

# DGE–CRED Practical Session 2: Implementation of storms, land loss and labour productivity losses

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On behalf of:



of the Federal Republic of Germany

# Task 1: Calibration workbook and the Baseline scenario.

- Use the CreateRawExcelInputFileRobust.m in the function folder.
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services
- Region: Vietnam
- Climate variables regional: surface temperature (tas), storms (storms)
- Climate variables national: sea level (SL)
- Use the Calibration.xlsx file and copy the Sheet Data and the Baseline sheet into the ModelSimulationandCalibration3Sectorsand1Region.xlsx.
- Run the Baseline scenario.

# Task 1: Calibration workbook and the Baseline scenario.

- First modify line 12 to 15 in the CreateRawExcelInputFileRobust.m

```
%% Define sectors
casSectors = {'Agriculture, forestry and fishery'; 'Industry'; 'Services'};
inbsectors_p = length(casSectors);
%% Define subsectors
casSubSectors = {'Agriculture, forestry and fishery'; 'Industry'; 'Services'};
inbsubsectors_p = length(casSubSectors);
%% Define regions
casRegions = {'Vietnam'};
inbregions_p = length(casRegions);

%% Define regional climate variables
casClimateVarsRegionalName = {'surface temperature (Celsius)', 'storms (storms)'};
casClimateVarsRegional = {'tas', 'storms'};

%% Define national climate variables
casClimateVarsNationalName = {'Sea level'};
casClimateVarsNational = {'SL'};
casClimateVars = [casClimateVarsRegional casClimateVarsNational];
```

# Task 1: Calibration workbook and the Baseline scenario.

- Copy from Calibration.xlsx file the data into the ModelSimulationandCalibration3Sectorsand1Region.xlsx Sheet Data.

The image shows two side-by-side Microsoft Excel windows. The left window is titled 'Calibration' and the right window is titled 'ModelSimulationandCalibration3Sectorsand1Region'. Both windows have their ribbon menus open, showing tabs like File, Home, Insert, etc. The left window's status bar says 'Christoph Schult'. The right window's status bar says 'F17'. In the left window, cell C1 contains the value '0.158321065012966'. Below this, there is a table with columns labeled B through H. The first row has headers: 'Region', 'Initial Value Added Shares (phiV0)', 'Initial Employment Shares (phiE0)', 'Labour Cost Shares (phiW0)', 'Sector', 'export share (phiX)', and 'import share (phiI)'. The data rows show values for three regions: Germany, Vietnam, and Vietnam again. The right window shows a similar table structure with columns A through D. The first row has headers: 'Sector', 'Region', 'Initial Value Added Shares (phiV0)', and 'Initial Employment Shares (phiE0)'. The data rows show values for four sectors: Sector, Agriculture, Industry, and Services, all corresponding to Vietnam. The two tables appear to be identical, suggesting the data is being copied from one to the other.

Region	Initial Value Added Shares (phiV0)	Initial Employment Shares (phiE0)	Labour Cost Shares (phiW0)	Sector	export share (phiX)	import share (phiI)
Germany	0.158321065	0.376176484	0.6575	Agriculture, forestry and fishery	0.130530763	0.0
Vietnam	0.422561374	0.193657259	0.4725	Industry	0.466348074	0.7
Vietnam	0.419117561	0.43016626	0.6656	Services	0.102510019	0.6

Sector	Region	Initial Value Added Shares (phiV0)	Initial Employment Shares (phiE0)
1. Sector			
2. Agriculture, forestry and fishery	Vietnam	0.158321065	
3. Industry	Vietnam	0.422561374	
4. Services	Vietnam	0.419117561	

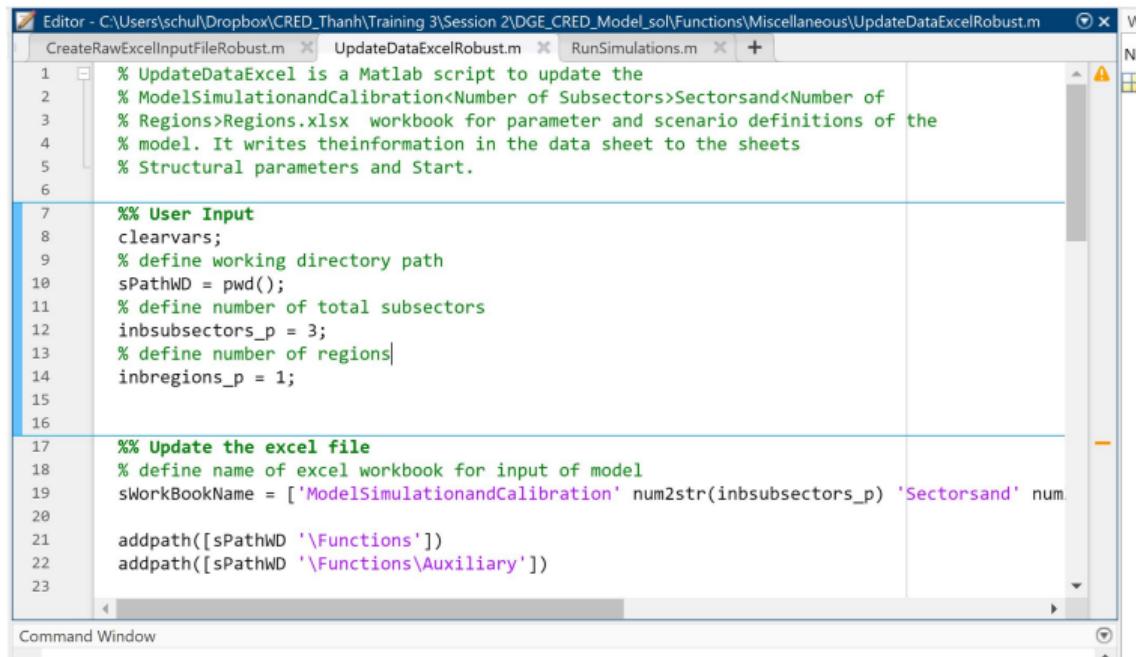
# Task 1: Copy the Baseline scenario.

- Copy from Calibration.xlsx file the Baseline scenario into the ModelSimulationandCalibration3Sectorsand1Region.xlsx Baseline sheet.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Time	expo_PoP	gv_1_1	gv_2_1	gv_3_1	gv_4_1	gv_5_1										
2	2	0	1.028	1.074	1.063	0.948	1.057	1.027									
3	3	0	1.0299	1.0793	1.0788	0.9506	1.0545	1.0285									
4	4	0	1.0312	1.0806	1.0801	0.9518	1.0558	1.0298									
5	5	0	1.024007	1.053448	1.071162	1.04887	1.021249										
6	6	0	1.023006	1.060273	1.067604	1.057568	1.044237	1.021992									
7	7	0	1.021666	1.05726	1.062242	1.059976	1.044106	1.028892									
8	8	0	1.020583	1.054397	1.060103	1.061775	1.0493	1.019847									
9	9	0	1.019533	1.051877	1.057262	0.963886	1.039895	1.018855									
10	10	0	1.018576	1.049933	1.050826	0.965502	1.037815	1.017932									
11	11	0	1.017447	1.048438	1.052042	0.967227	1.035924	1.017937									
12	12	0	1.016309	1.04721	1.049191	0.970422	1.034422	1.015358									
13	13	0	1.015213	1.035987	1.04488	0.971901	1.030801	1.01459									
14	14	0	1.014134	1.037987	1.040467	0.973309	1.02920	1.01388									
15	15	0	1.013055	1.036088	1.040477	0.974041	1.027797	1.013187									
16	16	0	1.012972	1.034384	1.038545	0.975209	1.026408	1.012569									
17	17	0	1.011707	1.030914	1.034764	0.976258	1.023333	1.011285									
18	18	0	1.011122	1.029394	1.030533	0.977113	1.022087	1.011883									
19	19	0	1.010938	1.028754	1.029754	0.978095	1.020792	1.011079									
20	20	0	1.010701	1.028133	1.028291	0.980101	1.020101	1.010791									
21	21	0	1.010538	1.027552	1.027652	0.980187	1.019901	1.010531									
22	22	0	1.010338	1.026918	1.027154	0.980129	1.019344	1.009679									
23	23	0	1.009736	1.025202	1.026267	0.982291	1.019412	1.009395									
24	24	0	1.009299	1.023941	1.02696	0.983176	1.018841	1.008773									
25	25	0	1.008906	1.022744	1.025011	0.984017	1.017319	1.008299									
26	26	0	1.008176	1.020387	1.024235	0.984817	1.016843	1.007884									
27	27	0	1.007801	1.019721	1.021821	0.98576	1.015831	1.006749									
28	28	0	1.007579	1.018593	1.020172	0.986501	1.014901	1.005731									
29	29	0	1.007071	1.018133	1.020077	0.986982	1.014237	1.004793									
30	30	0	1.006259	1.017399	1.016176	0.987032	1.012556	1.006431									
31	31	0	1.005526	1.016719	1.015753	0.988251	1.012878	1.0061									
32	32	0	1.005001	1.015383	1.017815	0.988839	1.012234	1.005795									
33	33	0	1.005709	1.015089	1.016026	0.989397	1.011823	1.005565									
34	34	0	1.005424	1.014335	1.016078	0.989927	1.010842	1.005523									
35	35	0	1.005153	1.013818	1.015274	0.990431	1.010849	1.004969									
36	36	0	1.004695	1.011621	1.011611	0.990403	1.008882	1.000771									

# Task 1: Update the parameters.

- Run UpdateDataExcelRobust.m.



