Innovation economics seminar in the master program Economics/Public Economics

Module: Topics in Applied Economic Theory

"Innovation economics seminar – Case studies on energy transitions based on the Multi-Level-Perspective and Technological Innovation Systems"

(Summer semester 2023, course number: 10146306/10146311 (Master), lecturer: Carsten Schwäbe, Carsten Dreher, language: English)

Course Description

Sustainability transitions as research agenda have become more important 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 changer in the transition process. In order to analyse the current state, challenges and intervention points for policy making, evolutionary 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 analysed regarding their specific functions, roles and relations with each other. As a result, the Innovation System approach, notably with a focus on technologies (Technological Innovation Systems, TIS), and the Multi-Level Perspective (MLP) occurred as 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 is able to not only look at one technology, but the entire ineraction of multiple existing and new technologies and socio-technical practices in the course of sustainability transitions.

Recent research on how to accelerate sustainability transitions emphasises the combined consideration of supply-sided and demand-sided challenges, notably in the fields of energy transitions. Promising and mature sustainable technologies still have problems to enter markets for diffusion. Other sustainable technologies, on the contrary, which have already entered the market to a certain degree, still have supply-sided challenges regarding the technological improvements based on R&D or the mobilisation of resources (e.g. the heating pump or electrolysis technologies for hydrogen production). Another supply-sided challenges 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 to a future hydrogen-based gas distribution grid. These examples among energy transitions demonstrate, that research on sustainability transitions and sustainable technologies require to consider an integrated analysis of different dimensions including supply-sided and demand-sided challenges as well as 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 are providing a variety of such analytical dimensions in integrated frameworks, this seminar aims presenting both concepts for analysing issues in sustainability transitions.

Apart from the introduction to both concepts, students are supposed to apply one concept in form of a term paper on a specific case study of an energy transition, which can be a technology using the TIS approach or a transition field (such as heating transitions for industry or for residential buildings) using the MLP approach. The case studies have a focus on energy transitions in Germany (or the EU). A list of topics and starting literature is provided below.

Requirements

Students are required to write a term paper (length approx. 4500 words) according to scientific standards. The seminar grade results from the evaluation of the written term paper. The guidelines for the preparation of seminar papers can be requested from the chair.
The research paper must be submitted digitally via e-mail as a PDF document by 01.08.2023, 10 am.

Acquisition of ECTS / credit points

Master: The seminar is assessed with 3 semester hours per week. Students will receive 6 credit points upon successful participation.

Participation and Deadlines

The seminar is aimed at students in the Economics and Public Economics master's program.
Interested applicants should apply by 6 pm on 13.04.2023, indicating: (1) first and last name, (2) matriculation number, (3) e-mail address, (4) copy of student ID, (5) certificate of previous grades, and (6) three topic preferences in descending order of preference (in case of other technological case studies you might be interested in, please message us).
Applications can be made by email to d.lang@fu-berlin.de. You will receive a notification about the possibility to participate on 15.04.2023. Incomplete or late applications will not be considered.
Topics will be assigned by 19.04.2022. The number of participants is limited to 24. In case of more applications, a selection will be made by the lecturers.

Admission restriction

All students enrolled in the master program "Economics" are applicable. Students of the master program "Public Economics" are only applicable if they successfully completed the course "Economics of Innovation and Innovation Policies" in a previous semester.

Course Timetable

The dates can be found in the course catalog or Blackboard. Please note that there may be changes at short notice.

Any changes to the schedule or further information will be communicated via Blackboard.
Nonetheless, all dates are to be regarded as mandatory dates.

