Assignment 2: Household Labor Supply and Taxes

The goal of this assignment is for you to *modify existing code* to answer policy relevant questions. All following questions should be answered using the model and code from lecture 6 on "Household Labor Supply and Taxes".

- **Structure:** Your project should consist of
  - A single self-contained pdf-file with all results. Include the model formulation and parameter values you used.
  - A single notebook (`.ipynb`) showing how the results in the pdf are produced.
  - Well-documented `.py` files.
- **Hand-in:** Upload the pdf and a single zip-file on Absalon with all elements above.
  - **Deadline:** April 10, 2025.
  - **Exam:** Your answers will be part of your exam portfolio.
    You can incorporate feedback before handing in the final version.

Questions

1. The household utility function in Borella, De Nardi and Yang (2023) and in our toy model from lecture 6 is the sum of individual utilities. Change the household utility function to be a weighted sum of individual utilities. Let μ be the weight on member 1 and $1-\mu$ be the weight on member 2. Write out the affected equations and implement it in Python. Show that the simulated labor market behavior is the same as in the baseline (from the lecture) when $\mu = 0.5$.
   [fix $\mu = 0.5$ in the following]

2. Why is the behavior unchanged from the modification with $\mu = 0.5$ in the question above?

3. Investigate the labor supply responses from individual taxation compared to joint taxation. Concretely, assume that agent 1 starts with human capital of 2 while agent 2 starts with human capital of 0 ($K_{1,0} = 2$, $K_{2,0} = 0$). The tax system under joint taxation is

$$T_{joint}(Y_1, Y_2) = (1 - \lambda^{joint}(Y_1 + Y_2)^{-\tau^{joint}}) \cdot (Y_1 + Y_2)$$

while the individual taxation scheme is

$$T_{indiv}(Y_1, Y_2) = (1 - \lambda^{indiv}(Y_1)^{-\tau^{indiv}}) \cdot Y_1 + (1 - \lambda^{indiv}(Y_2)^{-\tau^{indiv}}) \cdot Y_2$$

and (adjusted from Borella, De Nardi and Yang, 2023)

$$\lambda^{joint} = 2.28, \quad \tau^{joint} = 0.0861765$$
$$\lambda^{indiv} = 1.75, \quad \tau^{indiv} = 0.0646416$$

4. Calculate how the government budget would change from this reform. Be explicit on how you calculate this.

5. Determine at what level of λ^{indiv} the government budget would not change. Denote this $\lambda^{indiv,\star}$ and be explicit with how you find this value.

6. Which of the two taxation schemes would a household with initial human capital of $K_{1,0} = 2$, $K_{2,0} = 0$ (as above) prefer in beginning of life? Use $\lambda^{private,\star}$ in $T_{indiv}(Y_1, Y_2)$ such that the government budget is the same in the joint and individual taxation scheme. What if both members have high levels of initial human capital, say $K_{1,0} = 8$, $K_{2,0} = 8$?
   [*hint:* The first-period value function, $V_0(k_{1,0}, k_{2,0})$, measures the value of a given set of states (and rules).]

References

Borella, M., M. De Nardi and F. Yang (2023): "Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labor Supply?," *Review of Economic Studies*, 90(1), 102–131.