

# SOUTHMOD

Exercises with solutions

# Ecuador

ECUAMOD v1.3

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UNIVERSITY  
OF TAMPERE



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*Note: The exercises and solutions presented below are applicable to GHAMOD model v1.1.*

## Exercise 1: Running GHAMOD and analyzing poverty and inequality

### Task:

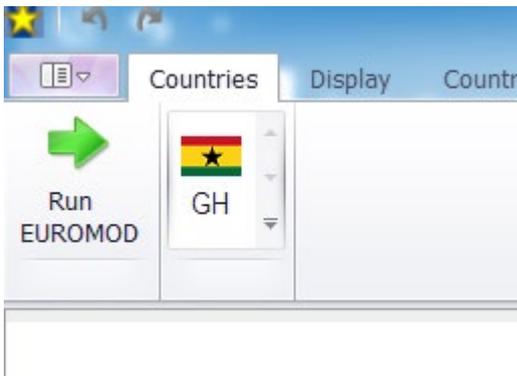
Run GHAMOD for two years, 2013 and 2016. Analyze what happens to poverty (as measured by the headcount index) and inequality (as measured by the Gini index) between the years. Explain the results.

### Purpose of the exercise:

The purpose of this exercise is to help you understand how GHAMOD can be run and how results can be analyzed using the Statistics Presenter tool.

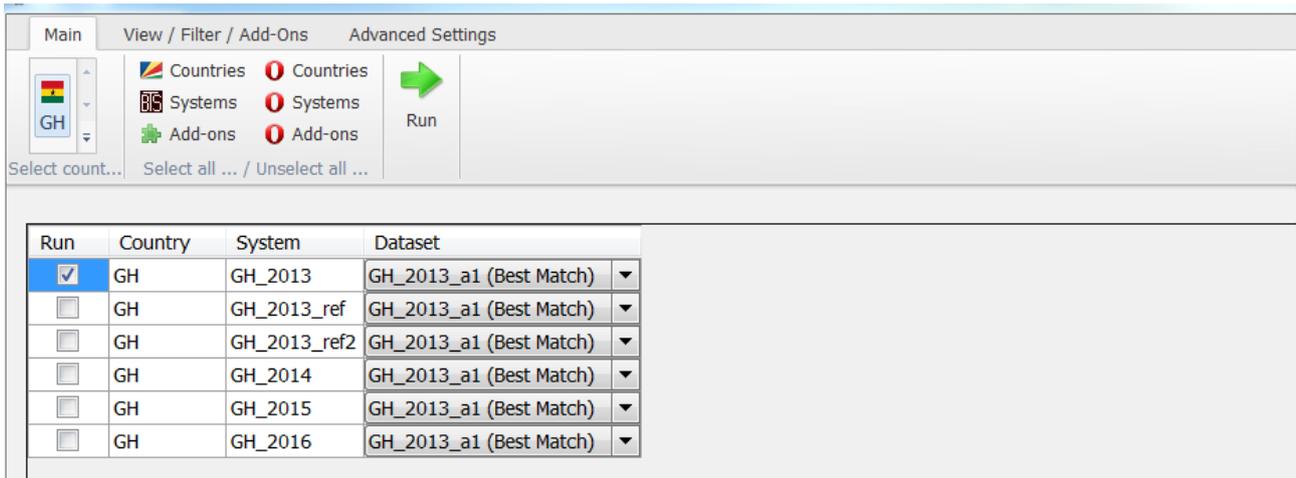
**Solution – Part 1:** Run GHAMOD selecting two policy systems, namely 2013 and 2016.

**Step 1:** Select Ghana from the ribbon bar:

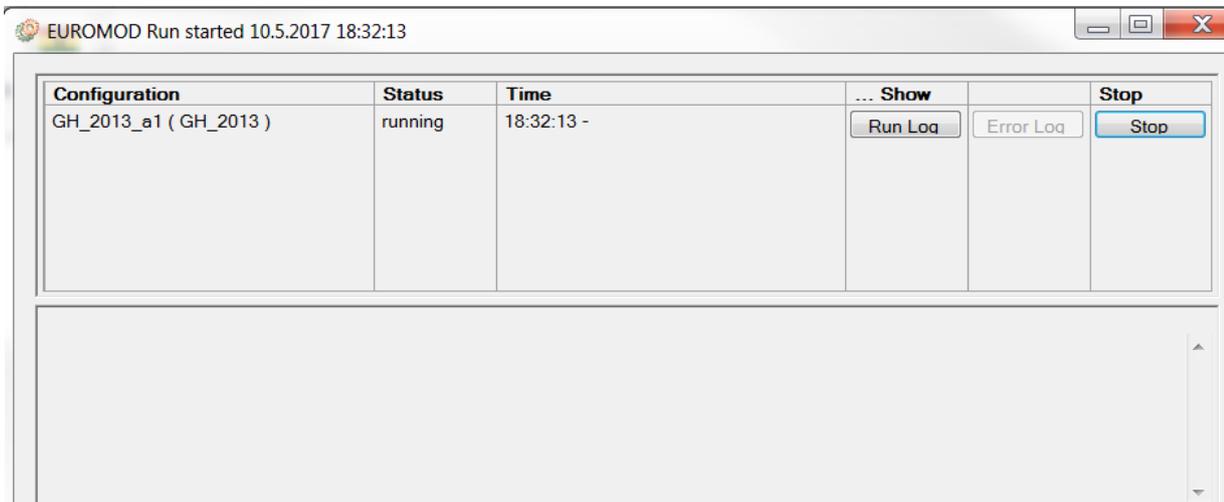


**Step 2:** GHAMOD can be run for one system at a time (A) or for two systems at the same time (B):

- A. Running GHAMOD for one system (2013 policies in this exercise):
  - a. Select the system you would like to run, thus GH\_2013 in this case and hit the "Run" button:

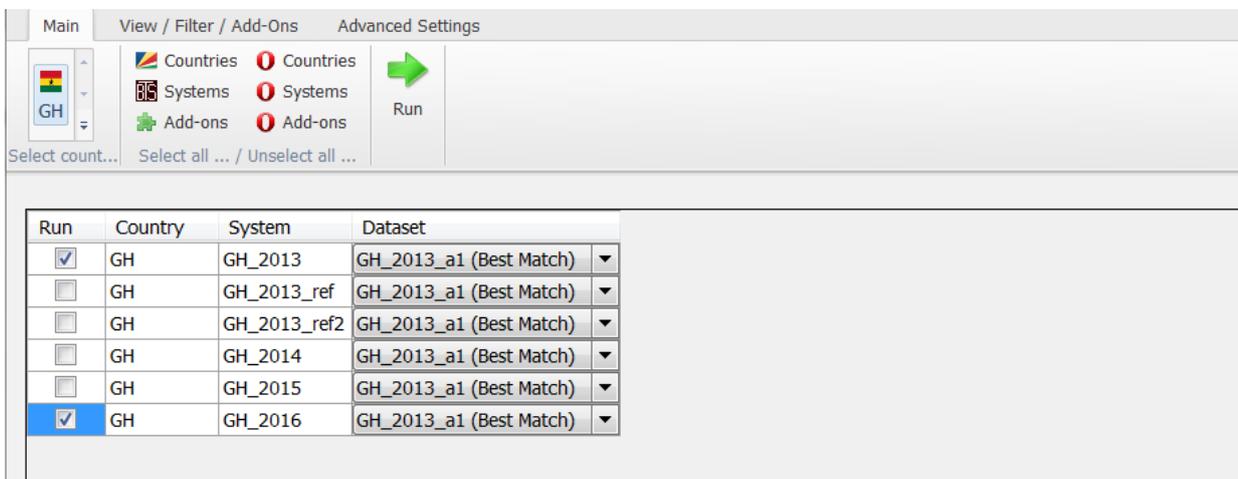


b. Wait as the software is compiling results:

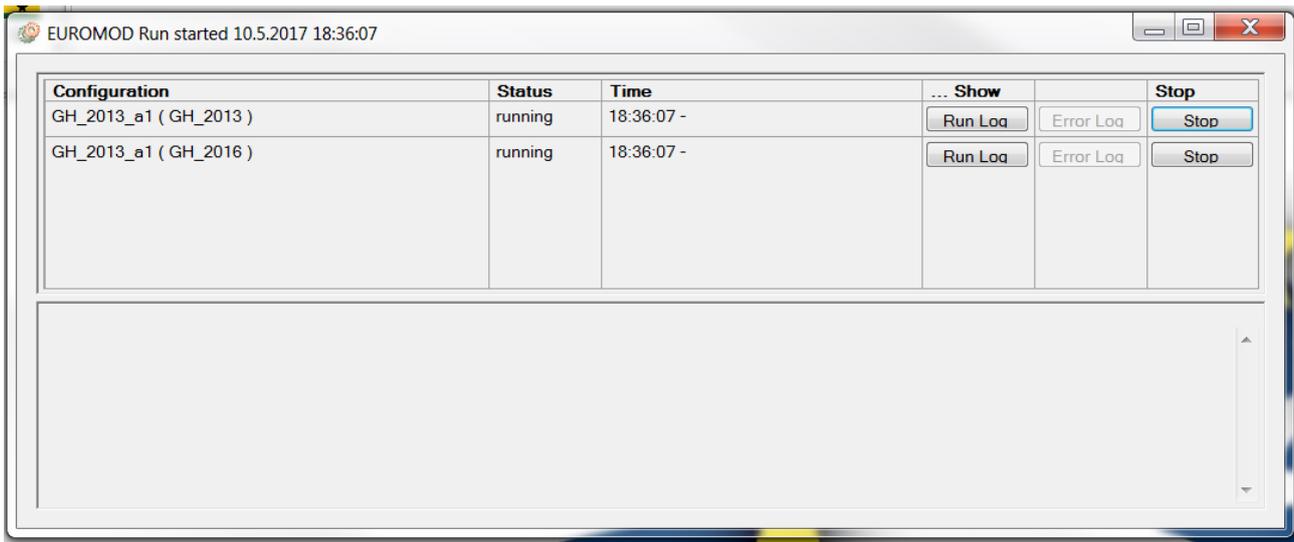


B. Running GHAMOD for two systems at the same time:

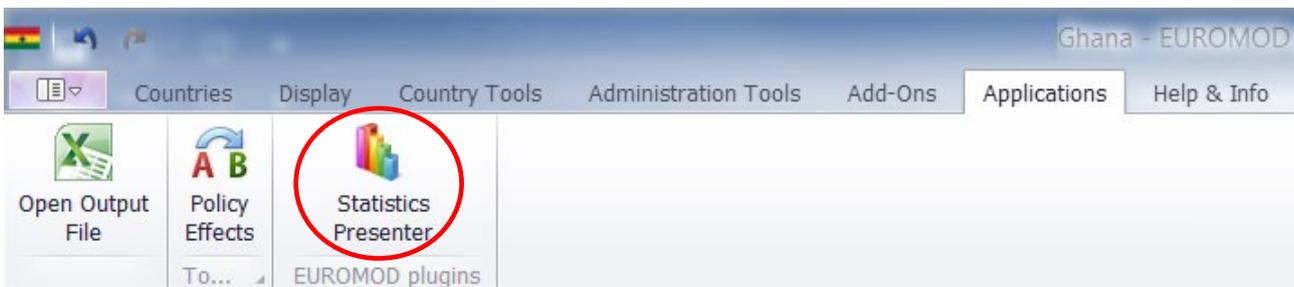
a. Select the systems you would like to run, thus GH\_2013 and GH\_2016 in this case and hit the "Run" button:



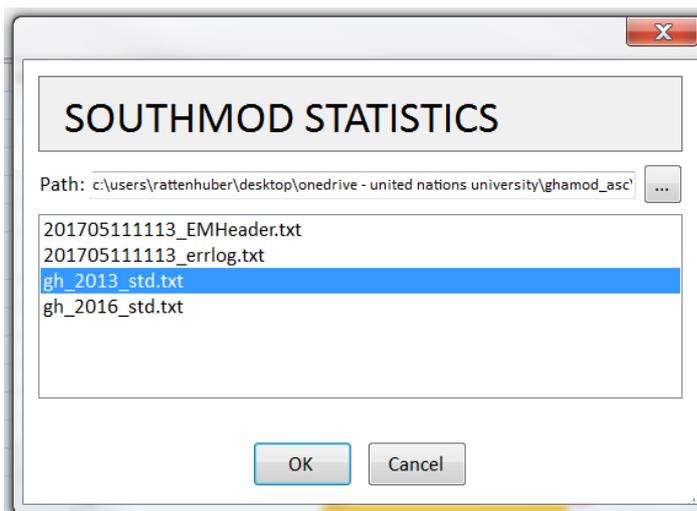
b. Wait as the software is compiling results:



**Step 3:** Check out the results using the Statistics Presenter. You can either look at results separately for each year or for both years at the same time. Open the “Applications” ribbon and click on “Statistics Presenter”:



**Step 4:** Pick on or more of the systems for which you would like to see results in the Statistics Presenter:



Once the Statistics Presenter has compiled the results (this may take some time depending on the size of the data set and the power of your machine), choose in the Statistics Presenter the appropriate tab that contains the information you need to answer your question. For the exercise at hand the Poverty and Inequality tabs are relevant:

**SOUTHMOD STATISTICS**  
Results for gh 2013

Tax-ben policy **Poverty** Inequality

Go to Chart Export Info

**Poverty**  
Share of poor population, in %

	... after taxes and transfers
▶ All	16,8
Male headed households	17,8
Female headed households	13,7
Households with children	18,0
Households with older persons	21,3

In case you chose have the Statistics Presenter run on both years, 2013 and 2016, the Statistics Presenter also allows you to switch between the results for the two years:

**SOUTHMOD STATISTICS**  
Results for gh 2013

Tax-ben policy Poverty **Inequality**

Go to Chart **Export** Info

**Inequality and the household income distribution (annual)**

	... after taxes and transfers
▶ Gini (household income)	0,4372
P80/P20	3,59
Quantiles of distribution and median	
20th	1 439,55
40th	2 262,55
50th	2 726,50
60th	3 272,06
80th	5 169,41
Absolute national poverty line	1 314,00

gh 2013 **gh 2016**

The Statistics Presenter also allows you to export the results when clicking on “Export”. You can either export parts of the results (tabs or years) or all results at once to an excel file.

