Spring 2022

ETH Zurich, MTEC Department

Advanced Sustainability Economics

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CER-ETH Doctoral Programme
ONLINE, 31 January - 4 February 2022

Classes are recorded and posted on Moodle

Course Objective

The course covers major economic theories and policy applications that are relevant for the general sustainability debate. Efficiency and intergenerational equity, natural resource depletion, harvesting renewable resources, endogenous (induced) capital and knowledge accumulation, pollution dynamics and abatement, climate change, population growth, and similar issues are the focal points of the lecture. The course applies basic methods of modern intertemporal economics and statistics to an increasingly active research field. The results of applying recent resource and growth theory are presented and extensively discussed in the current policy context.

Course Structure

The course is organized as a one-week block event and designed around eight chapters. There will be three regular lectures in the morning as well as discussion and exercise classes under the guidance of Clément Renoir and Evgenij Komarov in the afternoons.

Course Schedule

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
9.30-10.15	Lecture 1a	Lecture 2a	Lecture 3a	Lecture 4a	Lecture 5a
10.30-11.15	Lecture 1b	Lecture 2b	Lecture 3b	Lecture 4b	Lecture 5b
11.30-12.15	Lecture 1c	Lecture 2c	Lecture 3c	Lecture 4c	Lecture 5c
14.00-14.30	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A
14.45-15.45	Exercises	Exercises	Exercises	Exercises	Exercises
15.45-16.45	Individual Learning	Individual Learning	Individual Learning	Individual Learning	Individual Learning
16.45-17.15	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A	Discussion, Q&A

Course Requirements

The course is on the PhD level but open for master students. Successful completion of the course is equivalent to 3 ECTS points. Credits and the grade will be based on the quality of a personal written contribution consisting of a technical exercise and a short essay, which students send in via email until three weeks after completion of the course (or at a date of mutual agreement).

Course Chapters

1. Development and Sustainability
2. Theoretical Foundations
3. Optimum Use of Non-Renewable Resources
4. Sustainable Use of Non-Renewable Resources
5. Sustainable Use of Renewable Resources
6. Pollution Dynamics
7. Basic Climate Economy (BCE) model
8. Innovation-Driven Sustainable Growth, Population Growth

Recommended Reading

Book draft

- Bretschger, L. (2022): Economics of Sustainable Development, CER-ETH Press, ETH Zurich.

Books

- Bretschger, L. (2018): Greening Economy, Graying Society, 2nd edition, CER-ETH Press, Zurich.
- Bretschger, L. (1999): Economic Growth and Sustainable Development, Edwar Elgar, Cheltenham.
- Clark, C.W. (2005): Mathematical Bionomics, Optimal Management of Renewable Resources, 2nd edition, Wiley, Hoboken.
- Perman, R., Ma, Y., McGilvray, J, Maddison, D., and Common, M. (2011): Natural Resource & Environmental Economics, 4th edition, Longman, Essex.

Papers

- Bretschger, L. (2021): Getting the Costs of Environmental Protection Right: Why Climate Policy is Inexpensive in the End, Ecological Economics, 188, 107116, https://doi.org/10.1016/j.ecolecon.2021.107116.
- Bretschger, L. (2020): Malthus in the Light of Climate Change, European Economic Review, 127, 103477, https://doi.org/10.1016/j.euroecorev.2020.103477
- Bretschger, L. and C. Karydas (2019): Economics of Climate Change: Introducing the Basic Climate Economic (BCE) Model, Environment and Development Economics, 24(6): 560-582.

- Bretschger, L. and A. Pattakou (2019): As Bad as it Gets: How Climate Damage Functions Affect Growth and the Social Cost of Carbon, Environmental and Resource Economics, 72 (1): 5–26.
- Bretschger, L. (2017): Is the Environment Compatible with Growth? Adopting an Integrated Framework, Annual Review of Resource Economics, 9: 185-207.
- Bretschger, L. (2015): Energy Prices, Growth, and the Channels in Between: Theory and Evidence, Resource and Energy Economics, 39: 29–52.
- Dasgupta, P.S. and G.M. Heal (1974): The Optimal Depletion of Exhaustible Resources, Review of Economic Studies, 41, 3-28.
- Groth, C. (2007): A New-Growth Perspectives on Non-Renewable Resources, in: Bretschger, L. and S. Smulders (eds.): Sustainable Resource Use and Economic Dynamics, 127-163, Springer.
- Hartwick, J. M. (1977): Intergenerational Equity and the Investing of Rents from Exhaustible Resources, American Economic Review, 67/5, 972-74.
- Hotelling, H. (1931): The Economics of Natural Resources, Journal of Political Economy, 39, 2, 137-175.
- Romer, P.M. (1990): Endogenous Technical Change, Journal of Political Economy, 98, S71-S102.
- Xepapadeas, A. (2006): Economic Growth and the Environment, in: K.-G. Mäler and J. Vincent (Eds.), Handbook of Environmental Economics, Elsevier Science, Amsterdam.