

SOUTHMOD – simulating tax and benefit policies for development

## **How to implement sub-national poverty lines in a SOUTHMOD country model using conditional constants**

The case of UGAMOD

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**Abstract:** This note describes how to incorporate sub-national poverty lines into a SOUTHMOD country model using conditional constants within the constants function in such a way that the Statistics Presenter can generate national-level poverty statistics. The Uganda tax-benefit microsimulation model UGAMOD is used as an example.

**Key words:** tax-benefit microsimulation, poverty

**Supplementary material:** Further details about the UGAMOD model including documentation and information on how to obtain it can be accessed at this link: <https://www.wider.unu.edu/about/ugamod-simulating-tax-and-benefit-policies-development-uganda>.

**Related publication:** Waiswa, R., J. Okello Ayo, M. Noble, C. Byaruhanga, S. Kavuma, and G. Wright (2020). ‘SOUTHMOD Country Report Uganda - UGAMOD v1.4’. Helsinki: UNU-WIDER. Available at: <https://www.wider.unu.edu/publication/southmod-country-report-uganda-ugamod-v14>.

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## 1 Background

In some countries, for example Uganda, Mozambique, and Indonesia, official poverty lines are designated at sub-national rather than national level. This may be by region, province, or some other geographical area. However, for Statistics Presenter to work correctly with the SOUTHMOD country models, only one poverty line variable (*spl*) and its post fiscal equivalent (*splpf*) can be included in the output file if the poverty headcount and poverty gap measures are to be correctly calculated.

One way of achieving this is to construct some kind of weighted average poverty line for the whole country. This was the initial approach in Uganda for UGAMOD and is currently the approach used in Mozambique for MOZMOD. Another approach would be to use a complex *BenCalc* function with multiple conditions to output the appropriate poverty line as the output variable.

However, a more elegant solution is to use conditional constants within the constants function—*DefConst*—which is a function that exists within the EUROMOD software that is used by the SOUTHMOD country models. Within this function, constants can be set to different values dependent on certain conditions being fulfilled. So, the conditional constants will allow the poverty line constant to vary depending on the province or region where a particular individual/household resides.

## 2 Implementing conditional constants in UGAMOD's poverty policy

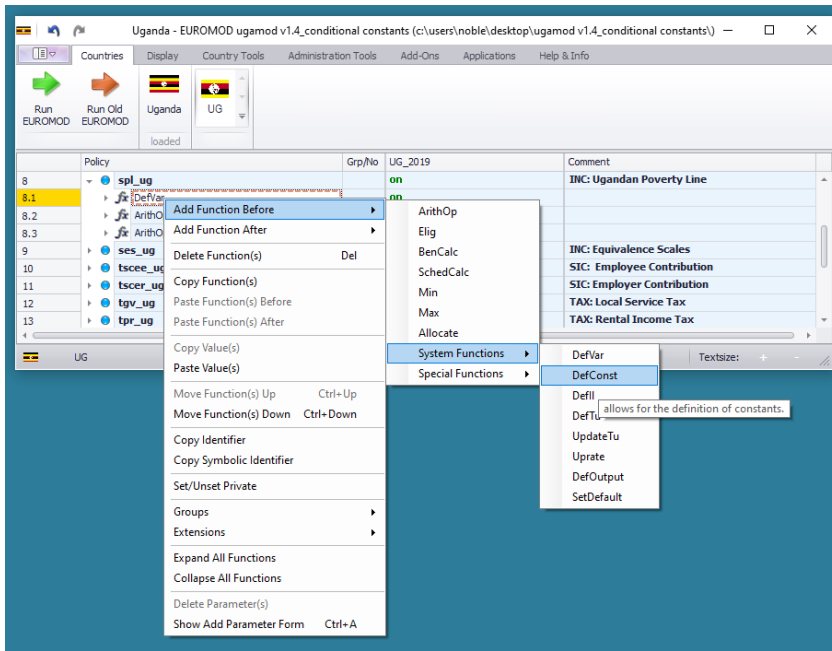
Using UGAMOD as a case study, the rest of this note describes the step-by-step implementation of the constants function—*DefConst*—for the regional level poverty lines in Uganda.

The conditional constants can be inserted in the generic constant policy if this is present in your model. However, it is probably better to insert a *DefConst* function as the first function in the poverty policy itself, and this is the approach taken here.