## Solution – Part 2: Analyze and explain the results

### Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
► Share of poor population, in %:			
All	24.9	24.9	0.0
Poor households out of ...			
... male headed households	26.6	26.7	0.0
... female headed households	19.7	19.7	0.0
... households with children	27.5	27.5	0.0
... households with older persons	33.7	33.7	0.0
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	8.1	0.0
Poor households out of ...			
... male headed households	8.8	8.8	0.0
... female headed households	6.0	6.0	0.0
... households with children	8.9	8.9	0.0
... households with older persons	11.0	10.9	-0.1
Absolute national poverty line, in national currency, yearly:	1,314.0	2,088.2	774.2

You notice that the poverty rate has remained constant. This is because all incomes and the poverty line are updated in the same proportion, and changes to government policies have been small enough not to have an impact on poverty. Inequality (below) is almost not affected at all.

### Inequality and the household income distribution - Consumption based, Indirect Tax off

after taxes and transfers, yearly

	Base scenario	Alternative scenario	Difference base vs alternative
► Gini (household income)	0.4171	0.4170	-0.0002
P80/P20	3.52	3.53	0.00
Quantiles of distribution and median			
20th	1,163.88	1,848.76	684.88
40th	1,786.53	2,838.71	1,052.17
50th	2,148.03	3,411.80	1,263.78
60th	2,594.04	4,122.31	1,528.27
80th	4,102.50	6,522.23	2,419.74
Absolute national poverty line, in national currency, yearly	1,314.00	2,088.24	774.24

## Exercise 2: Implementation of the LEAP cash transfer programme

### Task:

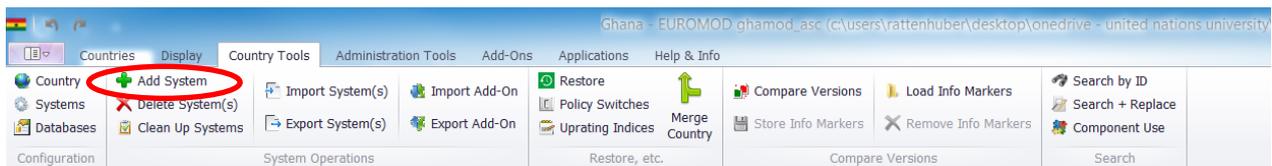
The Ghanaian government has decided to double the benefit amounts offered by the LEAP cash transfer programme for 2013. Simultaneously it decided to double the extreme poverty line used in the calculations for eligibility. Implement the above reform of the LEAP cash transfer programme and examine the impacts of this policy change on government expenditure, poverty and inequality.

### Purpose of the exercise:

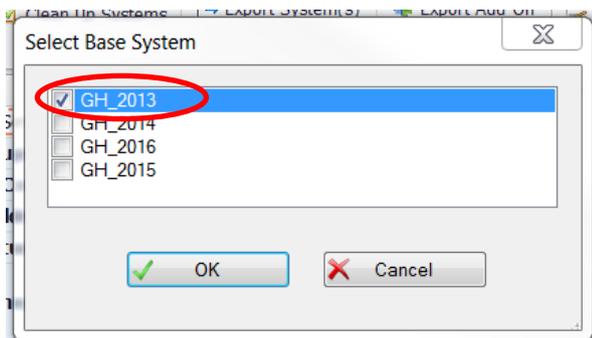
The purpose of this exercise is to help you learn to examine how simple policy changes where parameters are altered can be examined using GHAMOD.

### Solution – Part 1: Create a new policy system based on year 2013

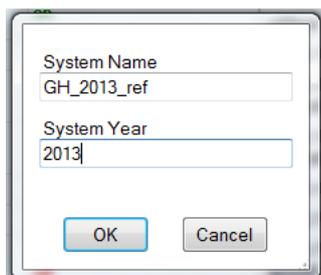
**Step 1:** we need to create a new policy system based on year 2016: Go to Country tools – add policy system – and use year 2016 as a base.



**Step 2:** Choose year 2013 as a base to take a copy from



**Step 3:** Name the new system GH\_2013\_ref:



Now you should see an additional column for reform system “GH\_2013\_ref”:

	Policy	Grp/No	GH_2013	GH_2013_ref	GH_2014	GH_2015	GH_2016	Comment
1	SetDefault_gh		on	on	on	on	on	DEF: Set Default
2	uprate_gh		on	on	on	on	on	DEF: UPRATING FACTORS
3	ConstDef_gh		on	on	on	on	on	DEF: Constants

## Solution – Part 2: Amend the LEAP policy

**Step 1:** Find the LEAP policy in the policy spine, open the policy and find where the benefit amounts are defined:

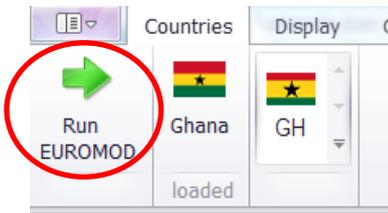
	Policy	Grp/No	GH_2013	GH_2013_ref	GH_2014	GH_2015	GH_2016	Comment
14	vat_on_exc_gh		on	on	off	off	off	TAX: Value Added Tax on good that are also subject to other indirect taxes
15	bsa_gh		on	on	on	on	on	BEN: LEAP transfer programme
15.1	DefConst		on	on	on	on	on	Constants for LEAP transfers
15.2	DefVar		on	on	on	on	on	Temp variables
15.3	BenCalc		on	on	on	on	on	nr of disabled
15.4	BenCalc		on	on	on	on	on	nr of Vulnerable children
15.5	BenCalc		on	on	on	on	on	nr of Pregnant women
15.6	BenCalc		on	on	on	on	on	nr of Aged
15.7	ArithOp		on	on	on	on	on	nr of beneficiaries
15.8	Elig		on	on	on	on	on	Extreme poverty condition
15.9	BenCalc		on	on	on	on	on	LEAP benefit amounts
15.10	Elig		off	off	off	off	off	Extreme poverty condition
15.11	BenCalc		off	off	off	off	off	LEAP benefit amounts
16	bed01_gh		on	on	on	on	on	BEN: School capitation grant

**Step 2:** Find the constant function defining the constants (thus the benefit amounts and the extreme poverty line) that need changing. The constant function if the LEAP benefit policy is on line 15.1 of the model. Change the monthly LEAP amounts and the extreme poverty line as desired (thus doubling each of them) in the 2013 reform system.

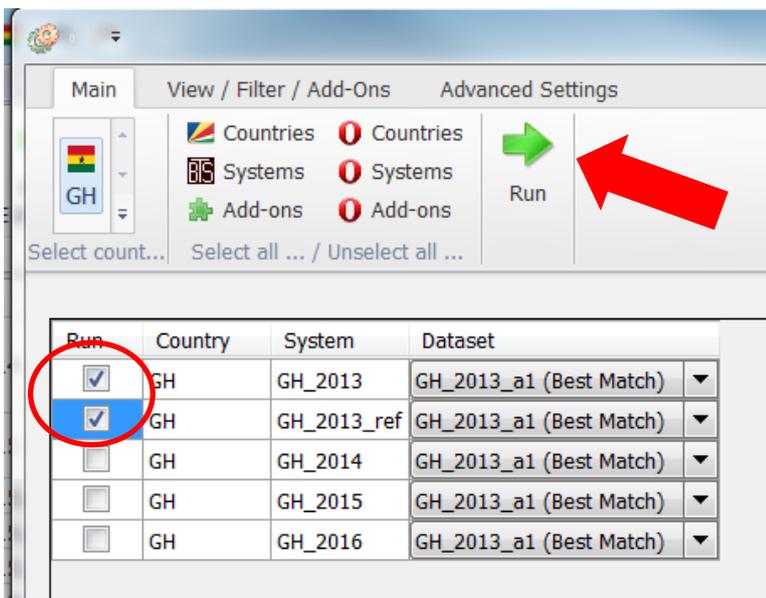
15	bsa_gh		on	on	on	on	on	BEN: LEAP transfer programme
15.1	DefConst		on	on	on	on	on	Constants for LEAP transfers
15.1.1	\$bch1		8#m	16#m	32#m	48#m	48#m	One beneficiary
15.1.2	\$bch2		10#m	20#m	38#m	60#m	60#m	Two beneficiaries
15.1.3	\$bch3		12#m	24#m	44#m	72#m	72#m	Three beneficiaries
15.1.4	\$bch4		15#m	30#m	53#m	90#m	90#m	Four/more beneficiaries
15.1.5	\$bch5		446.30#y	892.60#y	446.30#y	446.30#y	446.30#y	extreme poverty line
15.2	DefVar		on	on	on	on	on	Temp variables
15.3	BenCalc		on	on	on	on	on	nr of disabled
15.4	BenCalc		on	on	on	on	on	nr of Vulnerable children
15.5	BenCalc		on	on	on	on	on	nr of Pregnant women
15.6	BenCalc		on	on	on	on	on	nr of Aged
15.7	ArithOp		on	on	on	on	on	nr of beneficiaries
15.8	Elig		on	on	on	on	on	Extreme poverty condition
15.9	BenCalc		on	on	on	on	on	LEAP benefit amounts
15.10	Elig		off	off	off	off	off	Extreme poverty condition
15.11	BenCalc		off	off	off	off	off	LEAP benefit amounts

### Solution – Part 3: Run GHAMOD for the base year (2013) and the reform scenario (2013\_ref)

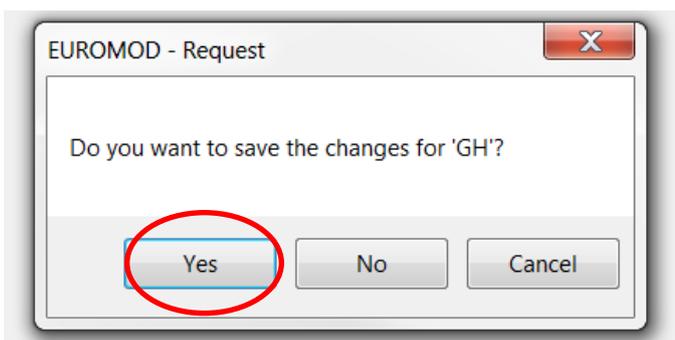
**Step 1:** Choose the “Run” button:



**Step 2:** Choose 2013 and 2013 reform systems and run the software:



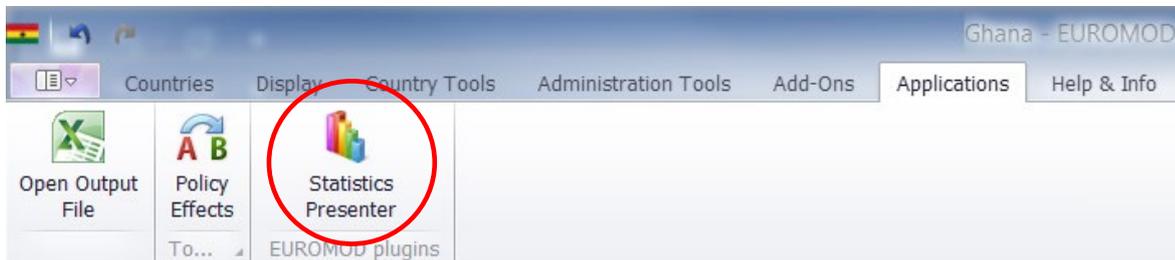
... but the software will first ask you to confirm that you want to save the changes to GHAMOD:



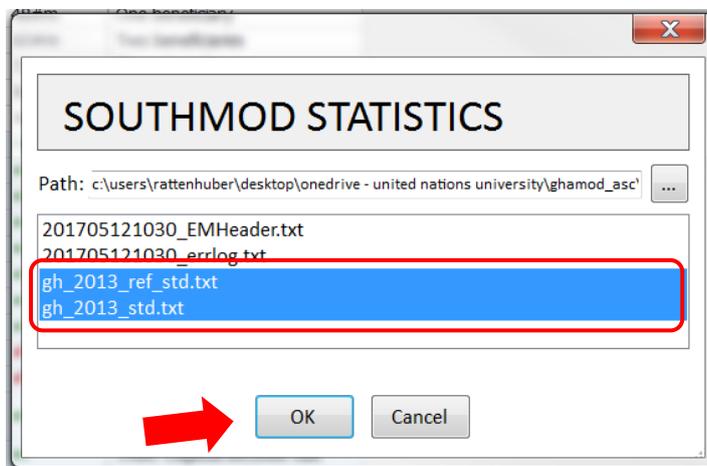
As you have created a new system (GH\_2013\_ref) and not overwritten any of the existing information, hit “yes” and wait for the software to finish.

## Solution – Part 4: Compile the results using the Statistics Presenter

**Step 1:** Launch the Statistics Presenter:



**Step 2:** Pick the base system and the reform system you would like to compare, thus gh\_2013\_std and gh\_2013\_ref\_std and run the Statistics Presenter:



**Step 3:** Switch between the results for the two systems in the Statistics Presenter for comparison.

## Solution – Part 5: Compile and compare the results using the Statistics Presenter

Comparing government expenditure shows that the expenditure on social transfers increased by more than 30 million cedi. This is driven entirely by an increase in social assistance under which the LEAP programme falls.

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	7,164.64	7,165.65	1.01
... direct taxes	3,629.11	3,629.11	0.00
... indirect taxes	1,983.40	1,984.42	1.01
... social security contributions (employee and employer)	1,552.12	1,552.12	0.00
Government expenditure on social transfers	534.01	572.37	38.37
... child benefits	0.00	0.00	0.00
... social assistance	3.34	41.70	38.37
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	530.67	530.67	0.00

Comparing poverty and inequality you can see that the policy changes translate into a reduction of the poverty gap from 8.1 to 8.0. This decrease benefits various household types and particularly households with older persons. Inequality also slightly decreased, see the change in the 20<sup>th</sup> percentile of the household income distribution.

## Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	24.9	24.9	0.0
Poor households out of ...			
... male headed households	26.6	26.6	0.0
... female headed households	19.7	19.7	0.0
... households with children	27.5	27.5	0.0
... households with older persons	33.7	33.7	0.0
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	8.0	-0.1
Poor households out of ...			
... male headed households	8.8	8.7	-0.1
... female headed households	6.0	5.8	-0.2
... households with children	8.9	8.8	-0.1
... households with older persons	11.0	10.5	-0.5
Absolute national poverty line, in national currency, yearly:	1,314.0	1,314.0	0.0

## SOUTHMOD STATISTICS

Results for gh 2013

Tax-ben policy Poverty Inequality

### Poverty

Share of poor population, in %

	... after taxes and transfers
▶ All	16,8
Male headed households	17,8
Female headed households	13,7
Households with children	18,0
Households with older persons	21,3

## SOUTHMOD STATISTICS

Results for gh 2013\_ref

Tax-ben policy Poverty Inequality

### Poverty

Share of poor population, in %

	... after taxes and transfers
▶ All	16,7
Male headed households	17,7
Female headed households	13,6
Households with children	17,9
Households with older persons	21,1

## SOUTHMOD STATISTICS

Results for gh 2013

Tax-ben policy Poverty Inequality

### Inequality and the household income

	... after taxes and transfers
▶ Gini (household income)	0,4372
P80/P20	3,59
Quantiles of distribution and median	
20th	1 439,55
40th	2 262,55
50th	2 726,50
60th	3 272,06
80th	5 169,41
Absolute national poverty line	1 314,00

## SOUTHMOD STATISTICS

Results for gh 2013\_ref

Tax-ben policy Poverty Inequality

### Inequality and the household income

	... after taxes and transfers
▶ Gini (household income)	0,4367
P80/P20	3,58
Quantiles of distribution and median	
20th	1 442,00
40th	2 263,16
50th	2 726,64
60th	3 272,06
80th	5 169,41
Absolute national poverty line	1 314,00

## Exercise 3: Examine the increase of LEAP benefit financed by an employee payroll tax

### Task:

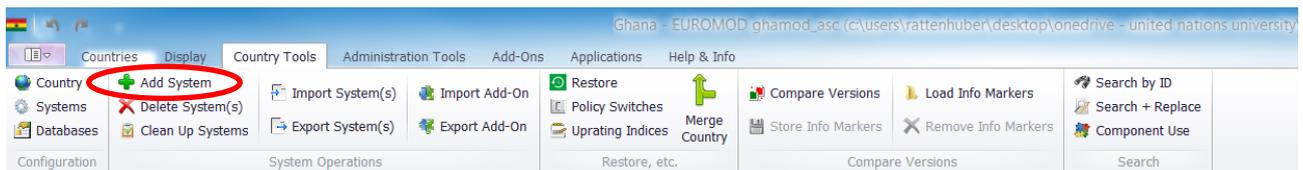
This is a continuation to Exercise 2. We now seek to examine combination of policies where the LEAP benefit increase is financed by an increase in the employee payroll tax. This is done by increasing the payroll tax by half a percentage point in 2013. Examine the impacts of the combined policy on poverty, inequality and the government budget.

### Purpose of the exercise:

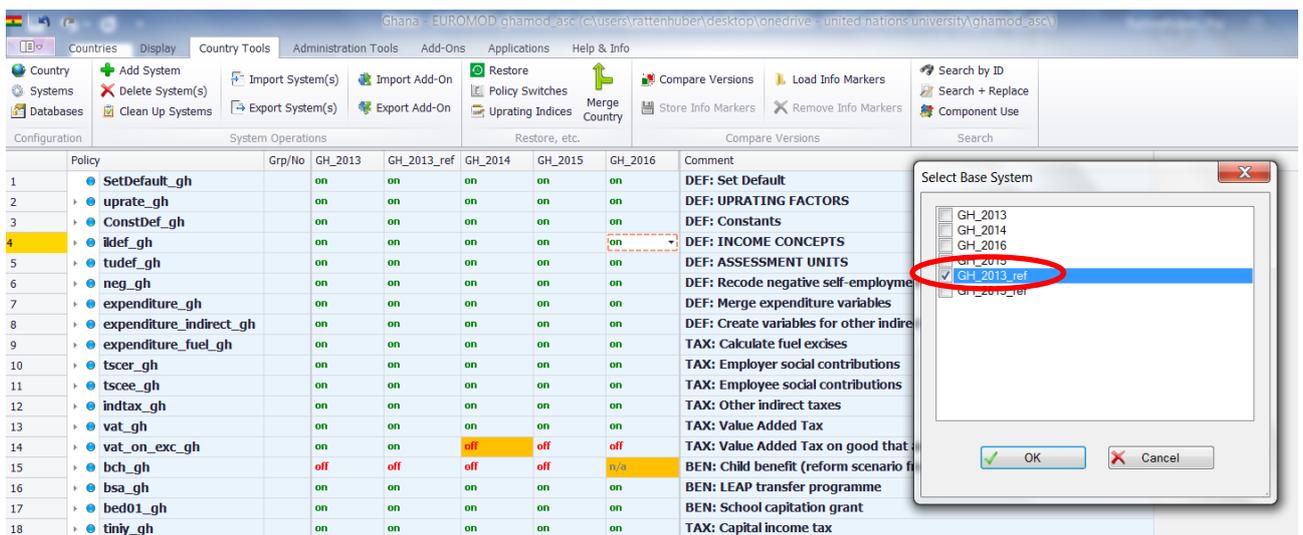
The purpose of this exercise is to help you learn to examine revenue-neutral reforms.

### Solution – Part 1: Create a new policy system

**Step 1:** We need to create a new policy system drawing from the reform system you created already based on year 2013 (GH\_2013\_ref). Go to Country tools – add policy system – and use GH\_2013\_ref as a base.



**Step 2:** Choose year 2013\_ref as a base to take a copy from



**Step 3:** Name the new system GH\_2013\_ref2:

System Name  
GH\_2013\_ref2

System Year  
2013

OK Cancel

Now you should see an additional column for reform system “GH\_2013\_ref2”:

	Policy	Grp/No.	GH_2013_ref2	GH_2016	Comment
1	SetDefault_gh		on	on	DEF: Set Default
2	uprate_gh		on	on	DEF: UPDATING FACTORS
3	ConstDef_gh		on	on	DEF: Constants
4	ildef_gh		on	on	DEF: INCOME CONCEPTS
5	tundef_gh		on	on	DEF: ASSESSMENT UNITS
6	neg_gh		on	on	DEF: Recode negative self-employment income to zero
7	expenditure_gh		on	on	DEF: Merge expenditure variables
8	expenditure_indirect_gh		on	on	DEF: Create variables for other indirect taxes
9	expenditure_fuel_gh		on	on	TAX: Calculate fuel excises
10	tscer_gh		on	on	TAX: Employer social contributions
11	tscee_gh		on	on	TAX: Employee social contributions
12	indtax_gh		on	on	TAX: Other indirect taxes
13	vat_gh		on	on	TAX: Value Added Tax
14	vat_on_exc_gh		off	off	TAX: Value Added Tax on good that are also subject to other indirect taxes
15	poa01_gh		on	n/a	BEN: Old-age pension reform idea
16	bsa_gh		on	on	BEN: LEAP transfer programme
17	ba01_gh		on	on	BEN: School capitation grant

## Solution – Part 2: Increase the employee payroll tax by half a percentage point

**Step 1:** Find the policy that models employee payroll tax and find within the policy the function where the contribution rate is defined:

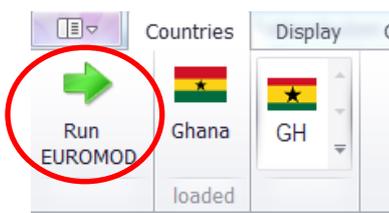
	Policy	Grp/No	GH_2013_ref2	GH_2016	Comment
8	expenditure_indirect_gh		on	on	DEF: Create variables for other indirect taxes
9	expenditure_fuel_gh		on	on	TAX: Calculate fuel excises
10	tscer_gh		on	on	TAX: Employer social contributions
11	tscee_gh		on	on	TAX: Employee social contributions
11.1	DefConst		on	on	Constants
11.1.1	\$tscee		0.03	0.03	SSNIT Rate
11.1.2	\$tschi		0.025	0.025	National Health Insurance Levy
11.2	Deffil		on	on	Contribution base
11.3	Elig		on	on	Eligibility SSNIT pension contribution
11.4	BenCalc		on	on	Earnings-related pension contribution
11.5	BenCalc		on	on	Health insurance levy
12	indtax_gh		on	on	TAX: Other indirect taxes
13	vat_gh		on	on	TAX: Value Added Tax

**Step 2:** Change the SSNIT Rate for the second reform scenario GH\_2013\_ref2 to 3.5% in line 11.1.1:

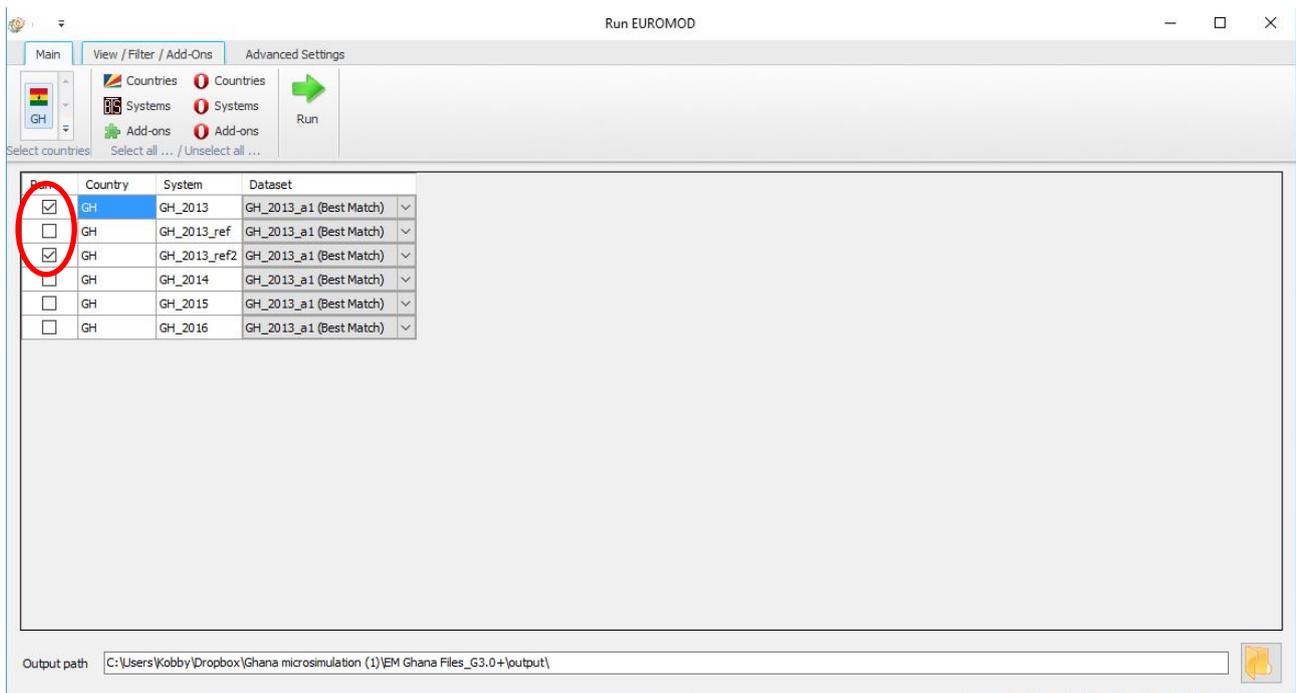
	Policy	Grp/No	GH_2013	GH_2013_ref	GH_2013_ref2	GH_2014
1	SetDefault_gh		on	on	on	on
11	tscee_gh		on	on	on	on
11.1	DefConst		on	on	on	on
11.1.1	\$tscee		0.03	0.03	0.035	0.03
11.1.2	\$tschi		0.025	0.025	0.025	0.025
11.2	Deffil		on	on	on	on

## Solution – Part 3: Run GHAMOD for the base year (2013) and the new reform scenario

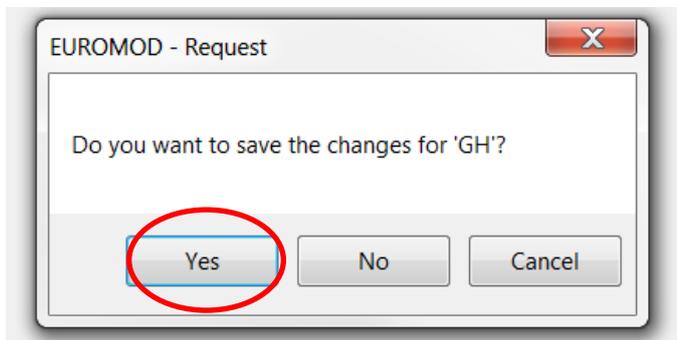
**Step 1:** Choose the “Run” button:



**Step 2:** Choose 2013 (GH\_2013) and new 2013 reform system (GH\_2013\_ref2) and run the software:



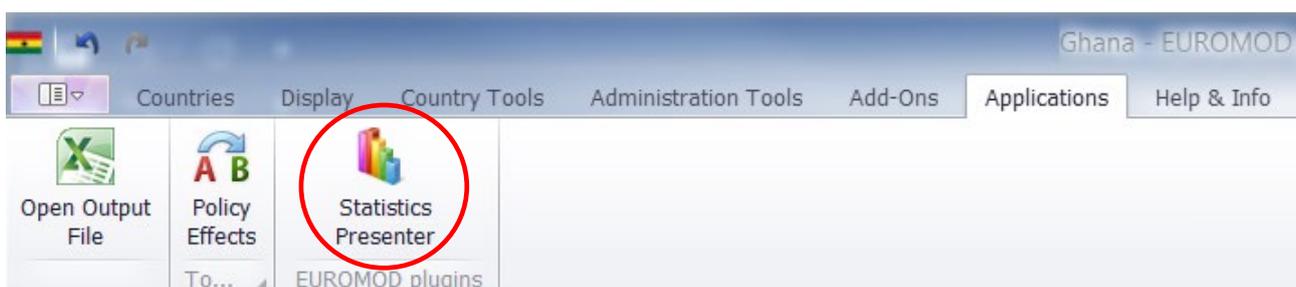
... but the software might first ask you to confirm that you want to save the changes to GHAMOD:



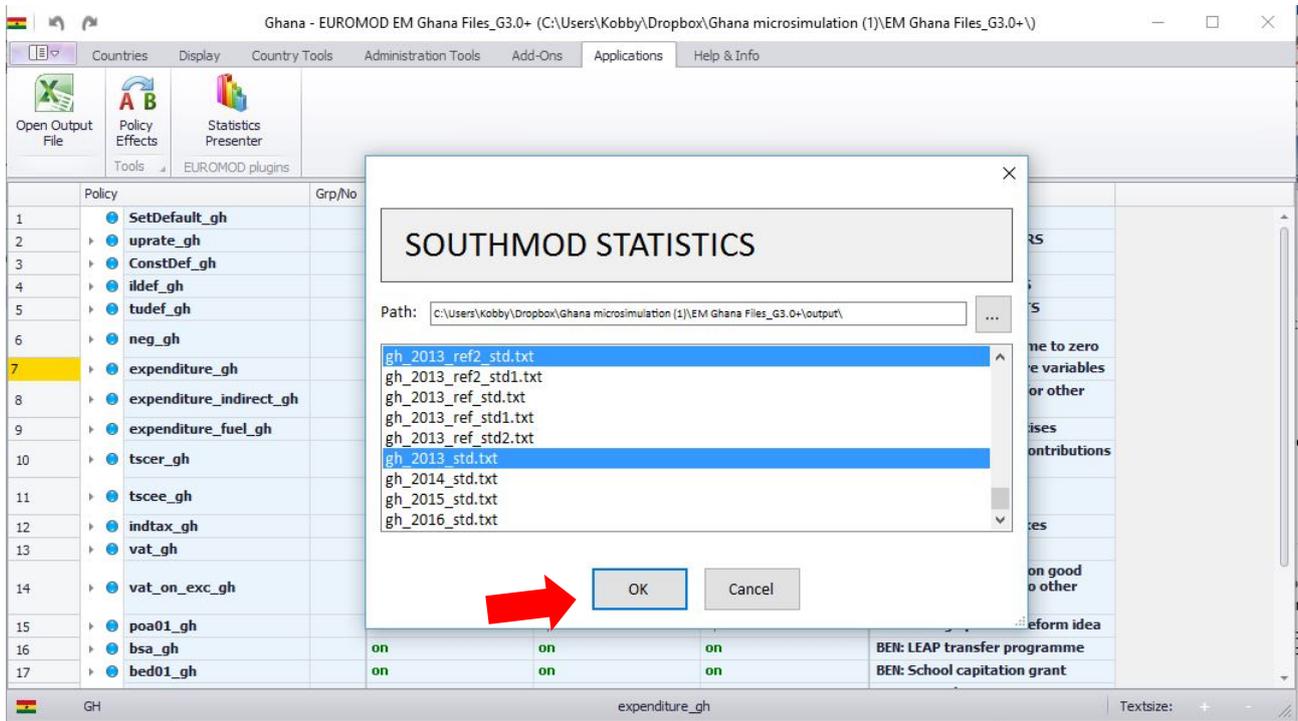
As you have created a new system (GH\_2013\_ref2) and not overwritten any of the existing information, hit "yes" and wait for the software to finish.

