Course information for the winter term 2024/25

Module: Applied Economic Theory
Course: Innovation economics

This course consists of two parts. In the first half, students will be introduced to the fundamentals of innovation economics to understand the transitions towards sustainability. In the second part, they will dive deep into current topics of transitions and use approaches and methods for analyzing those transitions.

Lecture part:

Students can explain essential aspects of innovation economics and to point out the implications of innovation activity for market dynamics. First, they will be able to define the term innovation and point out the different types of innovation. Students will know neoclassical/evolutionary models of innovation and growth and be able to critically contrast them in terms of explaining technological change and long-term growth. Furthermore, students can explain essential concepts of innovation economics and apply them in case studies to analyze diffusion processes, technology cycles, and interactions between market participants or (technological) innovation systems. Finally, students can reflect on normative aspects of economics from a Neo-Schumpeterian perspective.

- Intensive examination of theories of innovation economics to explain technological change and growth, innovation processes, fundamentals of neoclassical innovation economics, and evolutionary and institutional theoretical explanations.
- Apply the concepts of Neo-Schumpeterian innovation economics to concrete use cases in the context of case studies on (technological) innovation systems, market dynamics, innovation processes, and technology cycles.
- Discussion and short presentation of case studies in the tutorials.

Tutorial part:

- Deep dive into the content of the lecture's concepts
- Focus on methods for MLP and TIS analysis
- Case study analysis
- Creation of a podcast (15-45 min) on a topic from the lecture/ tutorial

Seminar part:

Sustainability transitions as research agendas have become more critical than ever. While tightened political goals and increasing environmental problems are highlighting the necessity

to accelerate sustainability transitions, further external events, such as gas shortages in the course of the Russian war in Ukraine, have become game changers in the transition process. To analyse the current state, challenges and intervention points for policy making, Neo-Schumpeterian innovation economics propose a systemic view on transition and necessary technologies. Systemic, in this sense, means that different actors groups contributing to sustainable technologies and transformations are analyzed regarding their specific functions, roles, and relations with each other. As a result, the innovation system approach, notably focusing on technologies (Technological Innovation Systems, TIS), and the multi-level perspective (MLP), were analytical concepts for research on sustainability transitions. While the TIS approach focuses on the challenges of one technology and related design varieties, the MLP approach cannot only look at one technology, but the entire interaction of multiple existing and new technologies and socio-technical practices during sustainability transitions.
Recent research on accelerating sustainability transitions emphasizes the combined consideration of supply-sided and demand-sided challenges, notably in energy transitions. Promising and mature sustainable technologies still have problems entering markets for diffusion. Other sustainable technologies, on the contrary, which have already entered the market to a certain degree, still have supply-side challenges regarding the technological improvements based on R&D or the mobilization of resources (e.g., the heating pump or electrolysis technologies for hydrogen production). Another supply-side challenge is the compatibility of technology to an existing or a possible new socio-technical system, for example, to a more flexible (“smart”) electric grid or a future hydrogen-based gas distribution grid. These examples among energy transitions demonstrate that research on sustainability transitions and sustainable technologies requires considering an integrated analysis of different dimensions, including supply-sided and demand-sided challenges and other challenges for transitions, including legitimacy or missing system building, system integration, foresight, or strategic intelligence activities. As the TIS functional approach and the regime dimensions of MLP provide a variety of such analytical dimensions in integrated frameworks, this seminar aims to present both concepts for analyzing issues in sustainability transitions.

Dates: See Course catalogue

Acquisition of ECTS / credit points:
The course is assessed with 6 semester hours per week. Students will receive 12 credit points upon successful participation.

Requirement and admission restriction:
No

Application:
CM

Examination:
Students are required to write a term paper (approx.20 pages) according to scientific standards and present their results (30 min). The seminar grade results from the evaluation of the written term paper and the presentation. The chair can provide guidelines for the preparation of seminar papers. The topic selection takes place before the winter break. The research paper must be submitted digitally via e-mail as a PDF document by 31.03.2025, 10 am.

Language: English

Contact:

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Recommended Literature:

Dosi, G. (1982): Technological paradigms and technological trajectories – A suggested interpretation of the determinants and directions of technical change. *Research Policy*, 11, 147-162.

Fagerberg, J. (2002): A Layman's Guide to Evolutionary Economics (No. 17). Centre for Technology, Innovation and Culture, University of Oslo.

Geels, F. W. (2002): Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy*, 31, 1257-1274.

Hekkert, M., Negro, S., Heimeriks, G., & Harmsen, R. (2011): Technological innovation system analysis: A manual for analysts. Copernicus Institute for Sustainable Development and Innovation, Utrecht University.

Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. (2007): Functions of innovation systems: A new approach for analyzing technological change. *Technological forecasting and social change*, 74(4), 413-432.

Nelson, R.R. et al. (2018): *Modern Evolutionary Economics*. Cambridge University Press.

Taylor, M., & Taylor, A. (2012): The technology life cycle: Conceptualization and managerial implications. *International Journal of production economics*, 140(1), 541-553.