House #Flat	LT	<input checked="" type="checkbox"/>	
aobiv	ASSETS	other buildi...	EditorNumeric	0			IT	<input type="checkbox"/>	
aoc	ASSETS	other capital	EditorNumeric	0			BG, PL, RO	<input type="checkbox"/>	
bac	BENEFIT/P...	accident/di...	EditorNumeric	0			AT	<input type="checkbox"/>	
bac00	BENEFIT/P...	accident/di...	EditorNumeric	0			AT	<input type="checkbox"/>	
bac01	BENEFIT/P...	accident/di...	EditorNumeric	0			AT	<input type="checkbox"/>	
bacot	BENEFIT/P...	accident/di...	EditorNumeric	0			AT	<input type="checkbox"/>	
bacpm	BENEFIT/P...	accident/di...	EditorNumeric	0			LU	<input type="checkbox"/>	
bca01	BENEFIT/P...	receiving c...	EditorNumeric	0			LU	<input type="checkbox"/>	

6.4.4 Managing country-specific advanced variables

There are some advanced variables that have the same name across countries but can assume country-specific values (for example, demographic variables related to a region). These variables are shown and can be changed by selecting the 'Manage Advanced Country-Specific Variables' option under 'Advanced Options'/'Manage settings'. Figure 49 shows that the demographic variable *drgn1* for region at the NUTS level 1 can assume different specifications depending on the country for which it is specified.

Figure 49: Managing country specific advanced variables

Variable Name	Category	Description	Editor Type	Household Variable	Comments																								
drg01	DEMOGRAPHIC	region : 01	EditorCombo	<input checked="" type="checkbox"/>																									
drgn1	DEMOGRAPHIC	region : nuts level 1	EditorCombo	<input checked="" type="checkbox"/>																									
<table border="1"> <thead> <tr> <th>Country</th> <th>Default Value</th> <th>Value Range</th> <th>Text Range</th> </tr> </thead> <tbody> <tr> <td>BE</td> <td>1</td> <td>1#2#3</td> <td>Brussels#Flanders#Wallonia</td> </tr> <tr> <td>CZ</td> <td>1</td> <td>1</td> <td>Czech Republic</td> </tr> <tr> <td>PL</td> <td>1</td> <td>1#2#3#4#5#6</td> <td>CENTRALNY (Central)#POŁUDNI...</td> </tr> <tr> <td>UK</td> <td>7</td> <td>1#2#4#5#6#7#8#9#10#11#...</td> <td>Noth East#North West#Yorks a...</td> </tr> <tr> <td colspan="4">* [EditValue is null]</td> </tr> </tbody> </table>						Country	Default Value	Value Range	Text Range	BE	1	1#2#3	Brussels#Flanders#Wallonia	CZ	1	1	Czech Republic	PL	1	1#2#3#4#5#6	CENTRALNY (Central)#POŁUDNI...	UK	7	1#2#4#5#6#7#8#9#10#11#...	Noth East#North West#Yorks a...	* [EditValue is null]			
Country	Default Value	Value Range	Text Range																										
BE	1	1#2#3	Brussels#Flanders#Wallonia																										
CZ	1	1	Czech Republic																										
PL	1	1#2#3#4#5#6	CENTRALNY (Central)#POŁUDNI...																										
UK	7	1#2#4#5#6#7#8#9#10#11#...	Noth East#North West#Yorks a...																										
* [EditValue is null]																													
drgn2	DEMOGRAPHIC	region : nuts level 2	EditorCombo	<input checked="" type="checkbox"/>																									
lpm	LABOUR MARKET	pension membership	EditorCombo	<input type="checkbox"/>																									
lcl	LABOUR MARKET	collar	EditorCombo	<input type="checkbox"/>																									
lse00	LABOUR MARKET	self employed : main/...	EditorCombo	<input type="checkbox"/>																									
amrar	ASSETS	main residence : area...	EditorNumeric	<input checked="" type="checkbox"/>																									
tpceepx	TAX	comp prvt ctrb : empl...	EditorNumeric	<input type="checkbox"/>																									
*	[EditValue is null]			<input type="checkbox"/>																									