## Solution – Part 4: Compile the results using the Statistics Presenter

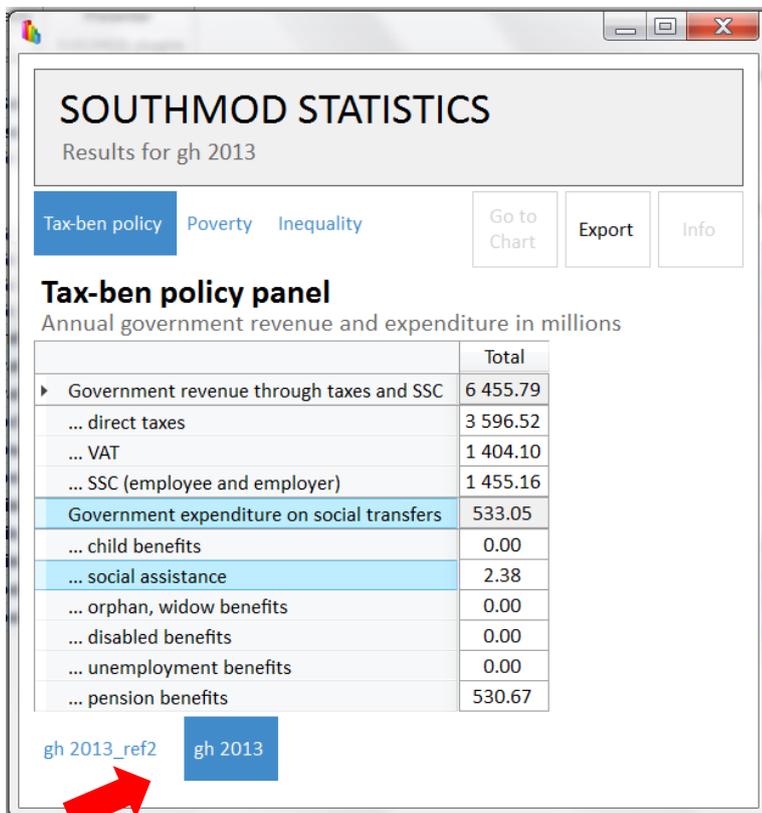
**Step 1:** Launch the Statistics Presenter:



**Step 2:** Pick the base system and the reform system you would like to compare, thus gh\_2013\_std and gh\_2013\_ref2\_std and run the Statistics Presenter tool:



Now you can switch between the results for the two systems at the bottom of the Statistics Presenter window for comparison.



## Solution – Part 5: Compile and compare the results using the Statistics Presenter

Comparing government expenditure shows that the expenditure on social transfers, and specifically social assistance under which the LEAP benefit is summed, increased by more than 38 million cedi. The payroll tax increase shows under government expenditure and the “... SSC” item. It is a little more than the additional expenditure for the extended LEAP benefits.

Tax-ben policy Poverty Inequality

### Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	7,164.64	7,208.01	43.37
... direct taxes	3,629.11	3,629.11	0.00
... indirect taxes	1,983.40	1,982.63	-0.77
... social security contributions (employee and employer)	1,552.12	1,596.26	44.14
Government expenditure on social transfers	534.01	572.37	38.37
... child benefits	0.00	0.00	0.00
... social assistance	3.34	41.70	38.37
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	530.67	530.67	0.00

Poverty is slightly reduced, as in the non-revenue-neutral reform scenario (exercise 2). Inequality decreased as expected. Note that the results for poverty and inequality are only marginally different between the revenue-neutral scenario and the scenario without the increase in payroll tax (as in exercise 2); this is likely because the majority of people at the bottom of the distribution is not employed in the formal sector and thus does not pay the payroll tax.

Tax-ben policy Poverty Inequality

### Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	24.9	24.9	0.0
Poor households out of ...			
... male headed households	26.6	26.7	0.0
... female headed households	19.7	19.7	0.0
... households with children	27.5	27.5	0.0
... households with older persons	33.7	33.7	0.0
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	8.0	-0.1
Poor households out of ...			
... male headed households	8.8	8.7	-0.1
... female headed households	6.0	5.8	-0.2
... households with children	8.9	8.8	-0.1
... households with older persons	11.0	10.5	-0.5
Absolute national poverty line, in national currency, yearly:	1,314.0	1,314.0	0.0

**Inequality and the household income distribution - Consumption based, Indirect Tax o**

after taxes and transfers, yearly

	Base scenario	Alternative scenario	Difference base vs alternative
► Gini (household income)	0.4171	0.4162	-0.0009
P80/P20	3.52	3.52	0.00
Quantiles of distribution and median			
20th	1,163.88	1,163.59	-0.29
40th	1,786.53	1,785.86	-0.67
50th	2,148.03	2,147.09	-0.94
60th	2,594.04	2,593.97	-0.07
80th	4,102.50	4,101.58	-0.91
Absolute national poverty line, in national currency, yearly	1,314.00	1,314.00	0.00

## Exercise 4: Implementation of universal old-age pension benefit

### Task:

The Ghanaian government considers introducing a universal old-age pension benefit. All people who are 65 years old or older but who do not yet collect any pension benefits are eligible. The amount given is 50 Ghana Cedi a month. Calculate the impacts of such a benefit on old-age poverty and government expenditure in policy year 2016.

### Purpose of the exercise:

This exercise teaches you how to examine the impacts of counterfactual policies that do not yet exist.

### Solution – Part 1: Create a new system

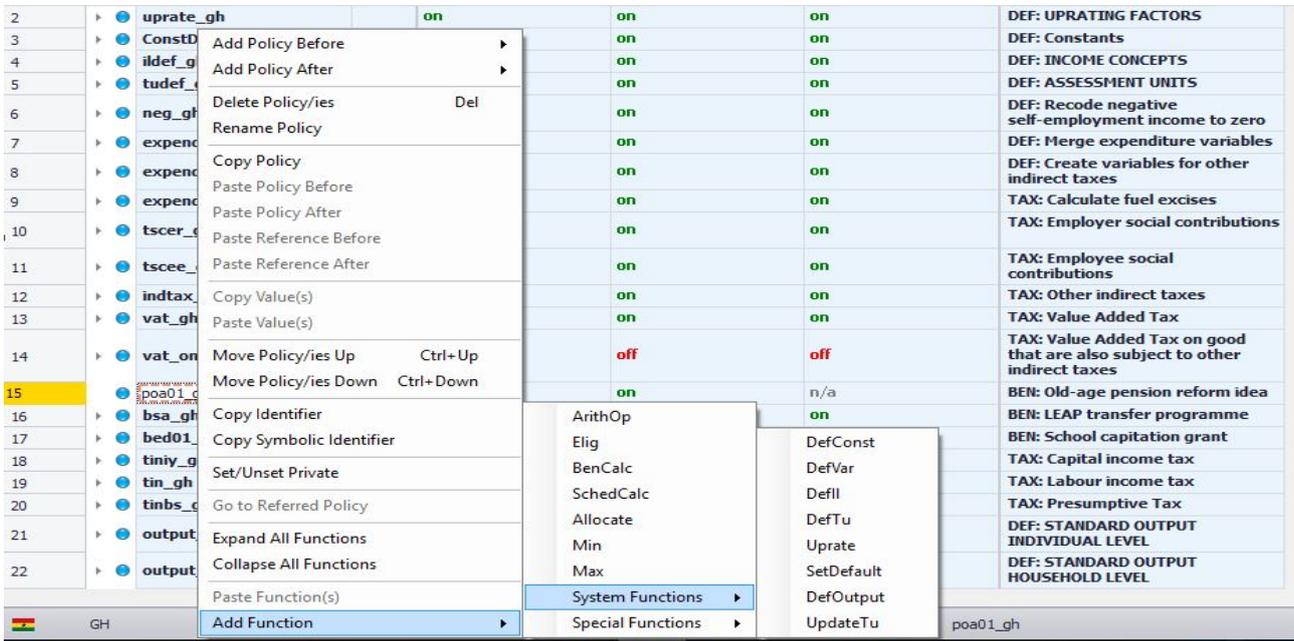
You need to again create a new system as in exercise 2. You may call it GH2016\_ref2.

### Solution – Part 2: Add the new policy

**Step 1:** Introduce the new policy before the present policy in line 15. Call it poa02\_gh, as the pension variable in the input data set is poa. Do this by right clicking and selecting “add policy after”:

	Policy	Grp/No	GH_2013_ref2	GH_2016	GH_2013	Comment
1	SetDefault_gh		on	on	on	DEF: Set Default
2	uprate_gh		on	on	on	DEF: UPRATING FACTORS
3	Con			on	on	DEF: Constants
4	ilde			on	on	DEF: INCOME CONCEPTS
5	tud			on	on	DEF: ASSESSMENT UNITS
6	neg			on	on	DEF: Recode negative self-employment income to zero
7	exp			on	on	DEF: Merge expenditure variables
8	exp			on	on	DEF: Create variables for other indirect taxes
9	exp			on	on	TAX: Calculate fuel excises
10	tsce			on	on	TAX: Employer social contributions
11	tsce			on	on	TAX: Employee social contributions
12	indt			on	on	TAX: Other indirect taxes
13	vat			on	on	TAX: Value Added Tax
14	vat			off	on	TAX: Value Added Tax on good that are also subject to other indirect taxes
15	bsa			on	on	BEN: LEAP transfer programme
16	bed			on	on	BEN: School capitation grant
17	tin			on	on	TAX: Capital income tax
18	tin			on	on	TAX: Labour income tax
19	tinb			on	on	TAX: Presumptive Tax
20	out			on	on	DEF: STANDARD OUTPUT INDIVIDUAL LEVEL
21	out			off	off	DEF: STANDARD OUTPUT HOUSEHOLD LEVEL

**Step 2:** The policy needs to have a constant, use DefConst function for this purpose. Go to the policy you created, right click and add function DefConst. Right click to see 'Show add parameter form'. Add a placeholder and close. Define a new constant \$poa2 and set its value to 50 Cedi. Remember to add #m to make sure the amount is a monthly one.



**Step 3:** The policy also needs a BenCalc function. Again right click. Use the Show parameter form option by right clicking after inserting the BenCalc function. You need to add a Comp\_Cond parameter, where the person needs to be 65 years or older and who does not yet receive a benefit.

This can be done by typing {dag>=65} & {poa=0}

The benefit subject to fulfilling the condition is entered via Comp\_perTU.

You also need an Output\_var, use poa02\_s.

The tax unit is tu\_individual\_gh as the eligibility condition is individual based.

poa02_gh		on	BEN: simple pension
DefConst		on	
\$poa2	1	50#m	
BenCalc		on	
Comp_Cond	1	{dag>=65} & {poa=0}	
Comp_perTU	1	\$poa2	
Output_Var		poa02_s	
TAX_UNIT		tu_individual_gh	

**Step 4:** The new variable you created must also be added into income lists in order for it to have an impact on government expenditure, poverty and inequality. Do this by inserting the new output variable to policy 4.13 (Income list for simulated benefits). Right click to see Add parameter form, select placeholder. Remember to add a plus (+). Also add it to “ils\_bensimp”. This will make sure the policy is taken into account in the calculation of consumption possibilities. For the policy to also appear in the Government revenue and expenditure tax in the Statistics Presenter, also add the variable to another income list, namely Income list for Pensions (4.18).

fix	Defil	on	o
	name	ils_bensim	ils
	bed01_s	+	+
	bsa_s	+	+
	poa01_s	n/a	n
	poa02_s	+	n
fix	Defil	on	o
fix	Defil	on	o
fix	Defil	on	o
fix	Defil	on	o
fix	Defil	on	o
	Name	ils_pension	ils
	poa	+	+
	poa01_s	n/a	n
	poa02_s	+	n
fix	Defil	on	o

**Step 5:** Run the two models (2016 and 2016\_ref2) and examine the results using the Statistics Presenter. You will notice that poverty for the households with elderly has dropped from 33.7 to 29.2 per cent among the households with members with older persons (who are older than 65) and the programme costs 762 million Cedi. This can be seen from the tax-ben tab, where the pension outlays have increased from 843 to 1605 million.