The screenshot shows a MATLAB Editor window with three tabs at the top: 'CreateRawExcelInputFileRobust.m', 'UpdateDataExcelRobust.m' (which is the active tab), and 'RunSimulations.m'. The code in the editor is as follows:

```
%>>> % UpdateDataExcel is a Matlab script to update the
% ModelSimulationandCalibration<Number of Subsectors>Sectorsand<Number of
% Regions>Regions.xlsx workbook for parameter and scenario definitions of the
% model. It writes the information in the data sheet to the sheets
% Structural parameters and Start.

%% User Input
clearvars;
% define working directory path
sPathWD = pwd();
% define number of total subsectors
inbsubsectors_p = 3;
% define number of regions
inbregions_p = 1;

%% Update the excel file
% define name of excel workbook for input of model
sWorkBookName = [ 'ModelSimulationandCalibration' num2str(inbsubsectors_p) 'Sectorsand' num2str(inbregions_p) 'Regions.xlsx'];
addpath([sPathWD '\Functions'])
addpath([sPathWD '\Functions\Auxiliary'])
```

# Task 1: Run the Baseline scenario.

- Execute RunSimulation.m
- makes sure that you add the right dynare version, have the right scenarios specified and the correct vector for sSubsecstart and sSubsecend.

The screenshot shows the MATLAB IDE interface. On the left, the code editor displays the script `RunSimulations.m` with the following content:

```
sion < • DGE_CRED_Model_sol
Editor - C:\Users\schul\Dropbox\CRED_Thanh\Training 3\Session 2\GDE_CRED_Model_sol\RunSimulations.m
CreateRawExcelInputFileRobust.m UpdateDataExcelRobust.m RunSimulations.m +
1 % RunSimulations is a Matlab script to run different scenarios stored in
2 % ModelSimulationandCalibration<Number of Subsectors>Sectorsand<Number of
3 % Regions>Regions.xlsx workbook. The DGE_CRED_Model.mod file is changed
4 % in the script.
5
6 addpath('C:\dynare\4.6.4\matlab')
7 %% Specify scenario names
8 casScenarioNames = {...;
9     'Baseline';
10    };
11
12 %% Define sector structure
13 sSubsecstart = '[1, 2, 3]';
14 sSubsecend = '[1, 2, 3]';
15
16 %% Define number of regions
17 sRegions = '1';
18
19 %% Define additional specification of the version of the model for sensitivity analysis.
20 sSensitivity = '';
21
22
23 %% Execute dynare to run the model
```

To the right of the code editor is the workspace browser, which lists variables and their current values:

Name	Type	Value
caData	double	1000
caHead	string	1000
casDat	double	1000
casShe	string	1000
caValu	double	1000
caValu	double	1000
dat_rar	double	1000
icorow	double	1000
icoshe	double	1000
inbcoll	double	1000
inbreg	double	1000
inbro	double	1000
inbsub	double	1000
iparam	double	1000
iposco	double	1000
iposro	double	1000
itempl	double	1000
ivaluec	double	1000
sExcel	string	1000
sPathW	string	1000
sSearch	string	1000
sSheet	string	1000
sWorkl	string	1000
temp	double	1000
templic	double	1000

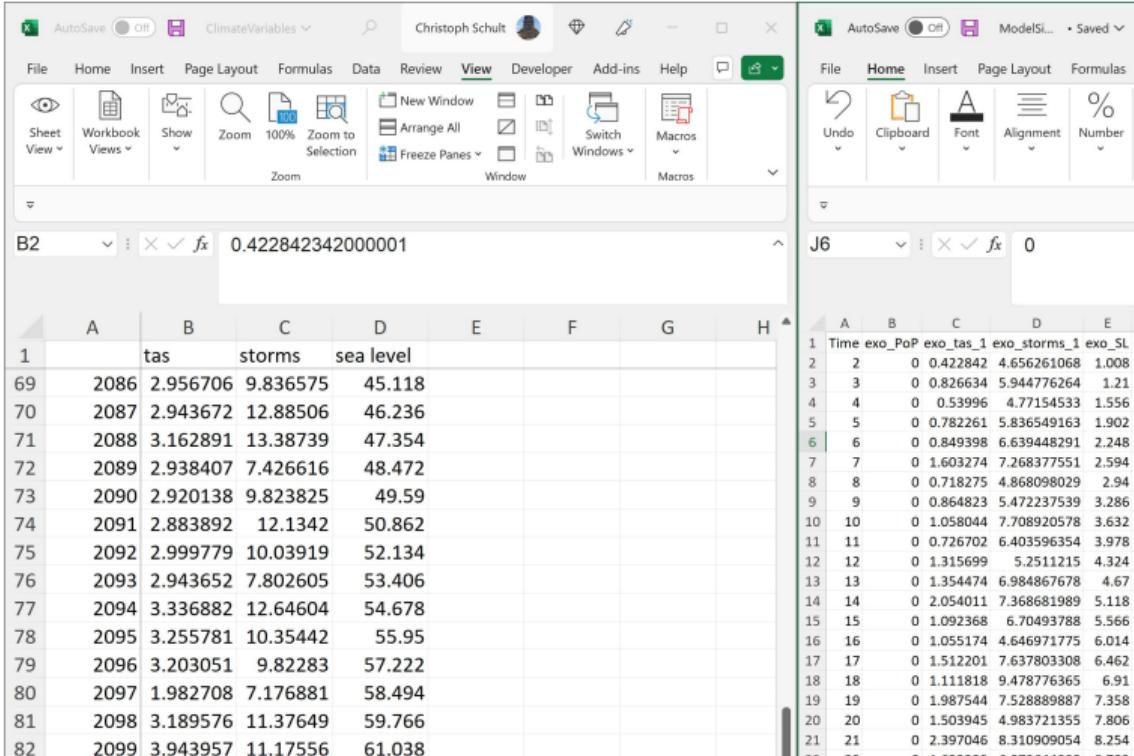
At the bottom left, the command window shows the text `// 3/400`. The page footer indicates `| p.6 |`.

## Task 2: Define SSP 119, 245 and 585 scenario.

- Create three scenarios called SSP119, SSP245 and SSP585.
- Use the ClimateVariables.xlsx file.
- Copy temperature, storms and sea level to the respective sheet.
- Run the scenarios.

## Task 2: Create the SSP 119, 245 and 585 scenario.

- Make sure that the last values for the climate variables are not zero.
- Copy the data from the ClimateVariables.xlsx file into the sheets.



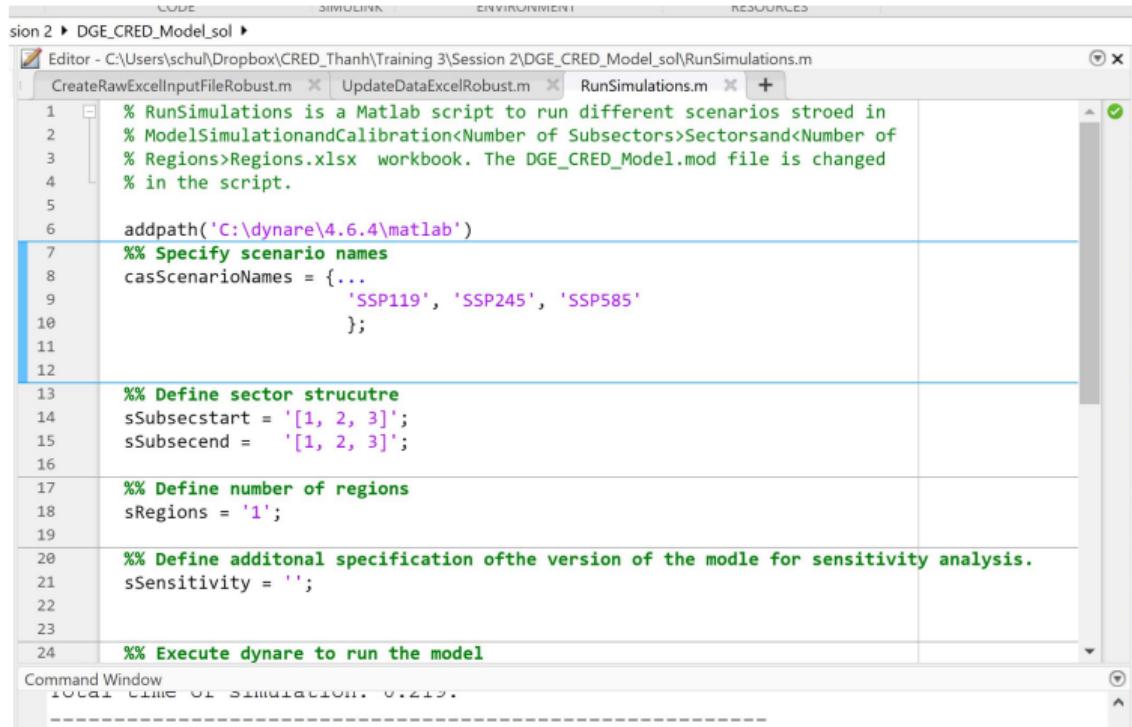
The image shows two Microsoft Excel windows side-by-side. The left window displays a grid of climate variable data with columns labeled A through H and rows numbered 1 to 82. The data includes variables like tas, storms, and sea level. The right window shows a single row of data with columns A through E, and cell J6 contains the formula '=0'. Both windows have standard Excel toolbars and ribbon menus.

