Economic Complexity - ADIN151NAMB

Corvinus University of Budapest, Fall 2025

Social Data Science MA

Tuesdays 9:50-11.20; Room: C314

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When sending emails, please begin the subject line with EC25.

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Course page: https://github.com/blengyel/economic_complexity2025

Course description

The economic and technological development of countries, cities, and companies can be better understood using modern network science tools. The focus of the course is on complexity approaches to economic and technological development and its interrelatedness with the progress of firms, cities, and countries. The aim of the course is to acquaint students with the concepts of economic geography, economic networks, and economic complexity. The students will be able to formulate and answer questions about geographic aspects of the economy such as agglomeration and regional specialization. Students will learn how theories are linked to network and data science approaches, i.e., the production of knowledge in economic and social systems from the perspectives of economic geography and corporate aspects. The course is broken down to 3 modules: 1. Foundations of Economic Complexity, 2. Central Topics of Economic Geography, 3. Recent Research.

Learning outcomes

- Students will use social science theories to form testable hypotheses about observed data generated by social and economic processes and to constructively understand the work of other data scientists.
- They will develop abilities to think through counterfactual and alternative hypotheses on causal relationships.
- Students will understand the sociological, psychological and economic theories that explain the mechanisms behind human behavior and social structures.
- They will consider it important to take social impacts into account in work and translate data-driven insights into practical recommendations.

Tasks:

- Careful reading of the required literature and presentation of it in class discussions.
- Researching case studies related to the theories discussed in class and preparing presentations based on them.
- Formulating research questions and preparing a research plan based on them.
- Researching data related to the research plan and preparing a brief analysis of it.
- Written summary and oral presentation of the research based on the analysis of the data.

Evaluation and grading

1. Class activity (weekly): Students' activity in the class asking and answering questions. - 3%
2. Literature (weekly): Each class will include a discussion of the assigned reading, which may also be done in writing as needed. - 27%
3. Homework (biweekly): Students will collect short case studies, and work on other types of short assignments related to the class material. - 10%
4. Research proposals in groups of 2: proposals will include a research problem, research question, data sources, methodology, expected results, and impact presented on week 8. - 30%
5. Written exam on week 12 OR Research report submission and presentation on week 12. – 30%

    Grades: 1 (50% or below), 2 (51%-66%), 3 (68%-76%), 4 (77%-86%) 5 (87% or above)

Research proposals and research projects

Research proposals – prepared in groups of 2 – will include a research problem, question, description of data collection, methodology, expected outcomes, impact, and references. The written proposal must be prepared in pdf format (font size 12, line spacing 1.5, 2.5 margins, times new roman font, page numbering) and then must be presented in the class. Coverage: 5-7 pages, plus references. Deadline for paper submission: November 16. Presentation: November 18 (week 8).

Instead of taking the written exam, the groups can choose to further work on their idea and submit a full research report. This report includes analysis of the proposed research and discussion of results. Coverage: 10-15 pages, plus references. Deadline for submission: December 12. Presentation: December 16 (week 12).

All assignments will be evaluated on basis of creativity, links to the class, sophistication, and presentation. Large language models are permitted for use in defining the research niche of the assignment, refining the text of the papers, and analyzing data. Students must provide detailed information about the use of AI as part of the submitted paper.

Subject to change statement

Information contained in the course syllabus, other than the grade policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Schedule Plan