Tax-ben policy **Poverty** Inequality

## Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	24.9	24.1	-0.8
Poor households out of ...			
... male headed households	26.7	26.0	-0.7
... female headed households	19.7	18.4	-1.3
... households with children	27.5	26.7	-0.8
... households with older persons	33.7	29.2	-4.5
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	7.7	-0.4
Poor households out of ...			
... male headed households	8.8	8.4	-0.4
... female headed households	6.0	5.5	-0.5
... households with children	8.9	8.5	-0.4
... households with older persons	10.9	8.6	-2.3
Absolute national poverty line, in national currency, yearly:	2,088.2	2,088.2	0.0

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	11,961.21	11,984.45	23.24
... direct taxes	5,827.82	5,827.82	0.00
... indirect taxes	3,666.77	3,690.01	23.24
... social security contributions (employee and employer)	2,466.62	2,466.62	0.00
Government expenditure on social transfers	866.62	1,628.74	762.13
... child benefits	0.00	0.00	0.00
... social assistance	23.28	23.28	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	843.33	1,605.46	762.13

## Exercise 5: Implementation of old-age-grant like in South Africa

### Task:

The Ghanaian government is interested in knowing what would happen if it introduced an old-age grant in the manner of the present policy in place in South Africa. Examine the impacts that the S-A old-age benefit system would have if it was implemented in Ghana in 2016.

For cost savings, let us assume that the amounts are divided by ten when converting to Ghana Cedi. This means that if the amount is 69000 Cedis a year, the value to be used in the exercise is 6900.

In Ghana, the benefit is targeted to those whose disposable income (ils\_dispy) falls below the threshold values.

Your task is to simulate the impacts of such a policy on poverty among households with older persons and on government expenditure.

### Purpose of the exercise:

The purpose of this exercise is to help you learn to implement a policy swap, a unique opportunity offered by the EUROMOD software.

### Solution – Part 1: Find the child benefit policy in the South-African model

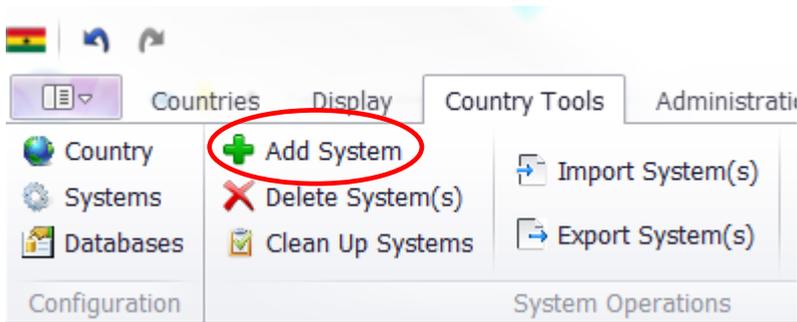
**Step 1:** Open the South-African model and locate the old-age grant policy. It is near the bottom of the spine, policy 13. (Tip: use the search opportunity to locate the policy.)

Policy ID	Policy Name	Active	Active	Active	Description
13	oag_sa	on	on	on	<b>BEN: Old Age Grant</b>
13.1	DefConst	on	on	on	Define constants
13.1.1	\$oag_single	61800#y	64680#y	69000#y	OAG income threshold for single person
13.1.2	\$oag_couple	123600#y	129360#y	138000#y	OAG income threshold for couple
13.1.3	\$oag_min_amount	100#m	100#m	100#m	OAG minimum amount
13.1.4	\$oag_amount	1350#m	1410#m	1500#m	OAG amount
13.1.5	\$oag_amount_75	20#m	20#m	20#m	OAG additional amount for over 75s
13.2	BenCalc	on	on	on	Eligibility condition and benefit calculation for a single person
13.3	BenCalc	on	on	on	Eligibility condition and benefit calculation for a married couple
13.4	BenCalc	on	on	on	Additional amount paid to anyone receiving OAG who is 75 or over

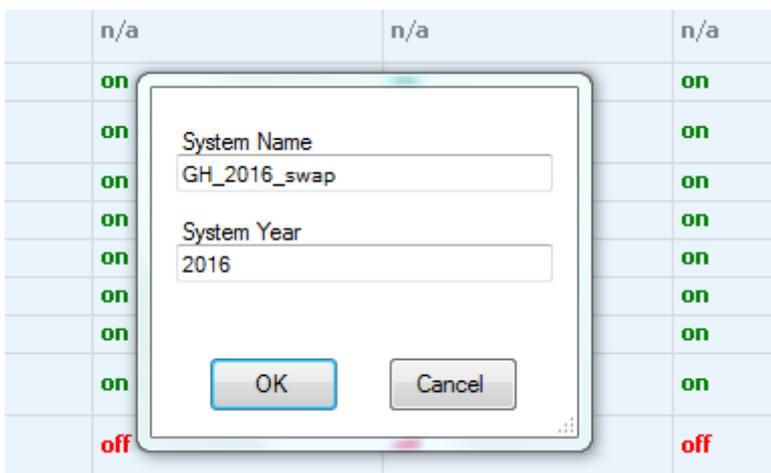
**Step 2:** Right click and copy the child benefit policy.

## Solution – Part 2: Create a new system and bring the new policy into the GHAMOD

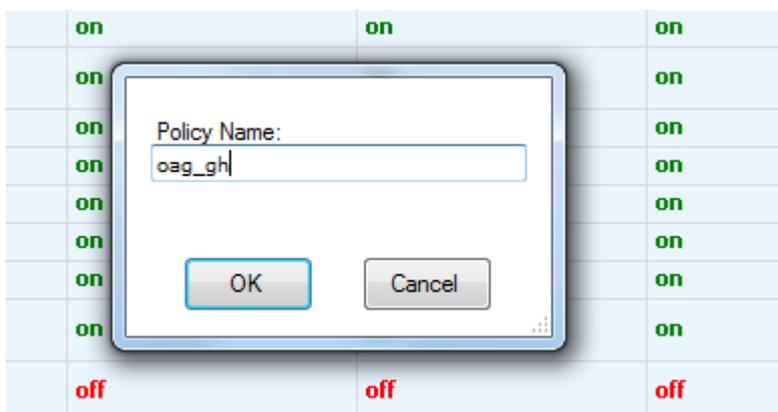
**Step 1:** Introduce a new system by opening the “Country Tools” ribbon and clicking on “Add System”:



**Step 2:** Pick 2016 as the base year:

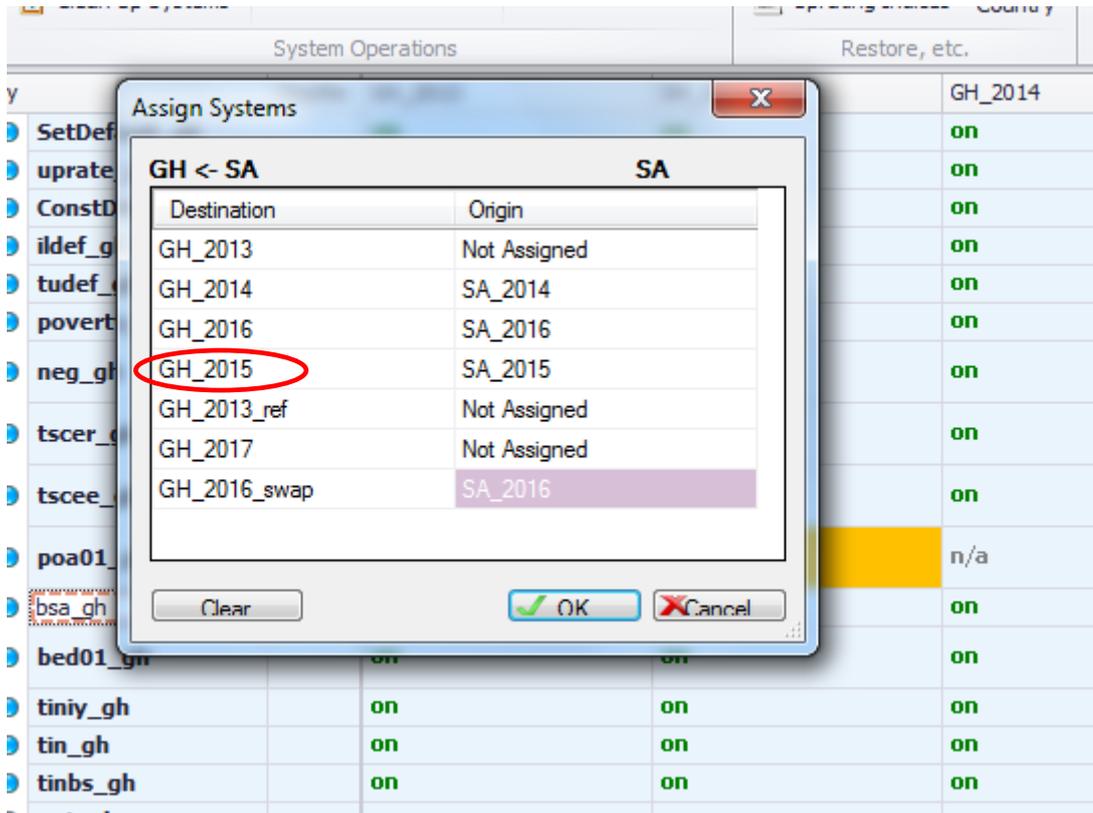


**Step 3:** In the spine, go to line 11, right click on the policy that sits on line 11 (“bsa\_gh”) and choose “Paste policy after”. Name the policy oag\_gh:



*Note:* You can paste the policy at any point in the spine where you want. Be careful though to make sure that possible interactions with other parts of the spine function as intended.

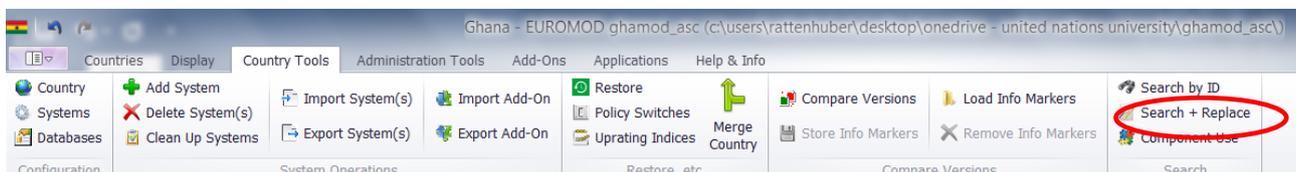
**Step 4** EUROMOD software proposes you how the Ghanaian and the S-A system are connected now. Confirm by pressing “OK”:

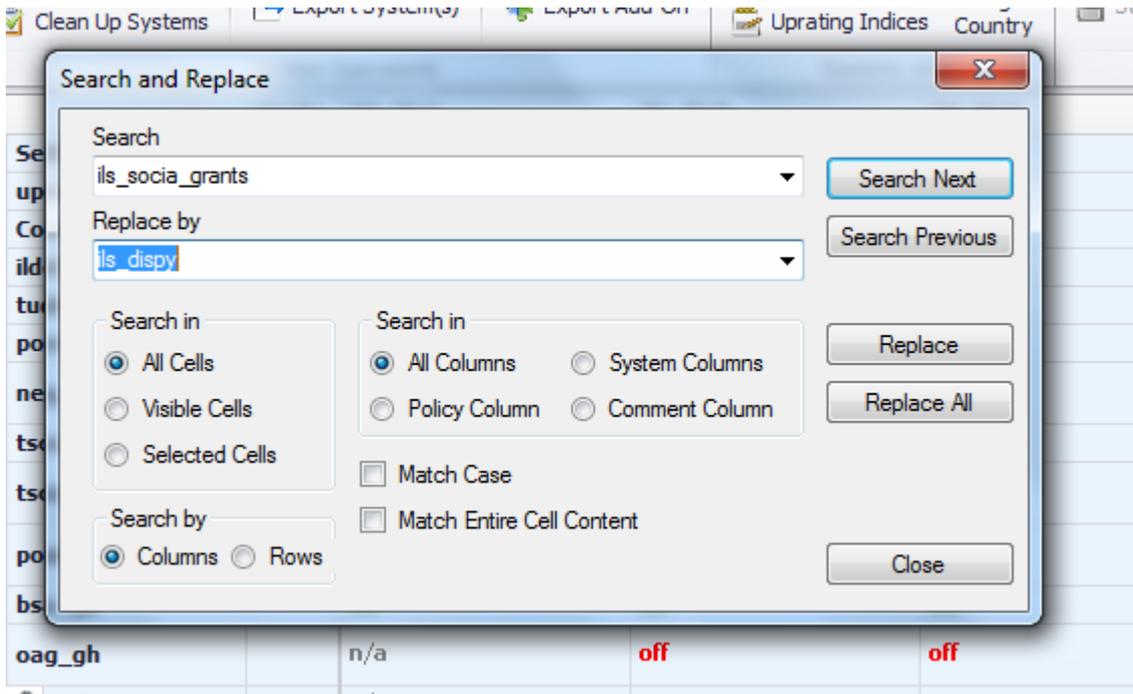


*Note:* If you need for your purposes different connections than what the software proposes, right click in any of the “Origin” fields to change it.

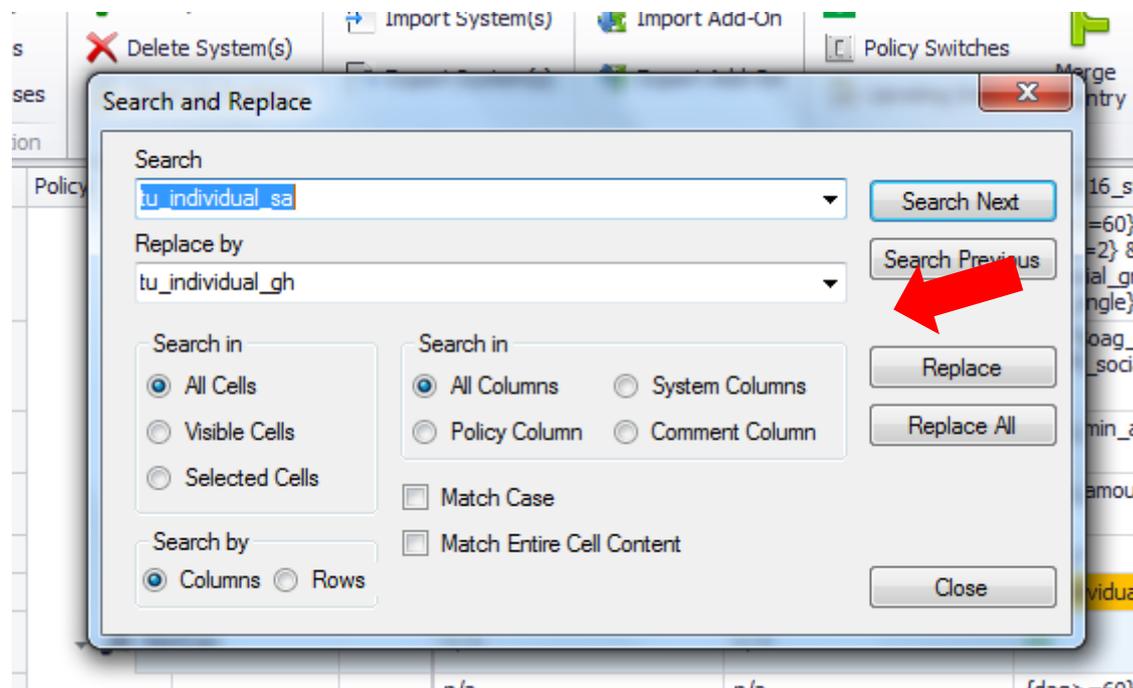
### Solution – Part 3: Amend the old-age grant policy

**Step 1:** Open the old-age grant policy that you just pasted into GHAMOD. You need to change the income list used in the means test (il\_social\_grants) to ils\_disy using the search and replace functionality in EUROMOD:





**Step 2:** Now check the tax unit. Currently it is set to the tax units coming out of the South-African system. Change these to “tu\_individual\_gh” and tu\_partners\_gh again using the search and replace function.