Save Close

6.4.5 Managing derived variables

HHoT also has an option for so-called '*derived variables*', for which the value can depend on the specified value of another variable. For each condition, it is possible to specify a simple value or a function of other variables. For example, if a person's economic status is specified as employee, the derived variables 'Months in employment' and 'Months in unemployment' will take the default values of 12 and 0 respectively; if a person's economic status is selected to be unemployed, these variables will take the values of 0 and 12. The conditional and default values of all derived variables are shown (and can also be changed) by selecting the 'Manage Derived Variables' option (under 'Manage settings' in the 'Advanced Options' menu).

Figure 50 shows how the variable *yemmy* indicating months in employment is set to 12 if *les*=3 (economic status is set to employee). It also shows how the hourly wage (*yivwg*) is set as a function of employment income (*yem*) and hours worked per week (*lhw*).

Figure 50. Derived variables editor

Variable Name	Category	Description	Countries	Default Value	Comments						
yem01	INCOME	employment : 01	BG	yem							
yemmy	INCOME	employment : months per year	AT, BE, BG...	0							
<table border="1"> <thead> <tr> <th>Condition</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>les = 3</td> <td>12</td> </tr> <tr> <td>*</td> <td></td> </tr> </tbody> </table>						Condition	Value	les = 3	12	*	
Condition	Value										
les = 3	12										
*											
yempmy	INCOME	employment : previous : months per...	BE, FI	0							
yemtx	INCOME	employment : taxable	BG	yem							
yemwg	INCOME	employment : wage/salary	SI	0							
yemxp	INCOME	employment : extra pay	AT	yem * 2 / 14							
yivwg	INCOME	imputed value : wage/salary	AT, BE, BG...	0							
<table border="1"> <thead> <tr> <th>Condition</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>lhw > 0</td> <td>yem / (lhw * 4.35)</td> </tr> <tr> <td>▶</td> <td></td> </tr> </tbody> </table>						Condition	Value	lhw > 0	yem / (lhw * 4.35)	▶	
Condition	Value										
lhw > 0	yem / (lhw * 4.35)										
▶											
yse	INCOME	self employment	EE, EL, FI, ...	0							
yse00	INCOME	self employment : main/basic	SK	0							
ysemy	INCOME	self employment : months per year	AT, BG, CY...	0							

Save Close

6.4.6 Managing a reference table

A reference table includes information for different countries and different years. HHoT for example already provides a reference table² but the user can also include their own reference tables. These tables are useful for defining numeric variables by using reference values (see section 3.2.3). As shown, the *'Numeric Variable Editor'* of numeric variables allows the specification of the reference table from which the value should be retrieved.

For example: in Figure 16, the reference table 'Average Employment Income' is used to define the variable 'main employment income'. However, the table could also be used to define other monetary variables such as pension income. Note that the reference table that is provided is in Euro.

Figure 51 shows how to manage a reference table.