	A	B	C	D	E	F	G	H
1		tas	storms	sea level				
69	2086	2.956706	9.836575	45.118				
70	2087	2.943672	12.88506	46.236				
71	2088	3.162891	13.38739	47.354				
72	2089	2.938407	7.426616	48.472				
73	2090	2.920138	9.823825	49.59				
74	2091	2.883892	12.1342	50.862				
75	2092	2.999779	10.03919	52.134				
76	2093	2.943652	7.802605	53.406				
77	2094	3.336882	12.64604	54.678				
78	2095	3.255781	10.35442	55.95				
79	2096	3.203051	9.82283	57.222				
80	2097	1.982708	7.176881	58.494				
81	2098	3.189576	11.37649	59.766				
82	2099	3.943957	11.17556	61.038				

J6      0

## Task 2: Execute the RunSimulation.m file.

- Rename the casScenarioNames object.
- Each scenario is one character string.



The screenshot shows the MATLAB IDE interface with the following details:

- Tab Bar:** CODE, SIMULINK, ENVIRONMENT, RESOURCES
- Project Browser:** Session 2 > DGE\_CRED\_Model\_sol >
- Editor:** Editor - C:\Users\schul\Dropbox\CRED\_Thanh\Training 3\Session 2\RunSimulations.m
- Script Content:**

```
1 % RunSimulations is a Matlab script to run different scenarios stored in
2 % ModelSimulationandCalibration<Number of Subsectors>Sectorsand<Number of
3 % Regions>Regions.xlsx workbook. The DGE_CRED_Model.mod file is changed
4 % in the script.
5
6 addpath('C:\dynare\4.6.4\matlab')
7 %% Specify scenario names
8 casScenarioNames = {...,
9     'SSP119', 'SSP245', 'SSP585'
10    };
11
12 %% Define sector structure
13 sSubsecstart = '[1, 2, 3]';
14 sSubsecend = '[1, 2, 3]';
15
16 %% Define number of regions
17 sRegions = '1';
18
19 %% Define additional specification of the version of the model for sensitivity analysis.
20 sSensitivity = '';
21
22
23 %% Execute dynare to run the model
```
- Command Window:** TOTAL TIME OF SIMULATION: 0.215.
- Toolbars and Panels:** Standard MATLAB toolbars and panels are visible on the right side of the interface.

## Task 3: Include damages to labour productivity.

Sub-sector	Description	Physical intensity (W)	Productivity reduction ( $D_s^{N,Heat}$ in $\frac{\%}{^{\circ}C}$ )
Agriculture, forestry and fishery	Heavy physical work	400	5.71
Industry	Moderate physical work	300	2.38
Services	Clerical/light physical work	200	0.35

Source: Kjellstrom et al. 2019 Table 6.43 and own computation.

## Task 3: Agriculture, forestry and fishery

= $\$C2*0.0571$

K	L	M	N	O	P
IAP_3_1	exo_D_1_1	exo_D_2_1	exo_D_3_1	exo_D_N_1_1	exo_D_N_1_2
0	0	0	0	= $\$C2*0.0571$	0.020058
0	0	0	0	0.00262336	0.00109
0	0	0	0	0.096260231	0.040122
0	0	0	0	0.074702003	0.031136
~	~	~	~	~	~

# Task 3: Industry

The screenshot shows a Microsoft Excel interface with a formula bar at the top containing the text `=\$C2*0.0238`. Below the formula bar is a table with 12 columns labeled J through R. The first row contains column headers such as `exo_IAP_2_1`, `exo_IAP_3_1`, etc. The second row contains numerical values: 0, 0, 0, 0, 0, 0, 0.048123273, `=\$C2*0.0238`, 0.002949763, 0, 0. The formula `=\$C2*0.0238` is highlighted in green, indicating it is currently selected or being edited.

J	K	L	M	N	O	P	Q	R	
0	0	0	0	0	0	0.048123273	=\\$C2*0.0238	0.002949763	0
0	0	0	0	0	0	0.00262336	0.00109345	0.000160801	0
0	0	0	0	0	0	0.096260231	0.040122478	0.005900364	0
0	0	0	0	0	0	0.074702003	0.031136737	0.004578932	0
0	0	0	0	0	0	0.03068152	0.012788444	0.001880654	0
0	0	0	0	0	0	0.047280777	0.019707224	0.002898121	0
0	0	0	0	0	0	0.089256155	0.0372844772	0.005477172	0

## Task 3: Services

The screenshot shows a Microsoft Excel spreadsheet with a formula editor open. The formula `=$C2*0.0035` is being typed into the formula bar. The spreadsheet contains several columns labeled K through Q. Column Q is highlighted in light gray. The data in column Q consists of the formula `=$C2*0.0035` repeated four times. The rest of the columns contain numerical values.

K	L	M	N	O	P	Q
exo_IAP_3_1	exo_D_1_1	exo_D_2_1	exo_D_3_1	exo_D_N_1_1	exo_D_N_2_1	exo_D_N_3_1
0	0	0	0	0.048123273	0.020058387	<code>=\$C2*0.0035</code>
0	0	0	0	0.00262336	0.00109345	0.000160801
0	0	0	0	0.096260231	0.040122478	0.005900364
0	0	0	0	0.074702003	0.031136737	0.004578932

## Task 4: Illustrate the impact of labour productivity on GDP and its components.

- What is the impact on GDP, consumption and investment in the SSP 119, 245 and 585 scenario?
- Use the Figures.xlsx file to create the graph.

## Task 4: Rename the workbook you refer to in the Excel sheet.

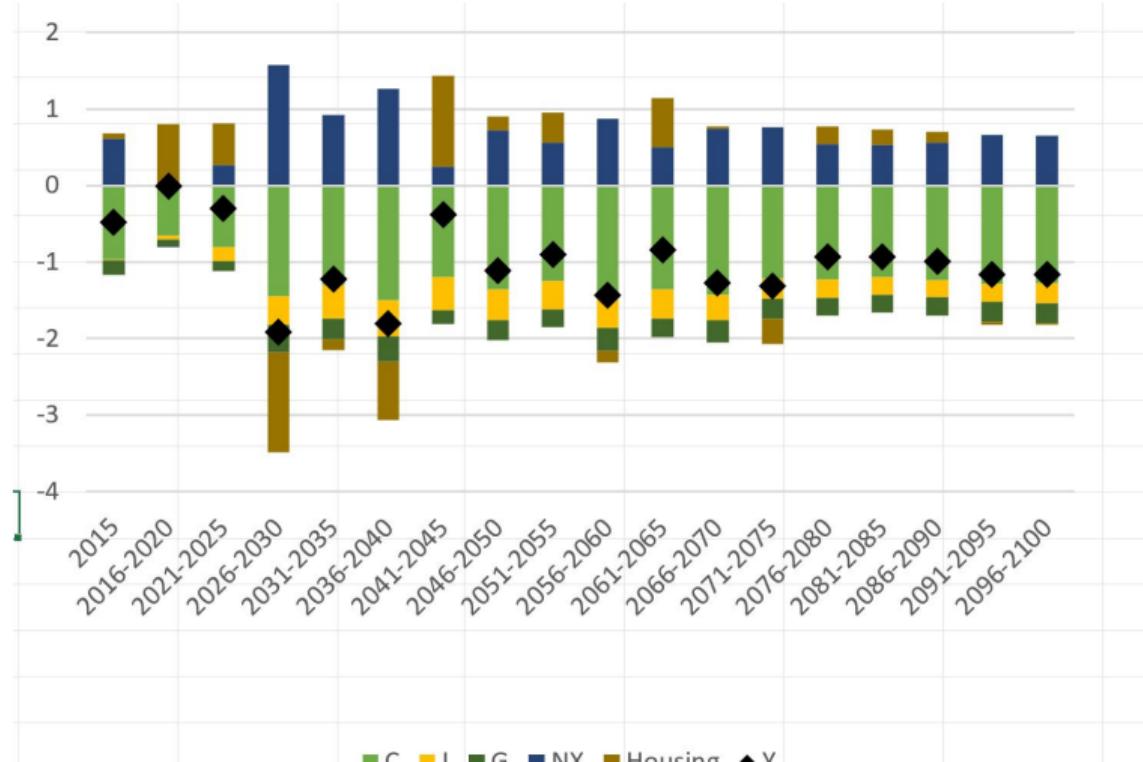
G64

▼ : X ✓ fx

A	B	C	D	E	F	I
1	Y	Y	C	C	I	
2	Year	Baseline	SSP119	Baseline	SSP119	B
3	2014	1.165338	1.1653	0.726204	0.726204	
4	ResultsScenarios3Sectorsand1Regions	2015	1.247481	1.239	0.778723	0.768764
5		2020	1.679994	1.673	1.014928	0.998989
6		2025	2.126184	2.1204	1.228267	1.205224
7		2030	2.558817	2.5355	1.440145	1.408944
8		2035	2.958148	2.9303	1.657551	1.621979
9		2040	3.3127	3.2675	1.872029	1.825073
10		2045	3.618043	3.5708	2.071791	2.018991
11		2050	3.874811	3.8153	2.24923	2.185688
12		2055	4.086752	4.035	2.401593	2.337262
13		2060	4.259178	4.1738	2.52936	2.448366
14		2065	4.397885	4.3432	2.634695	2.557329
15		2070	4.508495	4.4521	2.720439	2.632806
16		2075	4.596104	4.4926	2.789545	2.681187
17		2080	4.66513	4.5616	2.844795	2.729059
18		2085	4.719294	4.6188	2.888668	2.771214
19		2090	4.761661	4.6544	2.923301	2.803347
20		2095	4.794721	4.6797	2.950495	2.82429