**Step 3:** Finally, edit the comment of the benefit so that it is clearly marked as a reform idea, for example as “BEN: Old-age benefit (reform scenario from South Africa)”.

## Solution – Part 4: Add the output variable to the relevant income lists

In order for the old-age benefit to show up in households' final income/consumption possibilities we need to add it to the relevant income lists, "ils\_pen", "ils\_bensim", and "ils\_bensimsp"

**Step 1:** Include the grant output variable (*poa\_s*) in the relevant income lists. Therefore, right click into the lowest field or parameter of the definitional function and open the "Show Add Parameters Form". Check the "[Placeholder]" option and hit "Add", then "Close":

**Step 2:** Enter the name of the variable that you want to add to the respective income list and the appropriate sign (addition or subtraction), thus:

	Policy	Grp/No	GH_2013	GH_2013_ref	GH_2016_swap	GH_2
2.1	name		ils_origy	ils_origy	ils_origy	ils_ori
2.2			+	+	+	+
2.3			+	+	+	+
2.4			+	+	+	+
2.5			+	+	+	+
2.6			+	+	+	+
2.7			+	+	+	+
3	fx Defill		on	on	on	on
3.1	name		ils_pen	ils_pen	ils_pen	ils_pe
3.2			+	+	+	+
3.3			n/a	+	n/a	n/a
3.4			n/a	n/a	+	n/a
	fx Defill		on	on	on	on
5	fx Defill		on	on	on	on

**Step 3:** Repeat the for “ils\_bensim”, and “ils\_bensimsp”.

*Note:* If we plan to, for example, look at benefit amounts on a sub-group level using Stata, we also need to add *poa\_s* to the list of output variables defined at the far end of the spine in “output\_std\_gh” (individual level data) and “output\_std\_hh\_gh” (household level data).

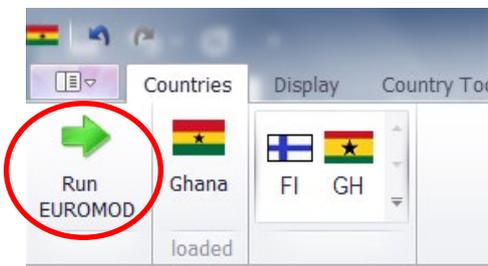
**Solution – Part 5:** Confirm the old-age benefit policy is only active for the reform scenario

Turn the policy off, except for the reform scenario system (GH\_2016\_swap):

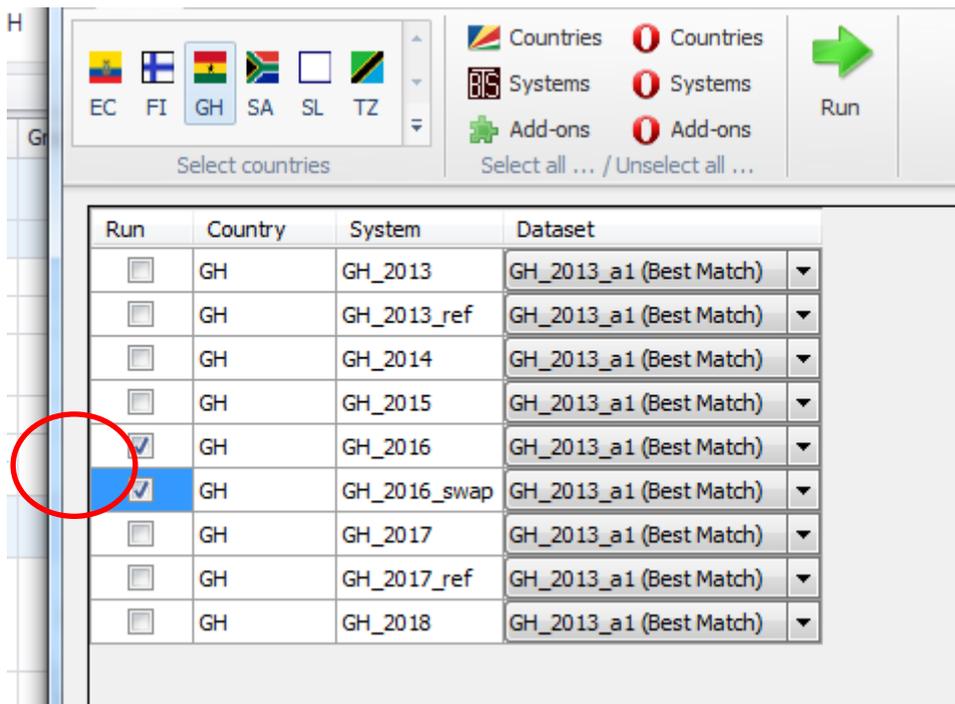
Policy	Grp/No	GH_2013_ref	GH_2014	GH_2015	GH_2016	GH_2016_swap
oag_gh		off	off	off	off	on
DefConst		n/a	on	on	on	on
\$oag_single		n/a	61800#y	64680#y	69000#y	69000#y
\$oag_couple		n/a	123600#y	129360#y	138000#y	138000#y
\$oag_min_amount		n/a	100#m	100#m	100#m	100#m
\$oag_amount		n/a	1350#m	1410#m	1500#m	1500#m
\$oag_amount_75		n/a	20#m	20#m	20#m	20#m

**Solution – Part 6:** Run GHAMOD for the base and the reform scenario

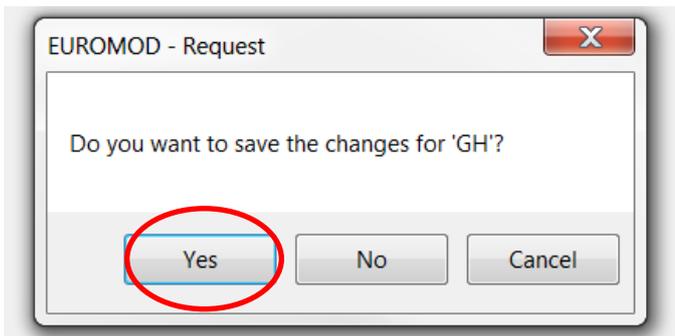
**Step 1:** Choose the “Run” button:



**Step 2:** Choose 2016 and 2016 reform systems and run the software:



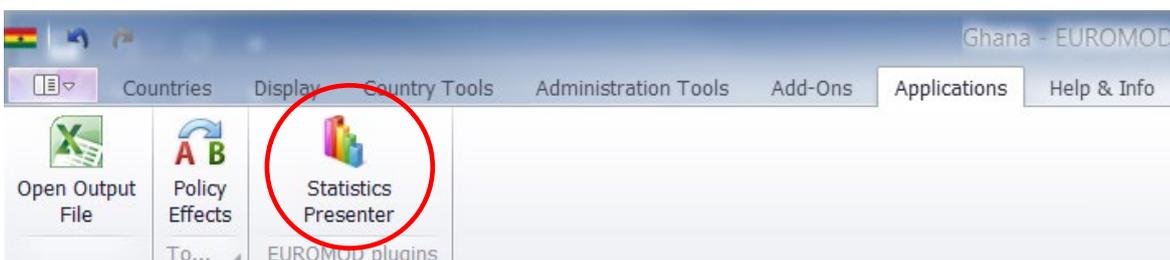
... but the software will first ask you to confirm that you want to save the changes to GHAMOD:



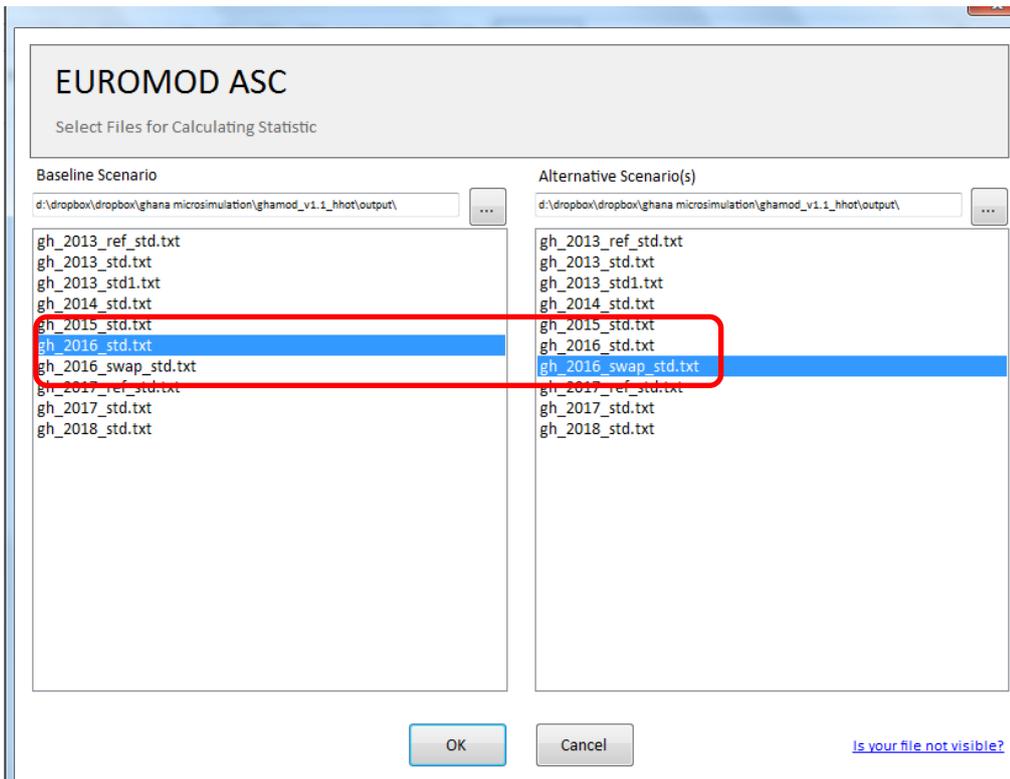
As you have created a new system (GH\_2016\_swap) and not overwritten any of the existing information, hit “yes” and wait for the software to finish.

**Solution – Part 7:** Run Statistics Presenter for the base and the reform year and examine the results

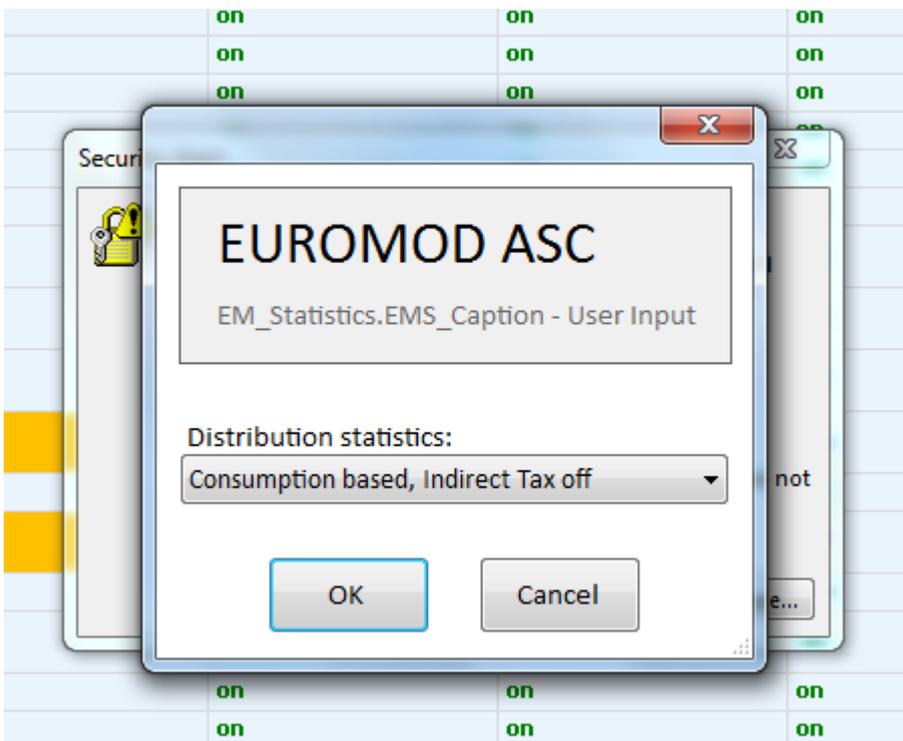
**Step 1:** Launch the Statistics Presenter:



**Step 2:** Pick the base system and the reform system you would like to compare, thus gh\_2016\_std and gh\_2016\_swap\_std and run the Statistics Presenter tool:



Choose



Government expenditure increased due to the newly created policy:

Tax-ben policy

Poverty

Inequality

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	11,596.71	12,042.46	445.75
... direct taxes	5,827.82	5,827.82	0.00
... indirect taxes	3,302.27	3,748.02	445.75
... social security contributions (employee and employer)	2,466.62	2,466.62	0.00
Government expenditure on social transfers	866.62	3,203.31	2,336.69
... child benefits	0.00	0.00	0.00
... social assistance	23.28	23.28	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	843.33	3,180.02	2,336.69

Poverty reduced by 2.3 percentage points and, as expected, particularly families with older persons benefitted, while household types less likely to have senior citizens benefitted as well nevertheless. Inequality decreased slightly even as all families (even the better off) benefit from the introduction of a fairly universal benefit.

## Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	24.9	22.6	-2.3
Poor households out of ...			
... male headed households	26.7	24.6	-2.1
... female headed households	19.7	16.8	-2.9
... households with children	27.5	25.3	-2.2
... households with older persons	33.7	23.5	-10.2
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	7.0	-1.1
Poor households out of ...			
... male headed households	8.8	7.7	-1.1
... female headed households	6.0	4.8	-1.2
... households with children	8.9	7.8	-1.2
... households with older persons	10.9	5.9	-5.0
Absolute national poverty line, in national currency, yearly:	2,088.2	2,088.2	0.0

## Inequality and the household income distribution - Consumption based, Indirect Tax off

after taxes and transfers, yearly

	Base scenario	Alternative scenario	Difference base vs alternative
► Gini (household income)	0.4170	0.4081	-0.0089
P80/P20	3.53	3.40	-0.13
Quantiles of distribution and median			
20th	1,848.76	1,960.37	111.61
40th	2,838.71	2,949.32	110.62
50th	3,411.80	3,530.85	119.05
60th	4,122.31	4,263.58	141.27
80th	6,522.23	6,665.39	143.16
Absolute national poverty line, in national currency, yearly	2,088.24	2,088.24	0.00

## Exercise 6: Replacement of a progressive personal income (labour) tax system with a flat rate tax system

### Task:

The Ministry of Finance would like to analyze replacing the current progressive personal income (labour) tax system with a flat rate tax system in 2016. The flat rate tax rate shall be 16% and the tax base is composed of earnings (gross employment and gross self-employment income). Only those in the formal sector are paying taxes.

Introduce a new labour tax policy for 2016 based on the above assumptions and turn off the policy for the current progressive tax system. Use the DefConst, DefIl and BenCalc functions to model the policy. Use the output variables that are already available from the existing labour tax policy function.

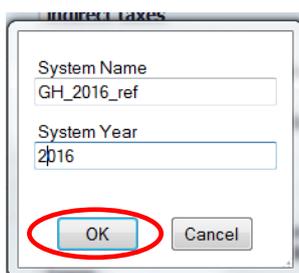
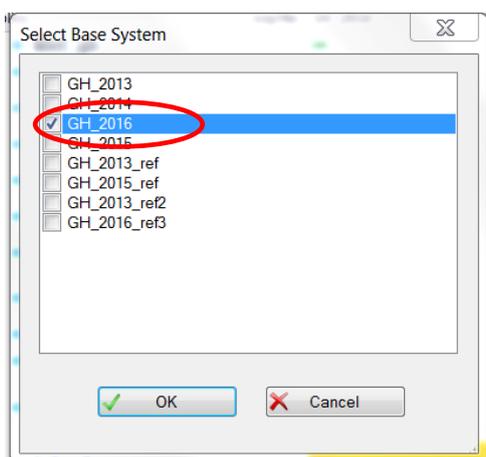
Use the Statistics Presenter to check the impact of the policy experiment on the government's budget balance, poverty and inequality.

### Purpose of the exercise:

The purpose of this exercise is to help you learn to implement a new policy.

### Solution – Part 1: Introduce a new system based on the 2016 system and turn off the labour tax policy

**Step 1:** Introduce a new system based on the 2016 system and name it 2016\_ref.



**Step 2:** Turn off the existing labour tax policy in the new system (2016\_ref).

Policy	Grp/No	GH_2016	GH_2016_ref	Comment
1		on		DEF: Set Default
19		on	off	TAX: Labour income tax
20		n/a	n/a	TAX: Flat tax rate reform
21		on	on	TAX: Presumptive Tax
22		on	on	DEF: STANDARD OUTPUT INDIVIDUAL LEVEL
23		off	off	DEF: STANDARD OUTPUT HOUSEHOLD LEVEL

**Solution – Part 2:** Introduce a new tax policy and add the necessary functions

**Step 1:** Add a new labour/personal income tax policy in the new system (2016\_ref): Right click on the current labour income tax policy “tinbs\_gh” – “Add policy after” – “Tax” (you could also add the policy before in this case). Give the new policy a name and click “ok”:

Policy Name:  
tinflatrate\_gh

OK Cancel

**Step 2:** Add the flat rate tax rate by right clicking in the policy, choosing “Add function” – “System Functions” – “DefConst”. Then right click in the newly created DefConst function, choose “Add Parameter Form” and add a Placeholder. Provide a name for the new constant (thus the flat rate tax rate) and provide the constant value in the 2016\_ref system:

Policy	Grp/No	GH_2016	GH_2016_ref	Comment
tinflatrate_gh		n/a	n/a	TAX: Labour income tax reform
DefConst		n/a	n/a	
\$flatrate	1	n/a	0.13	Flat rate tax reform: tax rate

**Step 3:** Add the income list for the tax base by right-clicking on “DefConst” function, choose “Add function after” – “System Functions” – “Defill”. Then right click in the newly created Defill function, choose “Add Parameter Form” and add two Placeholders:

Add Parameters

Defill (order: 2) in policy tinflatrate\_gh

Add	Parameter	Replaces	Grp/No	Count	Description
<input checked="" type="checkbox"/>	[Placeholder]			2	[Placeholder] stands for the name of a component (variable or incomelist) of t...
<input type="checkbox"/>	Warn_If_NonMonetary				If yes, a warning is issued if any component is non-monetary.

Show Common Parameters   
Show Footnote Parameters

Description (F5) Summary (F6) Add Close

In the resulting place holders enter the two items that make up the tax base, gross employment and gross self-employment income:

tinflatrate_gh					TAX: Labour income tax reform
DefConst		n/a	n/a	n/a	Flat rate tax reform: tax rate
\$flatratetax	1	n/a	0.16	n/a	
DefII		n/a	n/a	n/a	Flat rate tax reform: tax base
Name		n/a	il_tintb1	n/a	
yem00		n/a	+	n/a	employment income
yse		n/a	+	n/a	self-employment income

**Step 4:** Now add the last element of the policy the benefit calculator: Right click on DefII, choose “Add function after” – “BenCalc”. In the benefit calculator function, implement the conditions for those paying taxes and the tax calculation, choose the tax unit:

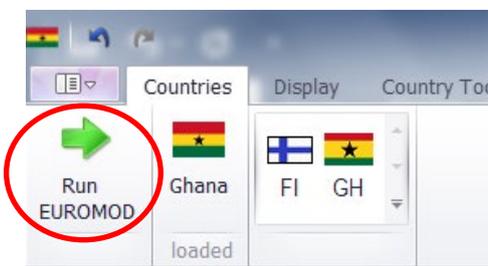
Policy	Grp/No	GH_2016	GH_2016_ref	Comment
tinflatrate_gh		n/a	on	TAX: Labour income tax reform
DefConst		n/a	on	Flat rate tax reform: tax rate
\$flatratetax	1	n/a	0.16	
DefII		n/a	on	Flat rate tax reform: tax base
Name		n/a	il_tintb1	
yem00		n/a	+	employment income
yse		n/a	+	self-employment income
BenCalc		n/a	on	
Comp_Cond	1	n/a	{il_tintb1 > 0} & {lfo=1}	
Comp_perTU	1	n/a	il_tintb1*\$flatrate	
Output_Var		n/a	tinna_s	
TAX_UNIT		n/a	tu_individual_gh	

Finally, make sure you turn on all the functions and policies for your reform scenario.

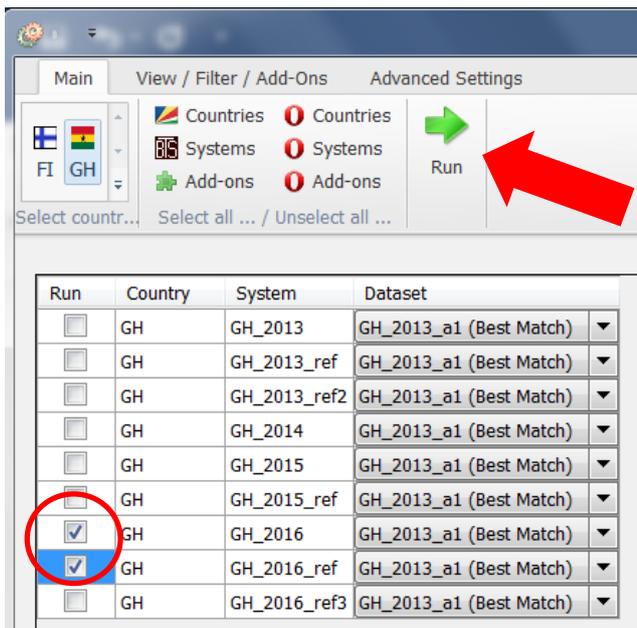
*Note:* You could also have defined the income list at the top of the spine in the “ildef\_gh” policy.

### Solution – Part 3: Run GHAMOD for the base and the reform year

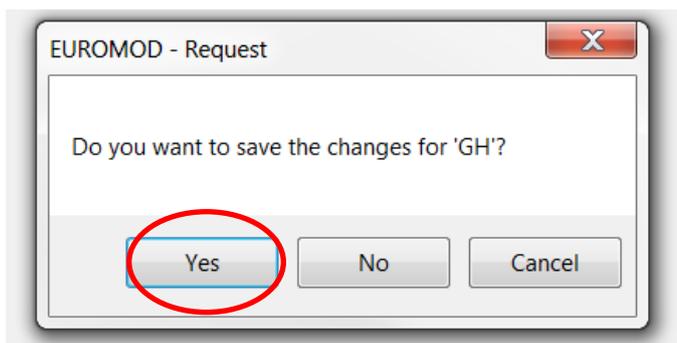
**Step 1:** Choose the “Run” button:



**Step 2:** Choose 2016 and 2016 reform systems and run the software:



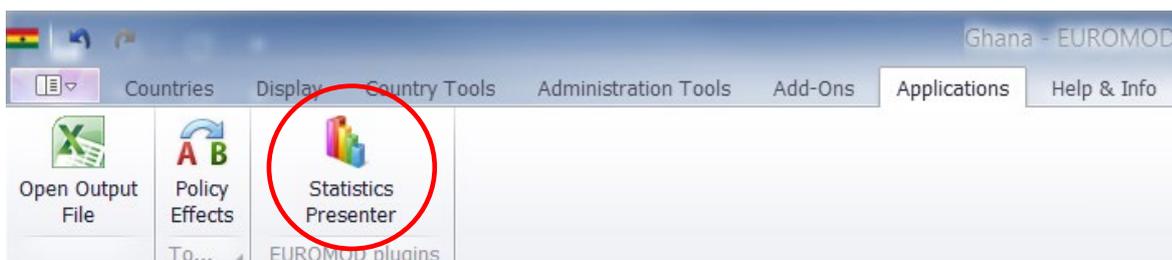
... but the software will first ask you to confirm that you want to save the changes to GHAMOD:



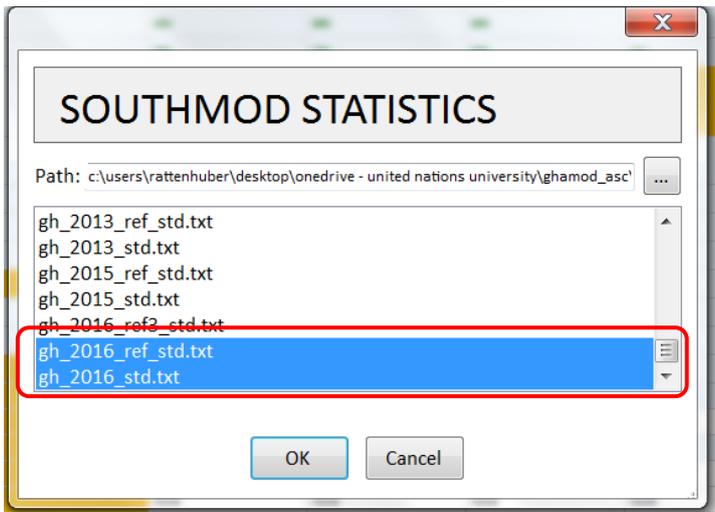
As you have created a new system (GH\_2016\_ref) and not overwritten any of the existing information, hit "yes" and wait for the software to finish.

**Solution – Part 4:** Run Statistics Presenter for the base and the reform year and examine the results

**Step 1:** Launch the Statistics Presenter:



**Step 2:** Pick the base system and the reform system you would like to compare, thus gh\_2016\_std and gh\_2016\_ref\_std and run the Statistics Presenter tool:



**Step 3:** Interpret the output. Government revenue from direct taxes is slightly higher. Mind that under direct taxes not only the revenue from the labour income tax but also the revenue from capital and presumptive tax (also see income list “Simulated taxes” on line 4.4 in the spine).

Tax-ben policy   Poverty   Inequality

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	11,961.21	11,993.40	32.19
... direct taxes	5,827.82	5,862.70	34.89
... indirect taxes	3,666.77	3,664.07	-2.70
... social security contributions (employee and employer)	2,466.62	2,466.62	0.00
Government expenditure on social transfers	866.62	866.62	0.00
... child benefits	0.00	0.00	0.00
... social assistance	23.28	23.28	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	843.33	843.33	0.00

Poverty based on simulated consumption possibilities overall did not react more than 0.1 %-point. But there are slight increases for certain subgroups. Inequality (Gini and the percentiles) is not increasing much either. If everyone in the economy paid income/labour tax, we would usually expect that a flat rate tax system significantly increases inequality and pushes up poverty. Yet in Ghana informality is high and only a small fraction of people pays labour income tax. Depending on where these people are situated in the income distribution this will lead to more or less changes in the distributional measures and poverty. To check out this thought you can open the data (stored as “gh\_2016\_ref\_std.txt” in the output folder) using a statistical software such as Stata to analyze the results in depth.

## Exercise 7: Personal income tax and social security payments in full formal sector employment

### Task:

The Ghanaian government wants to know how much its personal income tax and social security payments would increase if all workers were to work for the formal sector. Your responsibility is to examine the impacts of such a scenario on direct tax revenues, poverty, and inequality for the policy year 2017.

### Purpose of the exercise:

The purpose of this exercise is to help you learn to adjust the income tax base and appreciate the importance of the formality (lfo) variable.