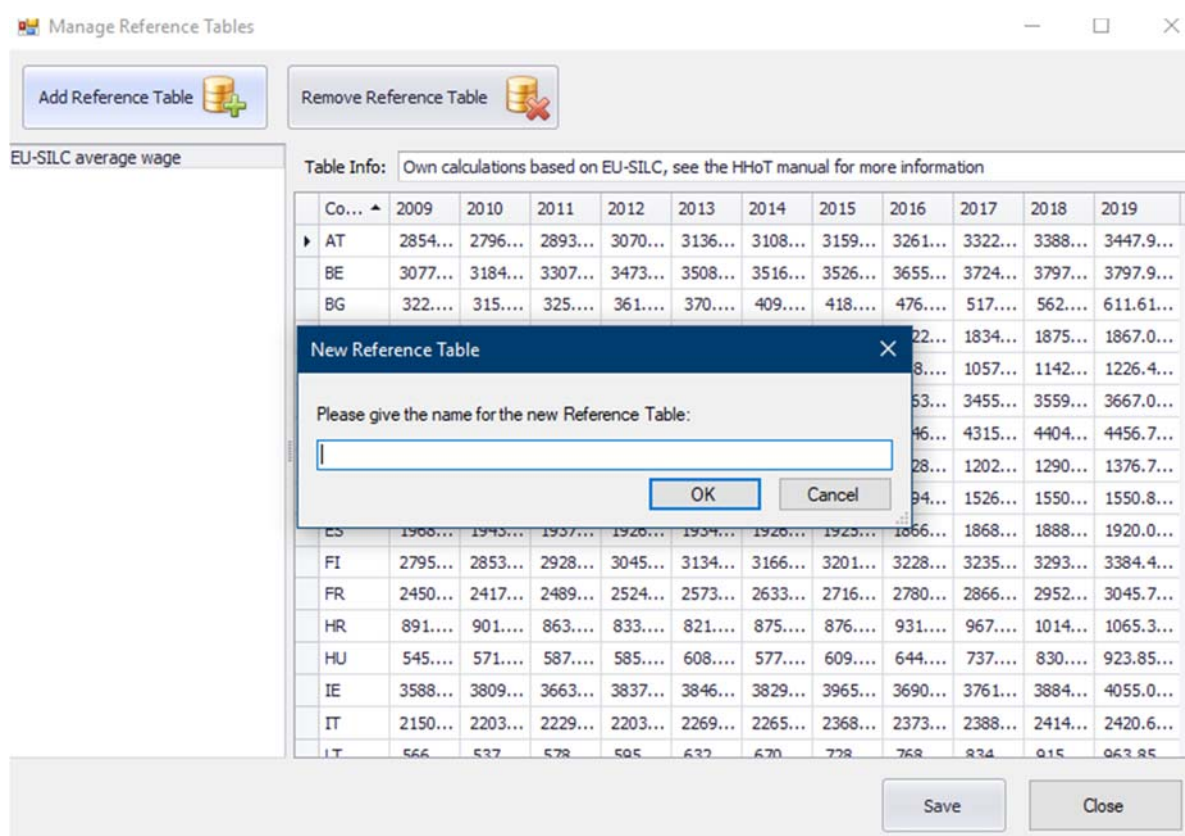
A reference table is basically a table with country rows and years in the columns. If the user decides to add a new table (by selecting 'Add Reference Table' under 'Advanced Options'/'Manage settings'/'Manage Reference Tables'), HHoT provides an empty table for all available countries and years. The user will be asked to specify a name for the new reference table (Figure 54) and it is also possible to add more information in the 'Table Info' field. You

can copy-paste the values of the table directly (e.g. from Excel) or fill in amounts manually. Cells that are not filled in will automatically be considered to be 0. Examples for reference tables are minimum wage levels, averages wages, housing costs or also non-monetary information such as retirement age for various years and countries.

You can browse through the different reference tables using the left panel. When a table is selected, you can fill in or modify the values of specific cells, copy/paste values from Excel or remove the reference table using the 'Remove Reference Table' button.

The HHoT interface already provides a reference table for average wages. This table is based on own calculations using EU-SILC data and the uprating factors for earnings provided in the EUROMOD country models. For more information on the methodology see Gasior and Recchia (2018), specifically the online supplementary material.

Figure 51. Managing a reference table



6.5 View - Show advanced variables

By default, the main panel in HHoT only includes basic variables (i.e. variables that users need to fill in with values). The basic variables cover the main individual and household characteristics, such as age, gender, education, marital status, economic status, employment income, etc. Basic variables do not come with a 'default' value, because they are supposed to be specified by the user as a basic requirement to define the households.

Advanced variables provide additional characteristics that one might want to specify for the hypothetical households but are not always necessary. For simplicity, advanced variables come with already predefined ‘default’ values (see 6.4.3 to learn how to look at the default values). They are shown after checking the ‘Show Advanced Variables’ option in the ‘View’ menu (Figure 52). Many advanced variables are country specific. Therefore, this option only works if at least one country is selected. The main panel shows in which countries each advanced variable is relevant (e.g. ‘used in CZ’).