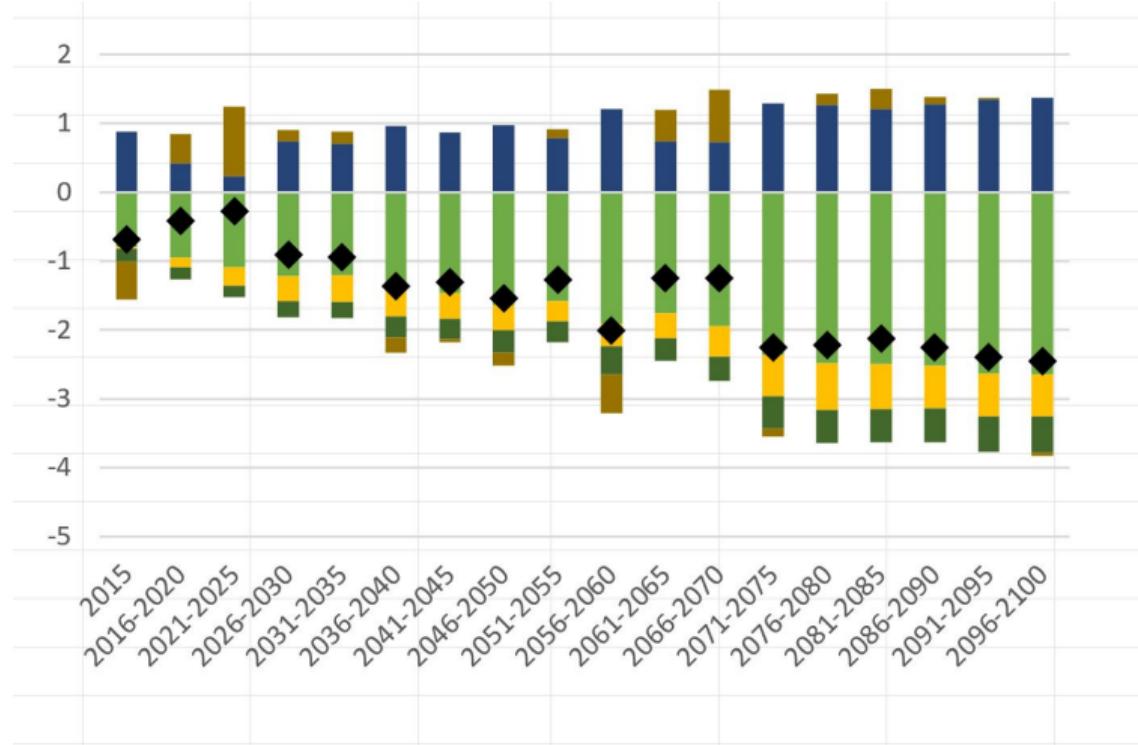
## Task 4: SSP 119

- Copy the GDP sheet and rename it into SSP119.
- Make sure to replace all SSP scenarios in line 2 with SSP 119.



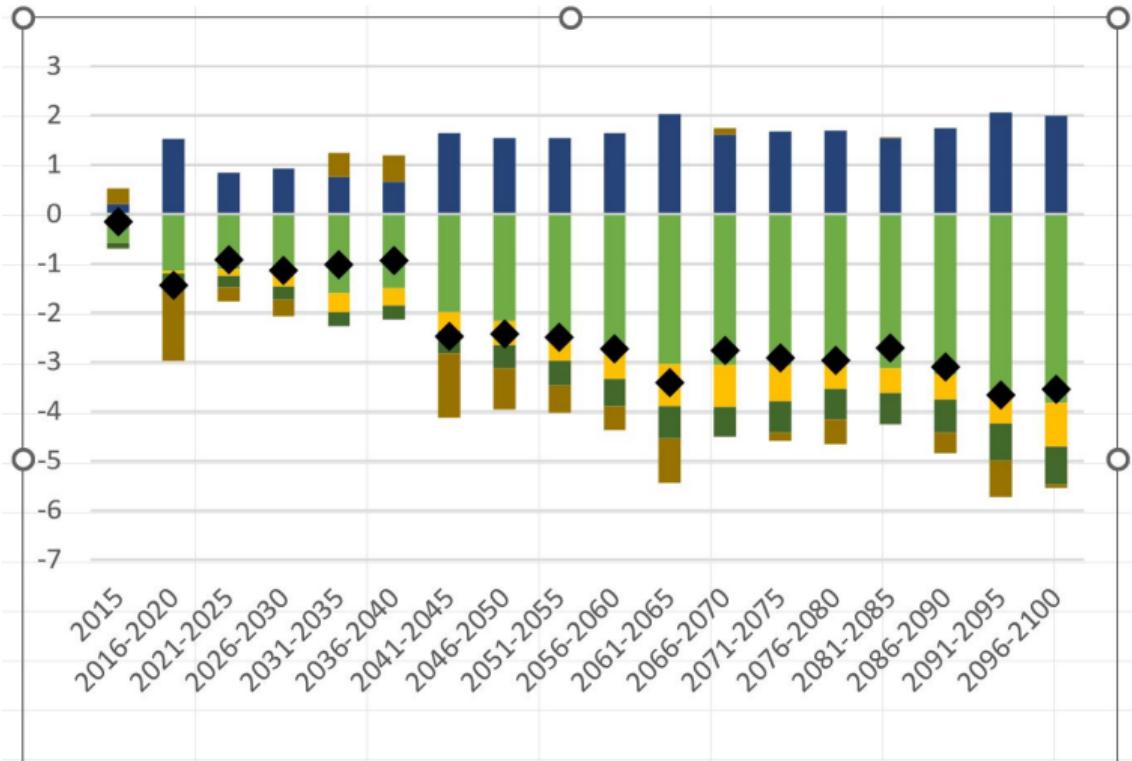
## Task 4: SSP 245

- Copy the GDP sheet and rename it into SSP245.
- Make sure to replace all SSP scenarios in line 2 with SSP 245.



## Task 4: SSP 585

- Copy the GDP sheet and rename it into SSP585.
- Make sure to replace all SSP scenarios in line 2 with SSP 585.



## Task 5: Land loss due to sea level rise in Agriculture, forestry and fishery.

- First, copy the existing SSP scenarios and call them SSP119Lab, SSP245Lab and SSP585Lab.
- Include land loss in agriculture, forestry and fishery such that it reduces total factor productivity in the sector as a share of total land used in the sector.
- Use the VLOOKUP function to make the land loss conditional on the respective sea level rise.
- You can find the required data in the LandLossAgricultureForestryFishery.xlsx file.

The screenshot shows a portion of an Excel spreadsheet. The active cell is C3, containing the value "143.4458000000001". The spreadsheet has columns A, B, C, D, and E. Row 1 contains the header "Sea level rise (cm)" under column A and "Vietnam (km<sup>2</sup>)" under column C. Row 2 contains "from" under A and "to" under B. Row 3 contains "0" under B and "5" under C, with "143.4458" in the formula bar above. Row 4 contains "5" under B and "10" under C, with "519.03" in the formula bar above. Row 5 contains "10" under B and "15" under C, with "617.673" in the formula bar above. Column D is labeled "Total land" and contains the values 263939, 519.03, and 617.673 respectively. Column E is empty.

	A	B	C	D	E
1	Sea level rise (cm)		Vietnam (km <sup>2</sup> )		
2	from	to	Land loss (km <sup>2</sup> )		
3	0	5	143.4458		
4	5	10	519.03		
5	10	15	617.673		

# Task 5: Change damages to total factor productivity in the agriculture, forestry and fishery sector.

- Change the values for exo\_D\_1\_1 in column L for all SSP scenarios.
- Use the VLOOKUP function to refer to the table in LandLossAgricultureForestryFishery.xlsx.

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top contains the formula: =VLOOKUP(\$E2;[LandLossAgricultureForestryFishery.xlsx]Sheet1!\$A\$3:\$C\$22;3;1) / [LandLossAgricultureForestry.xlsx]Sheet1!\$E\$1. The table below has columns labeled E through P. Row 1 contains labels for columns E through P. Row 2 contains numerical values: 1.283, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.19557536. Row 3 contains: 1.54, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.081294302, 0.03388449. Row 4 contains: 1.852, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.006060994, 0.002526299. Row 5 contains: 2.164, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.045037357, 0.018772138. Row 6 contains: 2.476, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.035765173, 0.014907375. Row 7 contains: 2.788, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.023400606, 0.009753667. Row 8 contains: 3.1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.065984809, 0.0275033. Row 9 contains: 3.412, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.043711282, 0.018219414. Row 10 contains: 3.724, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.098817882, 0.041188539. Row 11 contains: 4.036, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.011646388, 0.004854361. Row 12 contains: 4.348, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.039146284, 0.016316665. Row 13 contains: 4.66, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.085353916, 0.035576589. Row 14 contains: 4.886, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.078529897, 0.032732251. Row 15 contains: 5.112, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.047596718, 0.019838912. Row 16 contains: 5.338, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.082251251, 0.034283359. Row 17 contains: 5.564, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.121298861, 0.050558895.