List of topic examples including literature to start

1	MLP: Industrie-Wärme Dzebo, Nykvist. A new regime and then what? Cracks and tensions in the socio-technical regime of the Swedish heat energy system, 2017 https://www.sciencedirect.com/science/article/pii/S2214629617301263
2	MLP: Wohngebäude Wärme Young, Macura. Forging Local Energy Transition in the Most Carbon-Intensive European Region of the Western Balkans, 2023 https://www.mdpi.com/1996-1073/16/4/2077 Sinha. Green hydrogen potential for the Dutch built environment, 2021 https://repository.tudelft.nl/islandora/object/uuid:7cae77fd-e5b9-4fec-80aa-a3acdcc834ab
3	MLP: Flexibler Strommarkt Jorgensen et al. Navigations and governance in the Danish energy transition reflecting changing Arenas of Development, controversies and policy mixes, 2017 https://www.sciencedirect.com/science/article/pii/S2214629617303183
4	MLP: Mobilität Berkeley et al. Assessing the transition towards Battery Electric Vehicles: A Multi-Level Perspective on drivers of, and barriers to, take up, 2017 https://www.sciencedirect.com/science/article/abs/pii/S0965856416304785?casa_token=a2Hnd83gAP4AAAAA:jEuDEIgP9qnW5SO8nA1MGgpBhJNRfhxLi0KLloj3fTlztj2KBvw16p0NrANtWimWLW9ACPbD1w Krätzig et al. MLP Perspective to facilitate sustainable transitions, 2019 https://www.worldscientific.com/doi/abs/10.1142/S1363919619400061
5	MLP: Social innovation in Energy transitions Hölsgens et al. Sccial innovations in the German energy transition, 2018 https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-018-0150-7
6	MLP: Battery Torjesen, Isaksen. Rethinking the Role of Landscape in the Multi-Level Perspective: The Case of Electric Vehicle Battery Production in Europe and China, 2023 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4357817
7	TIS: Wasserstoff-Elektrolyse, Ashari et al. Knowledge and technology transfer via publications, patents, standards: Exploring the hydrogen technological innovation system, 2023 https://www.sciencedirect.com/science/article/pii/S0040162522007223
8	TIS: PV Vroon et al. Escaping the niche market: An innovation system analysis of the Dutch building integrated photovoltaics (BIPV) sector, 2022 https://www.sciencedirect.com/science/article/pii/S1364032121011771
9	TIS: Wind Offshore van der Loos et al. The co-evolution of innovation systems and context: Offshore wind in Norway and the Netherlands, 2021 https://www.sciencedirect.com/science/article/pii/S1364032120307991

	Sawulski. Technological innovation system analysis in a follower country – The case of offshore wind in Poland, 2019 https://www.sciencedirect.com/science/article/pii/S221042241830248X
10	TIS: Wärmepumpe Kieft et al. Heat pumps in the existing Dutch housing stock: An assessment of its Technological Innovation System, 2021 https://www.sciencedirect.com/science/article/pii/S2213138821000746
11	TIS: Battery Schade et al. The future of the automotive sector Emerging battery value chains in Europe, 2022 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4220540 Gong, Andersen. The role of natural resources in accelerating net-zero transitions: Insights from EV lithium-ion battery Technological Innovation System in China, 2022 https://ideas.repec.org/p/tik/inowpp/20221001.html Gong, Hansen. The rise of China's new energy vehicle lithium-ion battery industry: The coevolution of battery technological innovation systems and policies, 2023 https://www.sciencedirect.com/science/article/pii/S2210422422001204
12	TIS: Bioenergy Nevzorova. Functional analysis of technological innovation system with inclusion of sectoral and spatial perspectives: The case of the biogas industry in Russia, 2022 https://www.sciencedirect.com/science/article/pii/S2210422422000041
13	TIS: Steel TIS transformation to hydrogen use Kushnir et al. Adopting hydrogen direct reduction for the Swedish steel industry - A technological innovation system (TIS) study, 2020 https://www.sciencedirect.com/science/article/pii/S0959652619330550

Recommended literature for the seminar, in general:

Fagerberg, J. (2002). A Layman's Guide to Evolutionary Economics (No. 17). Centre for Technology, Innovation and Culture, University of Oslo. (https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.831.9363&rep=rep1&type=pdf)

Carlsson, B., & Stankiewicz, R. (1991). On the nature, function and composition of technological systems. Journal of evolutionary economics, 1(2), 93-118.

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

Hekkert, M., Negro, S., Heimeriks, G., & Harmsen, R. (2011). Technological innovation system analysis: A manual for analysts.

