Resource Economics (Spring Term 2025)

Project Assignment
Topic 3

Frank Krysiak(frank.krysiak@unibas.ch)
Raul Hochuli (raul.hochuli@unibas.ch)

Administrative Remarks

- **Task Structure**
  - There are five main topics to be covered, one topic per group.
  - Each topic is split into three tasks of increasing difficulty.
  - Grade will depend on how many tasks you solve and the quality of your report.
    - Solved 1st task, passing; 2nd task, good; and 3rd task, excellent grade
- **Report Structure**
  - Introduction (Why is the topic / model feature relevant?)
  - Description of procedure (Which model settings or additional extensions are chosen for certain scenario runs and why? Assume you write for an informed reader and focus on your changes/extensions.)
  - Result interpretation (Which insights can you derive from your model scenario outputs and what is there relevance?)
- **Prerequisites**
  - There will be a final "DICE default" model version uploaded to ADAM that you can use for your modeling scenarios (ipynb).
- **Hand in**
  - Your written report (PDF, max 10 pages text).
    - Self-disclaimer, who worked on what part of the project (1 Grade per group)
    - No further formality requirements (font, spacing etc.) but keep it reason-

able for a good reading experience (also with regards to the number of graphs in your text).

- Your model code (one or multiple files, .ipynb or .py)
  - 1 Code "version" per scenario (e.g. 1 function with specified settings, 1 separate code file)
  - All your scenarios should run through with no changes (exception: path adjustment to import exogenous variables CSV)
  - If not, separate the scenario so as to not disturb your other simulations
- One naming convention for all files (e.g. "GroupX_Lastname1Lastname2.pdf")
- **Deadline: 29thJune 2025**, by email to raul.hochuli@unibas.ch

Topic 3 - Population and Evaluation

Description

The DICE model assumes population growth and uses total utilitarianism as an evaluation criterion. Depending on what we assume to be reasonable about the future, we might also consider other demographic patterns and evaluation criteria. Use the three tasks below to elaborate how changes/adjustments in the size and use of population numbers have an impact in DICE and interpret its effects on the modeled future.

Tasks

1. The DICE default assumes an increasing world population based on UN population growth predictions. Assume that the world population is no longer increasing but remains constant at the initial input level. How does this affect your model results?

2. The first task clearly illustrates how assumptions for the exogenous variables have an impact on the model results. Next to labor, the assumed development of total factor productivity (TFP) also plays an important role in the DICE model. Use several scenarios to show how a slow and fast growth path for TFP in interaction with different population developments affects the model outcomes compared to the results in the first task.

3. DICE optimizes for the discounted total utility of consumption of the entire population. Given the model structure, could you think of a reason why such a definition of utility in the objective function might be problematic? Use an additional parameter `optim_on_utility_type:str` to allow the model to switch to an average-per-person utility definition and compare the outcome to your previous model results. (Hint: To see an actual difference between the default model scenario and the third task, you need to decrease the default social discount rate to 0.5%.)