## Task 6: How important are land losses for the GDP effect?

- Run the SSP scenarios with the land loss effect.
- Create a suitable graph to investigate the additional GDP effect due to land losses.

# Task 6: Run all scenarios.

- First run all SSP scenarios.

```
% NOBODYSNEEDSITASX WORKBOOK. THE DSE_CRED_TUTORIAL.MW FILE IS CHANGED  
% in the script.  
  
addpath('C:\dynare\4.6.4\matlab')  
%% Specify scenario names  
casScenarioNames = {...  
    ['SSP119', 'SSP245', 'SSP585', ...  
     'SSP119Lab', 'SSP245Lab', 'SSP585Lab', ...  
    ];  
  
%% Define sector structure  
sSubsecstart = '[1, 2, 3]';  
sSubsecend = '[1, 2, 3]';
```

# Task 6: Prepare Figures.xlsx file

- Copy the sheet in the Figures.xlsx file and change the references to the SSP scenarios such that you have the following excel workbook:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
2		Year	Baseline	SSP585	Baseline	SSP585Lab	Baseline	SSP245	Baseline	SSP245Lab	Baseline	SSP119	Baseline	SSP119Lab	
3		2014	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	1.165338	
4	ResultsSce	2015	1.247481	1.245467	1.247481	1.245529	1.247481	1.238903	1.247481	1.238966	1.247481	1.241383	1.247481	1.241446	
5		2020	1.679994	1.655729	1.679994	1.655784	1.679994	1.67298	1.679994	1.673037	1.679994	1.679777	1.679994	1.679832	
6		2025	2.126184	2.106571	2.126184	2.106607	2.126184	2.120351	2.126184	2.120409	2.126184	2.119638	2.126184	2.119693	
7		2030	2.558817	2.529348	2.558817	2.529644	2.558817	2.535199	2.558817	2.535511	2.558817	2.509573	2.558817	2.509886	
8		2035	2.958148	2.927266	2.958148	2.927619	2.958148	2.929923	2.958148	2.930271	2.958148	2.921438	2.958148	2.921812	
9		2040	3.3127	3.281103	3.3127	3.281572	3.3127	3.267088	3.3127	3.267495	3.3127	3.252576	3.3127	3.253022	
10		2045	3.618043	3.527885	3.618043	3.528367	3.618043	3.57023	3.618043	3.570753	3.618043	3.603707	3.618043	3.604281	
11		2050	3.874811	3.780328	3.874811	3.781021	3.874811	3.814712	3.874811	3.815267	3.874811	3.830903	3.874811	3.831507	
12		2055	4.086752	3.98414	4.086752	3.985034	4.086752	4.034307	4.086752	4.035038	4.086752	4.049187	4.086752	4.049819	
13		2060	4.259178	4.141848	4.259178	4.142711	4.259178	4.173033	4.259178	4.173795	4.259178	4.197259	4.259178	4.19791	
14		2065	4.397885	4.246381	4.397885	4.247483	4.397885	4.34257	4.397885	4.343187	4.397885	4.360049	4.397885	4.360895	
15		2070	4.508495	4.382714	4.508495	4.38391	4.508495	4.451126	4.508495	4.45207	4.508495	4.450224	4.508495	4.451061	
16		2075	4.596104	4.460748	4.596104	4.462067	4.596104	4.491406	4.596104	4.492625	4.596104	4.534958	4.596104	4.535826	
17		2080	4.66513	4.525355	4.66513	4.526905	4.66513	4.560366	4.66513	4.561604	4.66513	4.620731	4.66513	4.621609	
18		2085	4.719294	4.58972	4.719294	4.59145	4.719294	4.617353	4.719294	4.61877	4.719294	4.674352	4.719294	4.675419	
19		2090	4.761661	4.612089	4.761661	4.614229	4.761661	4.652795	4.761661	4.65442	4.761661	4.713138	4.761661	4.714247	
20		2095	4.794721	4.615428	4.794721	4.619119	4.794721	4.677702	4.794721	4.679711	4.794721	4.737753	4.794721	4.738898	
21		2100	4.820468	4.645272	4.820468	4.649284	4.820468	4.700412	4.820468	4.702454	4.820468	4.76313	4.820468	4.7643	
22			SSP 585	SSP 585 Lab	SSP 245	SSP 245 Lab	SSP 119	SSP 119 Lab							
23			2015	-0.161513	-0.156534	-0.687699	-0.682632	-0.488842	-0.483826						
24			2020	-1.44435	-1.441089	-0.417496	-0.414143	-0.012943	-0.009646						

# Task 6: Prepare Figures.xlsx file

- Depict in bar charts the impact on GDP for the different SSP scenarios.
- We can see that land loss in the agriculture sector has only a small impact.



## Task 7: Implement damages to the capital stock of the industry.

- Implement damages to the capital stock in the industry in Vietnam.
- The average value of capital in the manufacturing sector is 2634  $\frac{\text{billion VND}}{\text{km}^2}$ .

## Task 7: Use VLOOKUP to refer to LandLossIndustry.xlsx file

- First copy the existing SSP scenarios and rename them into SSPxxxLabLLAgri.
- Now, use the same procedure as for Task 5. Instead of the file LandLossAgricultureForestryFishery.xlsx sure the LandLossIndustry.xlsx.

The screenshot shows a portion of an Excel spreadsheet. Cell S2 contains the formula =VLOOKUP(\$E2;[LandLossIndustry.xlsx]Sheet1!\$A\$3:\$C\$22;3;1)\*2630  
/[LandLossIndustry.xlsx]Sheet1!\$D\$1. The table below has columns P through W. The first row of the table contains labels: exo\_D\_N\_2\_1, exo\_D\_N\_3\_1, exo\_D\_K\_1\_1, exo\_D\_K\_2\_1, exo\_D\_K\_3\_1, exo\_DH, exo\_I\_A\_DH, and exo\_I\_AP\_DH. The data rows show numerical values corresponding to these labels.

P	Q	R	S	T	U	V	W
exo_D_N_2_1	exo_D_N_3_1	exo_D_K_1_1	exo_D_K_2_1	exo_D_K_3_1	exo_DH	exo_I_A_DH	exo_I_AP_DH
0.019557536	0.002876108		0	0.0008058	0	0	0
0.03388449	0.004983013		0	0.00096888	0	0.0008695	0
0.002526299	0.000371514		0	0.00096888	0	0.0006167	0
0.018772138	0.002760609		0	0.00096888	0	0.000685	0
0.014907375	0.002192261		0	0.00096888	0	0.0007863	0
0.009753667	0.001434363		0	0.00096888	0	0.0007168	0
0.0275033	0.004044603		0	0.00096888	0	0.0005656	0
0.018219414	0.002679326		0	0.00096888	0	0.0008222	0
0.041188539	0.006057138		0	0.00096888	0	0.0008148	0
0.004854361	0.000713877		0	0.00096888	0	0.0006472	0
0.016215665	0.000200500		0	0.00096888	0	0.0006166	0

## Task 8: Implement damages caused by storms to housing.

- Implement damages to housing caused by storms.
- Damages caused per affected person in Vietnam by storms amounted to 890 Thousand VND per affected person.
- relative to GDP in 2018, this amounts to about  $1.3 \times 10^{-10}$  percentage points per year and affected person.
- Damages to houses exo\_DH is equal to the share of affected persons by storms multiplied by the number of person times  $1.3 \times 10^{-10}$ .
- Is housing destruction due to storms important for GDP reduction?

# Task 8: Destruction of housing stock due to storms

- Here, we need to keep track of the current population development ( $SUM(B2:B2) + Data!$R$2)$ ).
- Further, we multiply the current population by the share of affected persons (\$D2/100).