### Solution – Part 1: Create the policy reform

**Step 1:** Create the reform scenario using the steps in previous exercises and name it GH\_2017\_formal.

**Step 2:** Open the policies tscer\_gh, tscee\_gh, and tin\_gh. Remove the condition {lfo=1}

Policy	Grp/No	GH_2017	GH_2017_formal
tscer_gh		on	on
DefConst		on	on
BenCalc		on	on
comp_cond	1	{dag >= 15} & {dag <= 45} & {lfo=1}	{dag >= 15} & {dag <= 45}
Comp_perTU	1	yem*\$tscer	yem*\$tscer
output_var		tscer_s	tscer_s
TAX_UNIT		tu_individual_gh	tu_individual_gh
tscee_gh		on	on

Please do the same tscee\_gh and tin\_gh. In tscee\_gh, it can be the easiest to modify the comp\_cond as follows:

TAX_UNIT		tu_individual_gh	tu_individual_gh	tu_individual_gh	tu_individual_gh	
BenCalc		on	on	on	on	General component of SSNIT contribution
who_must_b...		one	one	one	one	
comp_cond	1	{lfo=1}	{lfo=0}   {lfo=1}	{lfo=1}	{lfo=1}	Formal Sector workers and the self-employed
comp_perTU	1	(yem+yse)*\$tscee	(yem+yse)*\$tscee	(yem+yse)*\$tscee	(yem+yse)*\$tscee	
output_var		tscee_s	tscee_s	tscee_s	tscee_s	Employee social contributions
TAX_UNIT		tu_individual_gh	tu_individual_gh	tu_individual_gh	tu_individual_gh	
BenCalc		on	on	on	on	National Health Insurance Levy (NHIL) component of SSNIT contribution

## Solution – Part 2: Run GHAMOD

Run GHAMOD for the two systems, GH\_2017 and GH\_2017\_formal.

## Solution – Part 3: Examine the results

Open the Stats Presenter and choose “Consumption based, indirect tax off” and examine the results.

Labour income tax receipts roughly double if all are formal. Poverty rates go up (for the total population by 3 %-points) due to greater tax payments and inequality increases a bit (informal people who now start to pay taxes typically have lower incomes).

Tax-ben policy Poverty Inequality

### Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	12,720.62	20,055.52	7,334.90
... direct taxes	6,225.43	12,666.89	6,441.46
... indirect taxes	3,882.14	3,627.60	-254.54
... social security contributions (employee and employer)	2,613.05	3,761.03	1,147.98
Government expenditure on social transfers	923.42	923.42	0.00
... child benefits	0.00	0.00	0.00
... social assistance	30.03	30.03	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	893.40	893.40	0.00

Tax-ben policy Poverty Inequality

### Poverty - Consumption based, Indirect Tax off

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	24.9	27.9	3.0
Poor households out of ...			
... male headed households	26.7	29.7	3.0
... female headed households	19.7	22.6	2.9
... households with children	27.5	30.7	3.2
... households with older persons	33.7	35.7	2.0
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.1	10.1	2.0
Poor households out of ...			
... male headed households	8.8	10.7	1.9
... female headed households	6.0	8.2	2.3
... households with children	8.9	11.0	2.1
... households with older persons	10.9	12.6	1.8
Absolute national poverty line, in national currency, yearly:	2,212.2	2,212.2	0.0

## Inequality and the household income distribution - Consumption based, Indirect

after taxes and transfers, yearly

	Base scenario	Alternative scenario	Difference base vs alternative
► Gini (household income)	0.4168	0.4244	0.0075
P80/P20	3.53	3.63	0.10
Quantiles of distribution and median			
20th	1,958.43	1,809.63	-148.80
40th	3,006.57	2,838.48	-168.08
50th	3,613.97	3,436.64	-177.33
60th	4,361.94	4,132.51	-229.43
80th	6,906.68	6,564.32	-342.36
Absolute national poverty line, in national currency, yearly	2,212.20	2,212.20	0.00

## Exercise 8: Change of direct/indirect tax mix

### Task:

A policy proposal about changing the direct/indirect tax mix has been floated around. The idea is to increase the reliance on the personal income tax and use the additional revenues to reduce the value-added tax rate. In the end, the total tax revenue remains (almost) unchanged. The policy involves raising all personal income tax rates by 10 percentage points. For example, the lowest rate is increased from 5 to 15, etc.

You are asked to evaluate the impacts of the reform on poverty and inequality (after taking into account indirect tax payment) for policy year 2017.

### Purpose of the exercise:

The purpose of this exercise is to make you familiar with the notion of after-fiscal income (consumption) and use the Statistics Presenter in the Indirect tax tool on mode.

## Solution – Part 1: Create the policy reform

**Step 1:** Prepare a new system with the base year set to 2017 and call it GH\_2017\_taxmix

**Step 2:** Change the tax rates in the personal income tax policy as follows:

Configuration	System Operations		Restore, etc.	Compar
Policy	Grp/No	GH_2017	GH_2017_taxmix	Comment
14	tin_gh	on	on	<b>TAX: Labour income tax</b>
14.1	DefConst	on	on	Constants: tax schedule
14.1.1	\$tinnatslt01	2592#y	2592#y	Tax schedule, lower limit 1
14.1.2	\$tinnatslt02	3888#y	3888#y	Tax schedule, lower limit 2
14.1.3	\$tinnatslt03	5700#y	5700#y	Tax schedule, lower limit 3
14.1.4	\$tinnatslt04	38880#y	38880#y	Tax schedule, lower limit 4
14.1.5	\$tinnatsrt01	0.05	0.15	Tax schedule, rate 1
14.1.6	\$tinnatsrt02	0.10	0.20	Tax schedule, rate 2
14.1.7	\$tinnatsrt03	0.175	0.275	Tax schedule, rate 3
14.1.8	\$tinnatsrt04	0.25	0.35	Tax schedule, rate 4
14.2	DefConst	on	on	Constants: tax allowances
14.3	DefVar	on	on	

## Solution – Part 2: Run GHAMOD for the base and the reform year

Run both systems and open the Stats Presenter to examine the increase in tax revenue. You will notice that the tax revenues have increased by approximately 1.8 billion Ghana cedi.

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	12,720.62	14,516.47	1,795.85
... direct taxes	6,225.43	8,105.85	1,880.42
... indirect taxes	3,882.14	3,797.57	-84.57
... social security contributions (employee and employer)	2,613.05	2,613.05	0.00
Government expenditure on social transfers	923.42	923.42	0.00
... child benefits	0.00	0.00	0.00
... social assistance	30.03	30.03	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	893.40	893.40	0.00

### Solution – Part 3: Examine the results

Calculate the required reduction in the value-added tax rate. Increase first the value-added tax rate for GH\_2017\_taxmix by 1 percentage point and examine the results.

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	12,720.62	14,732.70	2,012.08
... direct taxes	6,225.43	8,105.85	1,880.42
... indirect taxes	3,882.14	4,013.81	131.67
... social security contributions (employee and employer)	2,613.05	2,613.05	0.00
Government expenditure on social transfers	923.42	923.42	0.00
... child benefits	0.00	0.00	0.00
... social assistance	30.03	30.03	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	893.40	893.40	0.00

The indirect tax revenues are now 4,013.81 million whereas before they were 3,797.6. I.e. the difference is 217.2. This means that the VAT rate can be reduced by  $1800/217.2 = 8\%$  points. Change the VAT rate in GH\_2017\_taxmix to 9.5. With this change the budget balance is restored.

## Tax-benefit policy

Yearly, mill. national currency

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Government revenue through taxes, SSC and indirect taxes	12,720.62	12,786.63	66.01
... direct taxes	6,225.43	8,105.85	1,880.42
... indirect taxes	3,882.14	2,067.73	-1,814.41
... social security contributions (employee and employer)	2,613.05	2,613.05	0.00
Government expenditure on social transfers	923.42	923.42	0.00
... child benefits	0.00	0.00	0.00
... social assistance	30.03	30.03	0.00
... orphan/widow benefits	0.00	0.00	0.00
... disabled benefits	0.00	0.00	0.00
... unemployment benefits	0.00	0.00	0.00
... pension benefits	893.40	893.40	0.00

Poverty was slightly reduced by the move.

## Poverty - Consumption based, Indirect Tax on

after taxes and transfers

	Base scenario	Alternative scenario	Difference base vs alternative
▶ Share of poor population, in %:			
All	25.2	25.0	-0.3
Poor households out of ...			
... male headed households	27.0	26.8	-0.3
... female headed households	19.9	19.6	-0.2
... households with children	27.8	27.5	-0.3
... households with older persons	34.2	33.7	-0.5
Poverty gap (average normalised poverty gap, FGT(1)):			
All	8.2	8.1	0.0
Poor households out of ...			
... male headed households	8.9	8.8	0.0
... female headed households	6.0	6.0	0.1
... households with children	9.0	8.9	-0.1
... households with older persons	11.0	10.7	-0.3
Absolute national poverty line, in national currency, yearly:	2,155.6	2,155.6	0.0

whereas, somewhat surprisingly, inequality increased.

## Inequality and the household income distribution - Consumption based, Indirect Tax on after taxes and transfers, yearly

	Base scenario	Alternative scenario	Difference base vs alternative
► Gini (household income)	0.4143	0.4145	0.0002
P80/P20	3.50	3.52	0.02
Quantiles of distribution and median			
20th	1,900.14	1,903.60	3.46
40th	2,916.83	2,931.61	14.77
50th	3,496.21	3,508.90	12.69
60th	4,217.78	4,224.53	6.74
80th	6,652.90	6,696.35	43.45
Absolute national poverty line, in national currency, yearly	2,155.56	2,155.56	0.00

## Exercise 9: New information on tax and benefit policies for 2018

**Task:** Start preparing the update of GHAMOD to policy year 2018. It includes finding all policy rules (any changes to tax and benefit rules) as well as finding a suitable uprating index.

**Purpose of the exercise:** To get to learn how the model is kept up-to-date.

### Solution – Part 1: Find information on tax policies

**Step 1:** The best place to find tax information is the Ghana Revenue Authority website. You can easily find VAT, PIT, Excise and many other rates there. The site is usually updated a week after a change in policy. Go to the website <http://gra.gov.gh/>

**Step 2:** Look for the current Tax Acts of Parliament for Ghana. This will contain all the policy rules concerning taxes in the country. All documents can be found here <http://gra.gov.gh/index.php/legal-documents/>

### Solution – Part 2: Find information on benefit policies

For benefit policies such as LEAP, School Feeding Programme, Pensions etc. The best place to find such policy rules will be their respective programme websites. Information that can be obtained include benefit amounts, eligibility criteria, funding bodies, development partners etc.

LEAP: <http://leap.gov.gh/>

School Feeding Programme: <http://hgsf-global.org/ghana/policy>

Pensions and Social Security: <https://www.ssniit.org.gh/>

### Solution – Part 3: Find information on uprating indices

On uprating indices two major sources can be used. The first is the Bank of Ghana (BoG) monetary and time series data (this may lag behind some months). The second is the Ghana Statistical Service (GSS) monthly CPI bulletins. Links to check.

BoG: <https://www.bog.gov.gh/statistics/time-series-data>

GSS: [http://www.statsghana.gov.gh/cpi\\_bulletin.html](http://www.statsghana.gov.gh/cpi_bulletin.html)

## Exercise 10: Implementation of new policy rules to GHAMOD 2018

**Task:** Implement the changes to the policy rules for GHAMOD 2018.

**Purpose of the exercise:** To get to learn how the model is kept up-to-date.

### Solution – Part 1: Create a new system

Prepare a new system with the base year set to 2017 and call it GH\_2018

### Solution – Part 2: Include new policies in the new system

**Step 1:** Most policies in 2017 have not changed much in 2018 with the exception of the Free SHS policy which started in September 2018. As a result, in terms of existing tax-benefit regulation we do not make any changes.

Policy	Grp/No	GH_2017	GH_2018	Comment
1	SetDefault_gh	on	on	DEF: Set Default
2	uprate_gh	on	on	DEF: UPDATING FACTORS
3	ConstDef_gh	on	on	DEF: Constants
4	ildef_gh	on	on	DEF: INCOME CONCEPTS
5	tundef_gh	on	on	DEF: ASSESSMENT UNITS
6	poverty_lines_gh	on	on	INC: Poverty lines
7	neg_gh	on	on	DEF: Recode negative incomes to zero
8	tscer_gh	on	on	TAX: Employer social contributions
9	tscee_gh	on	on	TAX: Employee social contributions
10	poa01_gh	n/a	n/a	BEN: Hypothetical old-age pension reform
11	bsa_gh	on	on	BEN: LEAP transfer programme
12	bed01_gh	on	on	BEN: School capitation grant (in kind)
13	tiniy_gh	on	on	TAX: Capital income tax
14	tin_gh	on	on	TAX: Labour income tax
15	tin_flat_gh	n/a	n/a	TAX: Flat tax proposal
16	tinbs_gh	on	on	TAX: Presumptive Tax
17	vat_gh	on	on	TAX: Value-Added Tax
18	indtax_gh	on	on	TAX: Other indirect taxes
19	output_std_gh	on	on	DEF: STANDARD OUTPUT INDIVIDUAL LEVEL
20	output_std_hh_gh	off	off	DEF: STANDARD OUTPUT HOUSEHOLD LEVEL

**Step 2:** Introduce the new policy to model the Free SHS policy. Call it “bedes\_gh” and turn the policy on for the year 2018. Include parameters DefConst and BenCalc which should also be turned on for 2018.

13	▼	●	<b>bedes_gh</b>		n/a	<b>on</b>	<b>BEN: Free SHS Policy</b>	
13.1		▶	fx	DefConst		n/a	<b>on</b>	Constants
13.2		▶	fx	BenCalc		n/a	<b>on</b>	Benefits

**Step 3:** Introduce constants which shows the eligibility allocations for residents and non-resident students. Ghs1002.47 yearly for resident students and Ghs648.47 yearly for non-resident students. Under the benefit calculation introduce the eligibility criteria for allocating benefit amounts to resident and non-resident students. Sum simulated benefit amounts and name it bedes\_s.

13	▼	●	<b>bedes_gh</b>		n/a	<b>on</b>	<b>BEN: Free SHS Policy</b>	
13.1		▼	fx	DefConst		n/a	<b>on</b>	Constants
13.1.1				\$bes1		n/a	1002.47#y	Resident Student
13.1.2				\$bes2		n/a	648.47#y	Non-resident student
13.2		▼	fx	BenCalc		n/a	<b>on</b>	Benefits
13.2.1				Comp_Cond	1	n/a	{IsInEducation}&{der=1}&{dpp=1}	If member is resident
13.2.2				Comp_perTU	1	n/a	\$bes1	Benefit Amount
13.2.3				Comp_Cond	2	n/a	{IsInEducation}&{der=0}&{dpp=1}	If member is non-resident
13.2.4				Comp_perTU	2	n/a	\$bes2	Benefit Amount
13.2.5				Output_Var		n/a	bedes_s	Total Free SHS Grant
13.2.6				TAX_UNIT		n/a	tu_household_gh	