### Step 1

Introduce the *DefConst* function as the first function in the poverty policy *spl\_ug*. This is achieved by right-clicking the previous first function (in this case *DefVar*) and selecting *Add Function Before/System Functions/DefConst* as per the screenshot below:

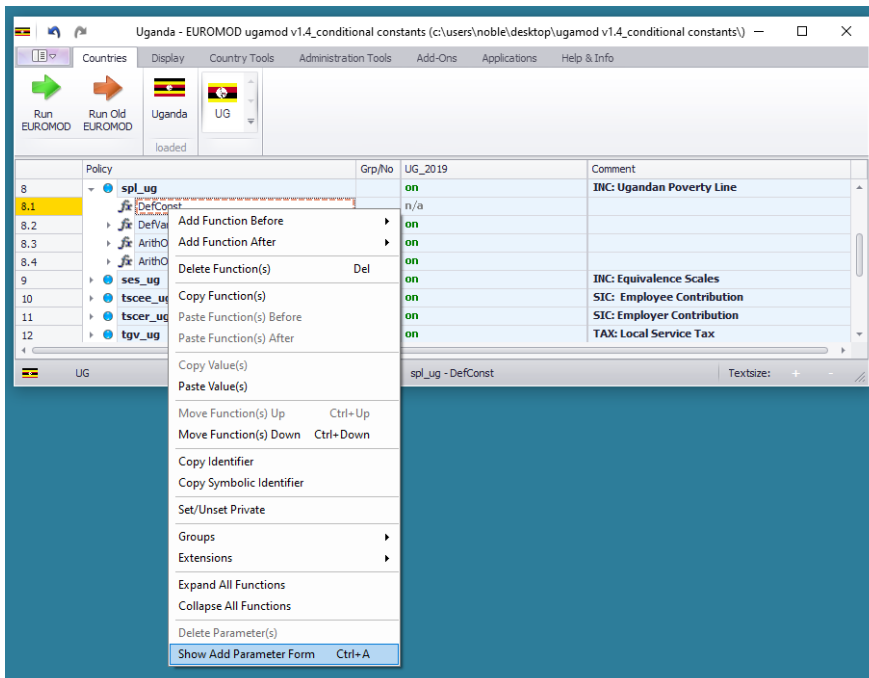
Screenshot 1.1



## Step 2

Right click on the newly introduced *DefConst* function and select *Show Add Parameter Form* as per the screenshot below:

Screenshot 2.1



This reveals the *Add Parameters* form:

Screenshot 2.2

**Add Parameters**

**DefConst (order: 1) in policy spl\_ug**

Add	Parameter	Replaces	Grp/No	Count	Description
<input type="checkbox"/>	Const_SystemYear				If set, constants are only defined if the run concerns the respective system year.
<input type="checkbox"/>	Const_Dataset				If set, constants are only defined if the respective dataset is used for the run.
<input checked="" type="checkbox"/>	Condition		1	1	If set, constant with same group only takes this value if condition is fulfilled (i.e. allows for diffe...
<input checked="" type="checkbox"/>	[Placeholder]		1	2	[Placeholder] stands for the name of the constant, which is defined in the policy column. The v...
<input type="checkbox"/>	Run_Cond				Function is only carried out if the condition is fulfilled. The parameter is intended to be a conditio...
<input type="checkbox"/>	#_LowLim		1	1	Footnote parameter for the further specification of an operand: replaces operand if operand is s...
<input type="checkbox"/>	#_UpLim		1	1	Footnote parameter for the further specification of an operand: replaces operand if operand is hi...
<input type="checkbox"/>	#_LimPriority		1	1	1-Footnote parameter for the further specification of an operand: Possible values: If upper limit (#...
<input type="checkbox"/>	#_Level		1	1	Footnote parameter for the further specification of an operand: indicates an alternative assessm...
<input type="checkbox"/>	#_Amount		1	1	Footnote parameter for the further specification of an operand: indicates the numeric value of a...
<input type="checkbox"/>	#_DataBasename		1	1	Parameter of query IsUsedDatabase.

Show Common Parameters  
 Show Footnote Parameters

Description (F5)    Summary (F6)    **Add**    Close

### Step 3

In the *Add Parameters* form relevant to the *DefConst* function, the parameter *Condition* appears above the parameter *[Placeholder]*. Selecting the *Condition* parameter will allow the setting of the *Condition* for the constant. The *[Placeholder]* parameter is used to specify the constant for the poverty line. As there are two poverty lines relevant to each *Condition*, it is important to add the *Condition* parameter and two counts of the *[Placeholder]* parameter as shown in the screenshot above. Press the *Add* button and then the *Close* button.

The screenshot below shows the parameters as they will appear:

Screenshot 3.1

Uganda - EUROMOD ugamod v1.4\_conditional constants (c:\users\noble\desktop\ugamod v1.4\_conditional constants\)

Run EUROMOD    Run Old EUROMOD    Uganda    UG

Policy	Grp/No	UG_2019	Comment
8	spl_ug	on	INC: Ugandan Poverty Line
8.1	DefConst	n/a	
8.1.1	Condition	1	n/a
8.1.2	[Placeholder]	1	n/a
8.1.3	[Placeholder]	2	n/a
8.2	DefVar	on	
8.3	ArithOp	on	
8.4	ArithOp	on	

UG    spl\_ug - DefConst    Textsize: + -

## Step 4

Next, the function should be switched on; and then the *Condition* parameter needs to be set to the relevant condition. In the case of the regional poverty lines in Uganda, there are eight regions designated by the input variable *drgn5*. The Ugandan regions are numbered as follows:

Table 1: Regions in Uganda

Region Number	Region name
10	Central rural
11	Central urban
20	East rural
21	East urban
30	North rural
31	North urban
40	West rural
41	West urban

Source: UGAMOD version 1.4.