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
	$=1.3*10^4*(-1)*(B2+Data!$R$2)*10^8*D2/100$																			
	6.356120681	1.2833	0	0	0	0	0	0	0	0	0.0005435	0	0.04692165	0.019557536	0.002876108	0	0.00970154	0	0.0067	
i	6.870159302	1.54	0	0	0	0	0	0	0	0	0.0005435	0	0	0.081294302	0.03388449	0.004983013	0	0.00970154	0	0.0067
r	4.871643535	1.852	0	0	0	0	0	0	0	0	0.0005435	0	0	0.00606994	0.002526299	0.00371514	0	0.00970154	0	0.0062
i	5.426039287	2.164	0	0	0	0	0	0	0	0	0.0005435	0	0	0.045037357	0.018772138	0.002760609	0	0.00970154	0	0.0069
i	6.223382262	2.476	0	0	0	0	0	0	0	0	0.0005435	0	0	0.035790173	0.014907175	0.002152261	0	0.00970154	0	0.0079
i	5.659140052	2.788	0	0	0	0	0	0	0	0	0.0005435	0	0	0.023406069	0.009753667	0.001434363	0	0.00970154	0	0.0072
i	4.460728169	3.1	0	0	0	0	0	0	0	0	0.0005435	0	0	0.06598480	0.0275033	0.004044603	0	0.00970154	0	0.0056
i	6.507096593	3.412	0	0	0	0	0	0	0	0	0.0005435	0	0	0.043711282	0.018219414	0.002679126	0	0.00970154	0	0.0082
i	6.443253909	3.724	0	0	0	0	0	0	0	0	0.0005435	0	0	0.098817882	0.041188539	0.006057138	0	0.00970154	0	0.0082
i	5.138438455	4.036	0	0	0	0	0	0	0	0	0.0005435	0	0	0.011646188	0.0048543461	0.0007113877	0	0.00970154	0	0.0065
i	4.868010394	4.348	0	0	0	0	0	0	0	0	0.0005435	0	0	0.039146284	0.016316665	0.002399509	0	0.00970154	0	0.0062
i	7.275198862	4.66	0	0	0	0	0	0	0	0	0.0005435	0	0	0.083539316	0.035576589	0.005231851	0	0.00970154	0	0.0092
i	6.623146337	4.886	0	0	0	0	0	0	0	0	0.0005435	0	0	0.078529897	0.032732251	0.004813566	0	0.00970154	0	0.0064
i	5.497205033	5.112	0	0	0	0	0	0	0	0	0.0019665	0	0	0.047596718	0.01988912	0.002917487	0	0.002306963	0	0.0007
i	4.407619851	5.338	0	0	0	0	0	0	0	0	0.0019665	0	0	0.082251251	0.034263359	0.00504167	0	0.002306963	0	0.00056
i	5.390721035	5.564	0	0	0	0	0	0	0	0	0.0019665	0	0	0.121258861	0.050558895	0.007435132	0	0.002306963	0	0.00068
i	6.116417134	5.79	0	0	0	0	0	0	0	0	0.0019665	0	0	0.071057085	0.029617489	0.004355513	0	0.002306963	0	0.00077

## Task 8: Execute the RunSimulation.m file

- Change the scenarios you want to run with the casScenarioNames. Here we need to keep track of the current population development ( $\text{SUM}(\text{B\$2:B2}) + \text{Data!$R\$2})$ ).
- Further, we multiply the current population by the share of affected persons (\$D2/100).

```
% RunSimulations is a Matlab script to run different scenarios stored in
% ModelSimulationandCalibration<Number of Subsectors>Sectorsand<Number of
% Regions>Regions.xlsx  workbook. The DGE_CRED_Model.mod file is changed
% in the script.

addpath('C:\dynare\4.6.4\matlab')
%% Specify scenario names
casScenarioNames = {...
    'SSP119', 'SSP245', 'SSP585',...
    | 'SSP119LabLLAgri', 'SSP245LabLLAgri', 'SSP585LabLLAgri',...
    'SSP119Lab', 'SSP245Lab', 'SSP585Lab',...
};

%% Define sector structure
sSubsecstart = '[1, 2, 3]';
sSubsecend = '[1, 2, 3]';

%% Define number of regions
sRegions = '1';

%% Define additional specification of the version of the module for sensitivity analysis.
```

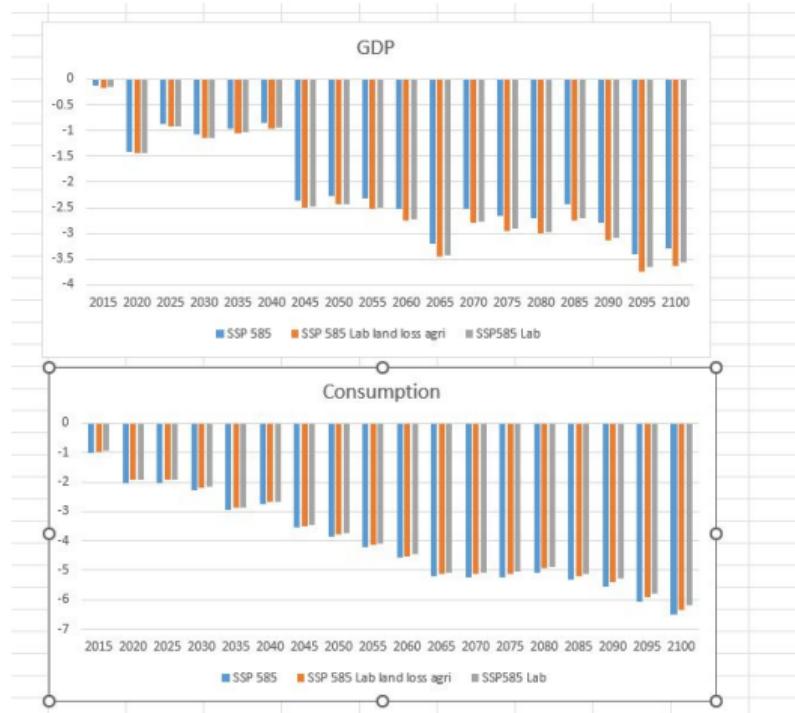
# Task 8: Depict the results

- Create a sheet in Figure.xlsx and plot Consumption and GDP relative to the Baseline for the SSP 585 scenario.

Year	C			C			C			C			C			C			C			C			C				
	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline		
2014	0.7705004	0.7705004	0.72360488	0.72360488	0.725020	0.725020	1.055191	1.055191	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	1.055388	
2015	0.779773	0.779956	0.77972885	0.77972885	0.779728	0.779728	0.771996	0.771996	1.247481	1.245799	1.245487	1.247481	1.245526	1.247481	1.245487	1.247481	1.245487	1.247481	1.245487	1.247481	1.245487	1.247481	1.245487	1.247481	1.245487	1.247481	1.245487	1.247481	
2020	1.014938	0.994035	1.014938	0.994035	1.095457	1.095457	0.995513	1.09994	1.095264	1.079994	1.079994	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784	1.079994	1.065784
2025	1.218287	1.203353	1.22827444	1.204329	1.228267	1.204657	1.218334	1.207729	2.126184	2.108573	2.108573	2.108573	2.106607	2.126184	2.106607	2.126184	2.106607	2.126184	2.119683	2.126184	2.119683	2.126184	2.119683	2.126184	2.119683	2.126184	2.119683	2.126184	2.119683
2030	1.440145	1.407213	1.44014479	1.408981	1.440144	1.408987	2.338817	2.338817	2.338817	2.329348	2.338817	2.329348	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	2.359844	2.338817	
2035	1.657551	1.608389	1.65755117	1.608973	1.657551	1.608973	2.958151	2.958151	2.958146	2.932784	2.958146	2.932784	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	2.976109	2.958146	
2040	1.872629	1.820388	1.872629	1.820388	1.872629	1.820388	1.821777	1.821777	1.822333	3.1127	1.298486	3.1127	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	3.281103	1.821777	
2045	2.071791	1.998401	2.07179127	1.998401	2.071791	1.998401	2.071791	2.06092	3.618043	3.532067	3.618043	3.618043	3.618043	3.532067	3.618043	3.532067	3.618043	3.532067	3.618043	3.618043	3.618043	3.618043	3.618043	3.618043	3.618043	3.618043	3.618043		
2050	2.24923	2.162965	2.24923049	2.164433	2.24923	2.164433	2.165152	2.165152	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551	3.876951	3.786551			
2055	2.436529	2.342599	2.436529	2.342599	2.436529	2.342599	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753	2.348753			
2060	2.623998	2.419379	2.62399897	2.413305	2.623998	2.413305	2.418171	2.418171	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176	4.131043	4.259176			
2065	2.811556	2.592065	2.811556	2.592065	2.811556	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065	2.592065			
2070	2.720419	2.570266	2.72041882	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419	2.581108	2.720419				
2075	2.785345	2.664335	2.785345	2.664335	2.785345	2.664335	2.789558	2.789558	2.646875	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698	4.593614	4.473698				
2080	2.844795	2.700508	2.84479464	2.700448	2.844795	2.700448	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547	4.46513	4.539547			
2085	2.888668	2.739382	2.88866777	2.739013	2.888668	2.739013	2.741212	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493	4.752324	4.608493				
2090	2.923301	2.761645	2.92330088	2.760987	2.923301	2.760987	2.768837	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411	4.715681	4.628411				
2095	2.950495	2.771113	2.95049523	2.775983	2.950495	2.775983	4.779781	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201	4.794721	4.63201				
2100	2.971758	2.777939	2.971758	2.778322	2.971758	2.778322	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488	4.820488				

# Task 8: Consumption vs. GDP effect

- Destruction of the housing stock leads to lower consumption but not to lower GDP.

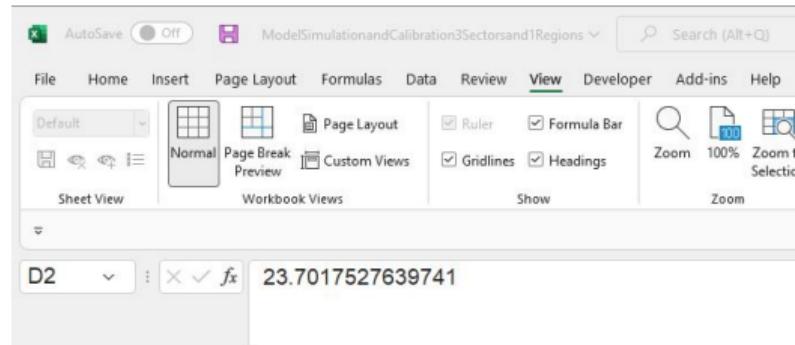


## Task 9: Conduct sensitivity analysis for damages caused by storms to housing.

- Define the scenarios SSP119stormhigh, SSP245stormhigh, SSP585stormhigh
- Replace the storm variable in the respective scenario sheets with the 95 percent value in the sheet Storms in the ClimateVariables.xlsx file.