Kushnir, D., Hansen, T., Vogl, V., & Åhman, M. (2020). Adopting hydrogen direct reduction for the Swedish steel industry: A technological innovation system (TIS) study. Journal of Cleaner Production, 242, 118185.

Sonnenschein, J., & Hennicke, P. (Eds.). (2015). The German Energiewende: a transition towards an efficient, sufficient green energy economy. Wuppertal Institut für Klima, Umwelt, Energie. (https://epub.wupperinst.org/frontdoor/deliver/index/docId/6107/file/6107_Energiewende.pdf)

Kreuz, S., & Müsgens, F. (2017). The German Energiewende and its roll-out of renewable energies: An economic perspective. Frontiers in Energy, 11(2), 126-134.

Rechsteiner, R. (2020). German energy transition (Energiewende) and what politicians can learn for environmental and climate policy. Clean technologies and environmental policy, 1-38.

Busse, M., Schwerdtner, W., Siebert, R., Doernberg, A., Kuntosch, A., König, B., & Bokelmann, W. (2015). Analysis of animal monitoring technologies in Germany from an innovation system perspective. Agricultural Systems, 138, 55-65.

Busse, M., Doernberg, A., Siebert, R., Kuntosch, A., Schwerdtner, W., König, B., & Bokelmann, W. (2014). Innovation mechanisms in German precision farming. Precision agriculture, 15(4), 403-426.

Eastwood, C. R., & Renwick, A. (2020). Innovation uncertainty impacts the adoption of smarter farming approaches. Frontiers in Sustainable Food Systems, 4, 24.

Kernecker, M., Knierim, A., Wurbs, A., Kraus, T., & Borges, F. (2020). Experience versus expectation: Farmers' perceptions of smart farming technologies for cropping systems across Europe. Precision Agriculture, 21(1), 34-50.

König, B., Janker, J., Reinhardt, T., Villarroel, M., & Junge, R. (2018). Analysis of aquaponics as an emerging technological innovation system. Journal of cleaner production, 180, 232-243.

Tziva, M., Negro, S. O., Kalfagianni, A., & Hekkert, M. P. (2020). Understanding the protein transition: The rise of plant-based meat substitutes. Environmental innovation and societal transitions, 35, 217-231.

Ulmanen, J., & Bergek, A. (2021). Influences of technological and sectoral contexts on technological innovation systems. Environmental Innovation and Societal Transitions, 40, 20-39.

Markard, J., Bento, N., Kittner, N., & Nunez-Jimenez, A. (2020). Destined for decline? Examining nuclear energy from a technological innovation systems perspective. Energy Research & Social Science, 67, 101512.

Bento, N., Nunez-Jimenez, A., Kittner, N. (2021). Decline processes in technological innovation systems: lessons from energy technologies. International Sustainability Transitions conference 2021.

Rohe, S., & Chlebna, C. (2021). A spatial perspective on the legitimacy of a technological innovation system: Regional differences in onshore wind energy. Energy Policy, 151, 112193.

Binz, C., Truffer, B., & Coenen, L. (2014). Why space matters in technological innovation systems—Mapping global knowledge dynamics of membrane bioreactor technology. Research Policy, 43(1), 138-155.

Binz, C., & Truffer, B. (2017). Global Innovation Systems—A conceptual framework for innovation dynamics in transnational contexts. Research policy, 46(7), 1284-1298.

Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Research Policy 31(8–9), 1257-1274.

Geels, F.W., 2011. The multi-level perspective on sustainability transitions: Responses to seven criticisms. Environmental Innovation and Societal Transitions 1(1), 24-40.

Geels, F.W., 2010. Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. Research Policy 39(4), 495-510.

Mole, B., 2020. Complementing the multi-level perspective with the coevolutionary framework to conceptualise barriers to sustainable transitions in agro-food industries.

Krätzig, O., Franzkowiak, V., Sick, N., 2019. Multi-Level Perspective To Facilitate Sustainable Transitions—A Pathway For German Oems Towards Electric Vehicles. International Journal of Innovation Management 23(8), 1940006.