Accordingly, for the first region's poverty lines—Central rural—the condition will be  $drgn5 = 10$ .

The two placeholders should then be set for the poverty line constant and the post fiscal income poverty line constant applicable to that particular region (in the form of monthly amounts). These have been named *\$basic\_needs\_pov\_line* and *\$indirect\_basic\_povline*, respectively, and the values set accordingly. NB: if there are additional poverty lines, such as food poverty lines and the post fiscal income equivalents, these should also be added at this point. See screenshot below:

Screenshot 4.1

Policy	Grp/No	UG_2019	Comment
8		on	INC: Ugandan Poverty Line
8.1		on	
8.1.1	1	drgn5 = 10	
8.1.2	1	42584	
8.1.3	1	38967.48	
8.2		on	
8.3		on	
8.4		on	

The *Grp/No* column is very important. As will have been observed, the condition parameter and the first placeholder were allocated to group 1 by default, but the second placeholder was automatically allocated to group 2 (see Screenshot 3.1). However, all placeholders relevant to the condition parameter need to be allocated the same group number as the condition and, if necessary, this should be undertaken manually (as in Screenshot 4.1), as the *Add Parameter Form* may not make the requisite allocation.

## Step 5

Step 4 should be repeated for each condition to achieve a complete list of conditional constants. See the screenshot below for the finished function in UGAMOD:

Screenshot 5.1

Policy	Grp/No	UG_2019	Comment
8		on	<b>INC: Ugandan Poverty Line</b>
8.1		on	
8.1.1	1	drgn5=10	Central rural
8.1.2	1	42584	
8.1.3	1	38967.48	
8.1.4	2	drgn5=11	Central urban
8.1.5	2	46233.65	
8.1.6	2	42077.08	
8.1.7	3	drgn5=20	East rural
8.1.8	3	41245.18	
8.1.9	3	36887.78	
8.1.10	4	drgn5=21	East urban
8.1.11	4	44187.74	
8.1.12	4	38993.57	
8.1.13	5	drgn5=30	North rural
8.1.14	5	41684.79	
8.1.15	5	37704.34	
8.1.16	6	drgn5=31	North urban
8.1.17	6	43537.83	
8.1.18	6	38915.19	
8.1.19	7	drgn5=40	West rural
8.1.20	7	40558.76	
8.1.21	7	37211.52	
8.1.22	8	drgn5=41	West urban
8.1.23	8	43190.13	
8.1.24	8	39955.71	
8.2		on	
8.3		on	
8.4		on	

NB: it is possible to add all the eight condition parameters and 16 placeholders with one visit to the *Add Parameters* form. However, it will then be necessary to group the conditions and parameters manually and allocate them appropriate group numbers as above.

For completeness the following screenshot shows the full *spl\_ug* policy in UGAMOD:

Screenshot 5.2

Policy	Grp/No	UG_2019	Comment
8		<b>on</b>	<b>INC: Ugandan Poverty Line</b>
8.1		<b>on</b>	
8.1.1	1	drgn5=10	Central rural
8.1.2	1	42584	
8.1.3	1	38967.48	
8.1.4	2	drgn5=11	Central urban
8.1.5	2	46233.65	
8.1.6	2	42077.08	
8.1.7	3	drgn5=20	East rural
8.1.8	3	41245.18	
8.1.9	3	36887.78	
8.1.10	4	drgn5=21	East urban
8.1.11	4	44187.74	
8.1.12	4	38993.57	
8.1.13	5	drgn5=30	North rural
8.1.14	5	41684.79	
8.1.15	5	37704.34	
8.1.16	6	drgn5=31	North urban
8.1.17	6	43537.83	
8.1.18	6	38915.19	
8.1.19	7	drgn5=40	West rural
8.1.20	7	40558.76	
8.1.21	7	37211.52	
8.1.22	8	drgn5=41	West urban
8.1.23	8	43190.13	
8.1.24	8	39955.71	
8.2		<b>on</b>	
8.2.1	1	0	
8.2.2	2	0	
8.3		<b>on</b>	
8.3.1		\$basic_needs_pov_line*\$f_CPI_Overall	Basic Needs Poverty Line
8.3.2		spl	
8.3.3		tu_individual_ug	
8.4		<b>on</b>	
8.4.1		\$indirect_basic_povline*\$f_CPI_Overall	Basic Needs Poverty Line for post fiscal income
8.4.2		splpf	
8.4.3		tu_individual_ug	

Statistics Presenter will now calculate the poverty headcount and poverty gap measures correctly and will generate national level results.