# Task 9: Create the sheets for SSP585stormhigh, SSP245stormhigh and SSP119stormhigh

- Copy the affected persons for the 95 percent interval from the sheet storms in the ClimateVariables.xlsx file.



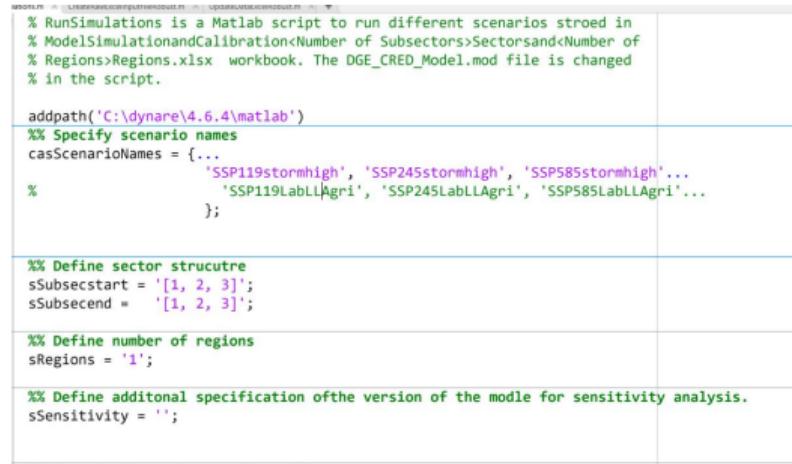
The screenshot shows a Microsoft Excel interface with the following details:

- File Tab:** ModelSimulationandCalibration3Sectorsand1Regions
- View Tab:** Checked under Show section.
- Zoom:** 100%.
- Formula Bar:** Displays the formula `23.7017527639741`.
- Table Data:** A data table with columns A through I and rows 43 through 66. The data includes numerical values such as 1.8691061, 41.00311468, 20.89, etc.

	A	B	C	D	E	F	G	H	I
43	43	0	1.8691061	41.00311468	20.89	0	0	0	0
44	44	0	2.4300643	31.2328937	21.702	0	0	0	0
45	45	0	2.1328232	34.29799253	22.514	0	0	0	0
46	46	0	2.9910023	37.85197402	23.326	0	0	0	0
47	47	0	3.1000792	37.25128747	24.138	0	0	0	0
48	48	0	2.8766968	31.20137922	24.95	0	0	0	0
49	49	0	2.4274391	37.65918547	25.762	0	0	0	0
50	50	0	3.4324178	43.05118872	26.574	0	0	0	0
51	51	0	2.5326493	44.18750937	27.386	0	0	0	0
52	52	0	3.6754953	35.48919742	28.198	0	0	0	0
53	53	0	3.4296377	37.60085438	29.01	0	0	0	0
54	54	0	2.8111601	44.87878523	29.95	0	0	0	0
55	55	0	3.1925128	41.03416827	30.89	0	0	0	0
56	56	0	2.2017653	35.61654660	31.02	0	0	0	0

# Task 9: Execute the RunSimulation.m file

- Make sure to rename the scenario names.



The screenshot shows a MATLAB code editor window with the following content:

```
% RunSimulations is a Matlab script to run different scenarios stored in
% ModelSimulationandCalibration<Number of Subsectors>Sectorsand<Number of
% Regions>Regions.xlsx workbook. The DGE_CRED_Model.mod file is changed
% in the script.

addpath('C:\dynare\4.6.4\matlab')
%% Specify scenario names
casScenarioNames = {...%
    'SSP119stormhigh', 'SSP245stormhigh', 'SSP585stormhigh',...
    'SSP119LabLLAgri', 'SSP245LabLLAgri', 'SSP585LabLLAgri',...
};

%% Define sector structure
sSubsecstart = '[1, 2, 3]';
sSubsecend = '[1, 2, 3]';

%% Define number of regions
sRegions = '1';

%% Define additional specification of the version of the module for sensitivity analysis.
sSensitivity = '';
```

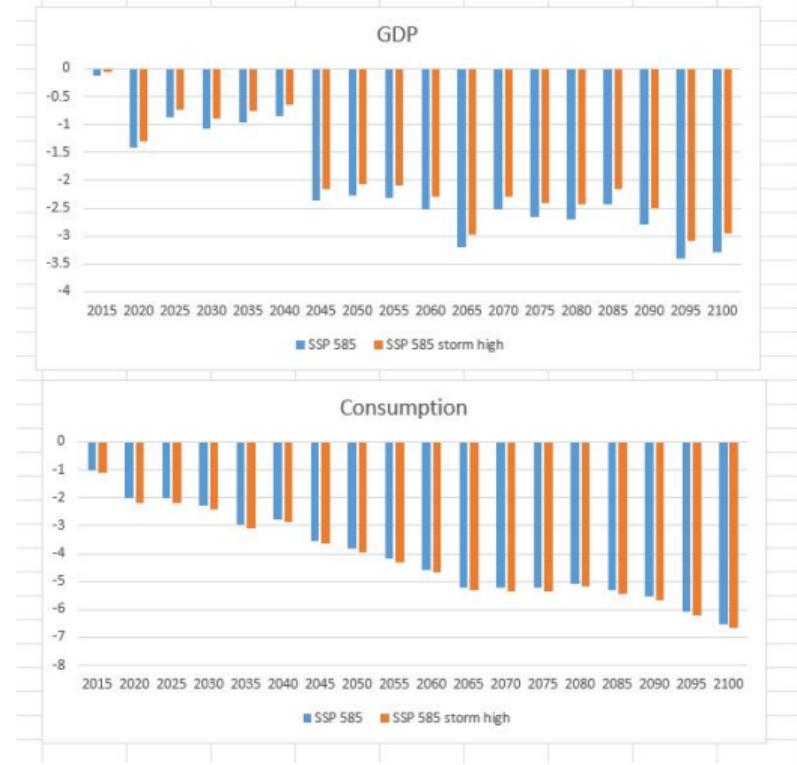
# Task 9: Create a Figure comparing GDP and consumption losses for 50 percentile and 95 percentile storms.

- You need to create a sheet in Figures.xlsx as previously.

Year	Y	Y	Y	Y	C	C	C	C
	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585	Baseline	SSP585
<b>ResultsSce</b>								
2014	1.16534	1.16534	1.16534	1.165337639	0.7262	0.7262	0.7262	0.7262
2015	1.24748	1.2458	1.24748146	1.24675	0.77872	0.77096	0.77872	0.76997
2020	1.67999	1.65626	1.679994099	1.65806	1.01493	0.9944	1.01493	0.99283
2025	2.12618	2.10773	2.12618437	2.11064	1.22827	1.20336	1.22827	1.20157
2030	2.55882	2.53131	2.558816725	2.53565	1.44014	1.40721	1.44014	1.40518
2035	2.95815	2.92996	2.958147834	2.93541	1.65755	1.60839	1.65755	1.60638
2040	3.3127	3.28489	3.312699892	3.29155	1.87203	1.82039	1.87203	1.81816
2045	3.61804	3.53267	3.618042767	3.53997	2.07179	1.99841	2.07179	1.99622
2050	3.87481	3.78635	3.874810724	3.79443	2.24923	2.16287	2.24923	2.16057
2055	4.08675	3.99218	4.086755223	4.00115	2.40159	2.3009	2.40159	2.29833
2060	4.25918	4.15141	4.259177837	4.161	2.52936	2.41368	2.52936	2.41106
2065	4.39788	4.25696	4.397884603	4.26743	2.63469	2.49744	2.63469	2.49437
2070	4.5085	4.39431	4.508495013	4.40509	2.72044	2.57827	2.72044	2.57537
2075	4.5961	4.4737	4.596103793	4.48515	2.78955	2.6435	2.78955	2.6404
2080	4.66513	4.53955	4.665130031	4.5518	2.84479	2.70051	2.84479	2.6971
2085	4.71929	4.60491	4.7192939	4.61757	2.88867	2.73508	2.88867	2.73186
2090	4.76166	4.62841	4.761661412	4.64222	2.9233	2.76144	2.9233	2.75766
2095	4.79472	4.63201	4.794720692	4.64616	2.9505	2.77113	2.9505	2.76762
2100	4.82047	4.66233	4.820467938	4.67789	2.97176	2.77794	2.97176	2.77343
GDP								
Consumption								
SSP 585    SSP 585 storm high								
2015	-0.13485	-0.058469237	-0.9974	-1.12378				
2020	-1.41254	-1.305747056	-2.02234	-2.1771				
2025	-0.86801	-0.731143018	-2.02822	-2.17367				
2030	-1.07491	-0.9053444369	-2.28656	-2.42758				
2035	-0.95302	-0.768523258	-2.96592	-3.08734				
2040	-0.83962	-0.638363448	-2.75853	-2.87775				
2045	-2.35973	-2.157812122	-3.54192	-3.64758				
2050	-2.28295	-2.074340462	-3.83977	-3.94174				
2055	-2.31402	-2.094530324	-4.19294	-4.29992				
2060	-2.53017	-2.305058587	-4.57363	-4.67704				
2065	-3.20441	-2.966196528	-5.2096	-5.32617				
2070	-2.53273	-2.293580198	-5.22608	-5.33271				
2075	-2.66326	-2.414100851	-5.23543	-5.34647				
2080	-2.69195	-2.429276285	-5.07196	-5.19193				
2085	-2.424369	-2.155492642	-5.31688	-5.42826				
2090	-2.7984	-2.508404399	-5.53676	-5.66608				

# Task 9: GDP effects vs. Consumption

- Consumption effects are higher, and GDP effects are lower.