Figure 52. Showing advanced variables

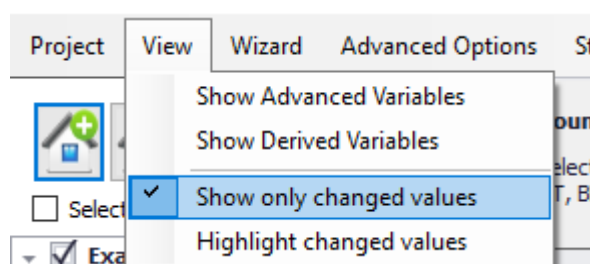
The screenshot shows the 'View' menu with the following options: ☒ Show Advanced Variables, ☐ Show Derived Variables, ☐ Show only changed values, and ☐ Highlight changed values. The main panel displays a table of variables for four household members (Adult1, Adult2, Child1, Child2). The table is divided into two sections: DEMOGRAPHIC and LABOUR MARKET. The DEMOGRAPHIC section includes variables like gender, age, father, mother, partner, education, marital status, region, citizenship, disability, and disability level. The LABOUR MARKET section includes variables like economic status, hours worked, industry, occupation, professional status, and part-time worker status. Red boxes highlight the following rows in the table:

Variable	Adult1	Adult2	Child1	Child2
region : nuts level 1 (drgn1) [used in AT]	Brussels	Brussels	Brussels	Brussels
citizenship (dcz) [used in AT]	Same country as...	Same country as...	Same country as...	Same country as...
disability (ddi) [used in all selected countries]	No	No	No	No
disability : level (%) (ddlv) [used in AT]	0	0	0	0
collar (ld) [used in AT]	white collar worker	white collar worker	white collar worker	white collar worker
civil servant (lcs) [used in all selected countries]	No	No	No	No
firm size (lfs) [used in BE]	15	15	15	15
industry (nace) : detailed industry	Wholesale and retail trade	Wholesale and retail trade	Wholesale and retail trade	Wholesale and retail trade
occupation (isco 1-digit) (loc) [used in AT]	service and sales	service and sales	service and sales	service and sales
professional (lpf) [used in AT]	no	no	no	no
part time worker : months per year	0	0	0	0

6.6 View - Show only/highlight changed values

It is possible to reduce the list of visible variables in the main panel, displaying only the variables with a changed value. This is done by selecting the ‘Show only changed values’ option in the ‘View’ menu (Figure 53).

Figure 53. Showing only changed values



Another useful option is to highlight the changed variables by selecting the 'Highlight changed values' option in the 'View' menu which highlights changed variables in red (Figure 54).

Figure 54. Highlighting changed values

The screenshot shows the application interface with the 'View' menu open and 'Highlight changed values' selected. The interface includes a 'Variable Filter' section, a list of variables (Father, Mother, Kid, kid2), and a table of household data. The table has columns for 'Father', 'Mother', 'Kid', and 'kid2'. The data is categorized into sections: DEMOGRAPHIC, LABOUR MARKET, INCOME, BENEFIT/PENSION, ASSETS, and EXPENDITURE. Values are highlighted in red to indicate they have changed from their default values.

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 Second...	Primary
education - highest status	Post Secondary	Post Secondary	Lower Second...	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

Please check the families and people that you wish to generate the Household Data for.

Generate

Note: These two features are designed only for advanced variables which have a default value. As basic variables do not have any default value, they are always considered as 'changed values' because they are specified by the user.

References

- Gasior, Katrin, and Pasquale Recchia. 2019. "The Use of Hypothetical Household Data for Policy Learning – Comparative Tax-Benefit Indicators Using EUROMOD HHoT." *Journal of Comparative Policy Analysis: Research and Practice*. doi:10.1080/13876988.2019.1609784