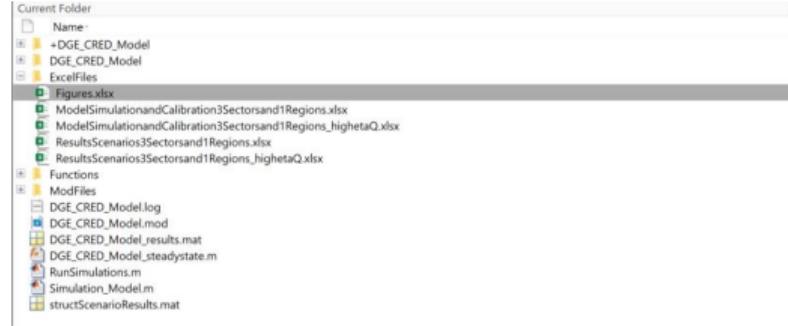
## Task 10: Conduct sensitivity analysis for low and high values for the elasticity of substitution between different domestic sectors.

- The degree of substitutability is given by  $\frac{\eta^Q - 1}{\eta^Q}$ .
- Estimation results suggest very low values of  $\eta^Q$ .
- So far we assumed a value of  $\eta^Q = 0.01$ .
- Set the value to 10 and analyse the impact.
- What is your initial hypothesis about the GDP impact for high and low elasticity of substitution?

$$Q_t^D = \left( \sum_k^K \omega_k^{Q^A \frac{1}{\eta^Q}} Q_{k,t}^{A,D \frac{\eta^Q - 1}{\eta^Q}} \right)^{\frac{\eta^Q}{\eta^Q - 1}} \quad (1)$$

# Task 10: Copy the ModelSimulationandCalibration3Sectorsand1Regions.xlsx file.

- Rename the copy to ModelSimulationandCalibration3Sectorsand1Regions\_etaQhigh.xlsx of You need to create a sheet in Figures.xlsx as previously.



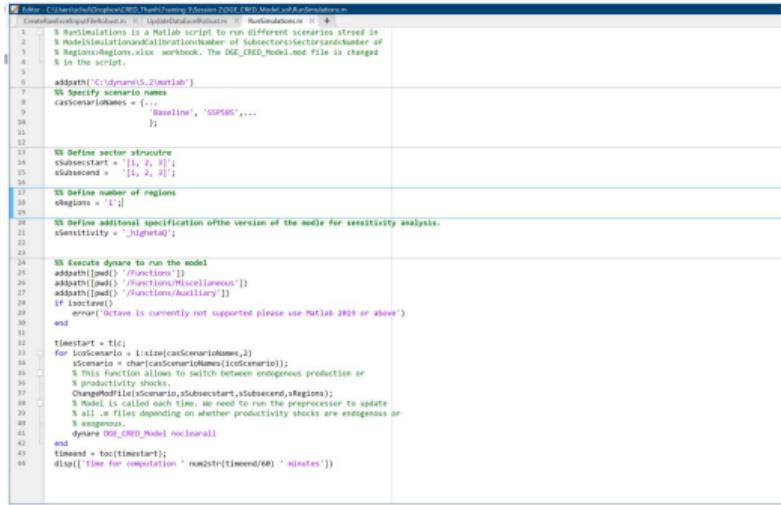
# Task 10: Set the value for etaQ\_p.

- Change the value of etaQ\_p from 0.01 to 10 in the Structural Parameters sheet.

A	B	C
1 Parameter	Value	Description
2 beta_p	0.9606	discount factor
3 delta_p	0.045	depreciation rate
4 sh_p	0.01	share of investments in residential buildings relative to GDP
5 phiB_p	10	foreign bond adjustment cost
6 phiK_p	10	investment adjustment cost
7 sigmaL_p	0.5	inverse Frisch elasticity
8 sigmaC_p	1	intertemporal elasticity of substitution for consumption
9 etaQ_p	10	elasticity of substitution between sectors
10 etaf_p	1.83	elasticity of substitution between imports and domestic products
11 etax_p	0.83	supply price elasticity of exports
12 tauC_p	0.2	consumption tax rate
13 tauNH_p	0	tax rate on labour income
14 tauKH_p	0	tax rate on capital income
15 phiM_p	0.3	share of imports on total used domestic products
16 iGAH_p	0	subsector to provide output for adaptation measures for housing sec
17 IIAPH_p	0	subsector to provide output for private adaptation measures for hou
18 Parameter values for subsector to provide output for adaptaion measures in respective subsector		0 subsector to provide outout for adadoaion measures in resoective su
19 iGA 1 o		

# Task 10: Execute the RunSimulation.m file.

- Change the scenarios you want to simulate, and do not forget to include the Baseline scenario.



The screenshot shows a MATLAB code editor window with the file 'RunSimulation.m' open. The code is a MATLAB script designed to run different scenarios. It includes sections for defining regions, sectors, and scenarios, as well as executing the DGE\_CRED\_Model.mod file for each scenario. The code uses MATLAB's addpath function to include specific files and defines regions, sectors, and scenarios. It also handles productivity shocks and model execution.

```
1 % RunSimulation is a Matlab script to run different scenarios stored in
2 % ModelSimulations.xlsCalibrationNumber of subsectors:sectors and number of
3 % Regions:Regions.xls workbook. The DGE_CRED_Model.mod file is changed
4 % in the script.
5
6 addpath('C:\dynare5.5\mfile');
7 %% Specify scenario names
8 cenarios = {'Baseline', 'SSPSBS',...
9             };
10
11
12 %% Define sector structure
13 subsectorstart = [1, 2, 3]';
14 subsectorend = [1, 2, 3]';
15
16 %% Define number of regions
17 regions = '1';
18
19 %% Define additional specification of the version of the model for sensitivity analysis.
20 sensitivity = '_Highetal';
21
22
23 %% execute dynare to run the model
24 addpath(['pwd'; '/functions']);
25 addpath(['pwd'; '/functions/endogenous']);
26 addpath(['pwd'; '/functions/auxiliary']);
27 if ismatlab()
28     error('Octave is currently not supported please use Matlab 2009 or above')
29 end
30
31 timestart = tic;
32 for i=1:length(cenarios);
33     scenario = char(cenarios(i));
34     scenario = char(cenarios(i));
35     % this function allows to switch between endogenous production or
36     % productivity shocks
37     Command = ['dynare DGE_CRED_Model subsectorstart', subsectorend, 'regions'];
38     % Model is called each time, we need to run the preprocessor to update
39     % all .m files depending on whether productivity shocks are endogenous or
40     % exogenous.
41     dynare DGE_CRED_Model nuclearall;
42 end
43 timestop = toc(timestart);
44 disp(['Time for computation ' num2str(timestop/60) ' minutes']);
```

# Task 10: Compare the results for low and high etaQ\_p.

- Create a new sheet in Figures.xlsx.
- List GDP for Baseline and SSP 585 scenario next to each other.
- Copy the range and change the reference to the ResultsScenarios3Sectorsand1Regions\_etaQhigh.xlsx in E4 and change the formula accordingly (replace \$A\$4 by \$E\$4)

	A	B	C	D	E	F	G	H
1		Year	Baseline	SSP585		IV	Y	
2		2014	1.165338	1.165338		Baseline	SSP585	
3	ResultsScenarios3Sectorsand1Regions	2015	1.247481	1.247599	ResultsScenarios3Sectorsand1Regions_highetaQ	\WS1!\$B\$1)	1.129242	
4		2020	1.679994	1.656264		1.208841	1.20739	
5		2025	2.126184	2.107729		1.627957	1.604629	
6		2030	2.558817	2.531312		2.060327	2.044068	
7		2035	2.958148	2.929956		2.479559	2.45686	
8		2040	3.3127	3.284886		2.866521	2.845645	
9		2045	3.618048	3.532667		3.210091	3.190544	
10		2050	3.874811	3.786351		3.505976	3.434101	
11		2055	4.086752	3.992184		3.754791	3.681642	
12		2060	4.259178	4.151413		3.960167	3.882866	
13		2065	4.397883	4.256958		4.127252	4.039353	
14		2070	4.508495	4.394307		4.261662	4.145398	
15		2075	4.596104	4.473698		4.368847	4.276927	
16		2080	4.66513	4.539547		4.453742	4.354584	
17		2085	4.719294	4.604913		4.52063	4.418552	
18		2090	4.761661	4.628411		4.573116	4.482155	
19		2095	4.794721	4.63201		4.614172	4.507287	
20		2100	4.820468	4.662326		4.646207	4.514929	
21					GDP	4.671157	4.545312	
22						etaQ_p = 0.8	etaQ_p = 1.0	

# Task 10: GDP effects are lower for a higher elasticity of substitution between sectors.

- A higher substitutability implies that damages in more severely affected sectors can be compensated with production from other sectors.