Week	Date	Room	Topics and details	Moduls	Ref.
1	Sept 16	*C557*	***Balázs Lengyel*** Introduction and overview of the course ***César Hidalgo*** Economic complexity, the empirics	I. Foundations of Economic Complexity	[**1, 2**]
2	Sept 23	*C314*	***César Hidalgo*** Mathematical foundations of economic complexity		[3]
3	Oct 7	*C314*	***Balázs Lengyel*** Knowledge, innovation, and technological development	II. Innovation and Economic Geography	[**4**]
4	Oct 14	*C557*	***Balázs Lengyel*** The development of cities and regions: agglomeration economies, the specialization-diversity debate		[**5**,6]
5	Oct 21	*C314*	***Zoltán Elekes*** Labor markets and skills: labor mobility, skill-relatedness		[**7**,8]
6	Nov 4	*C314*	***Balázs Lengyel*** Learning and innovation in networks: knowledge sourcing and dynamics of networks		[**9**,10]
7	Nov 11	*C557*	***Balázs Lengyel and Sándor Juhász*** Spatial and network inequalities: social capital, segregation and mixing		[**11**,12]
8	*Nov 18*	*C314*	*Presentation of students' research proposal*		
9	Nov 25	*C557*	***Gergő Tóth and Balázs Lengyel*** Shocks and adaptation: network resilience, systemic risks	III. Recent research	[**13**,14]
10	Dec 2	*C314*	***Viktor Stojkoski*** Digital trade and Multidimensional Economic Complexity		[**15**,16]
11	Dec 9	*C557*	***Balázs Lengyel*** Spatial diffusion of innovation: agents of change, interregional networks, and spatial life cycles		[17,**18**]
12	*Dec 16*	*C557*	*Written exam / Presentation of Projects*		

Recommended readings

Antonelli, C. (Ed.). (2011). *Handbook on the economic complexity of technological change*. Edward Elgar Publishing.

Hidalgo, C. (2015) *Why Information Grows*. Basic Books.

Hausmann, R., Hidalgo, C., Bustos, S. Coscia, M., Simoes, A. (2014) *The Atlas of Economic Complexity*. MIT Press.

Compulsory readings in BOLD *(further papers will provide extra points)*

[1] Hidalgo, C. A., Klinger, B., Barabási, A. L., & Hausmann, R. (2007). The product space conditions the development of nations. *Science*, *317*(5837), 482-487.

[2] Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. *PNAS*, *106*(26), 10570-10575.

[3] Hidalgo, C. A., & Stojkoski, V. (2025). The Theory of Economic Complexity. *arXiv preprint arXiv:2506.18829*.

[4] Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of Economic Literature*, **1120-1171.**

[5] Audretsch, D. B., & Feldman, M. P. (1996). R&D spillovers and the geography of innovation and production. *The American Economic Review*, *86*(3), 630-640.

[6] Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in cities. *Journal of Political Economy*, *100*(6), 1126-1152.

[7] Neffke, F., Henning, M., & Boschma, R. (2011). How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography*, *87*(3), 237-265.

[8] Alabdulkareem, A., Frank, M. R., Sun, L., AlShebli, B., Hidalgo, C., & Rahwan, I. (2018). Unpacking the polarization of workplace skills. *Science Advances*, *4*(7), eaao6030.

[9] Sorenson, O., Rivkin, J. W., & Fleming, L. (2006). Complexity, networks and knowledge flow. *Research Policy*, *35*(7), 994-1017.

[10] Abbasiharofteh, M., Kogler, D. F., & Lengyel, B. (2023). Atypical combinations of technologies in regional co-inventor networks. *Research Policy*, *52*(10), 104886.

[11] Tóth, G., Wachs, J., Di Clemente, R., Jakobi, Á., Ságvári, B., Kertész, J., & Lengyel, B. (2021). Inequality is rising where social network segregation interacts with urban topology. *Nature Communications*, *12*(1), 1143.

[12] Aiello, L. M., Vybornova, A., Juhász, S., Szell, M., & Bokányi, E. (2025). Urban highways are barriers to social ties. *PNAS*, *122*(10), e2408937122.

[13] Tóth, G., Elekes, Z., Whittle, A., Lee, C., & Kogler, D. F. (2022). Technology network structure conditions the economic resilience of regions. *Economic Geography*, *98*(4), 355-378.**

[14] Diem, C., Borsos, A., Reisch, T., Kertész, J., & Thurner, S. (2022). Quantifying firm-level economic systemic risk from nation-wide supply networks. *Scientific Reports*, *12*(1), 7719.

[15] Stojkoski, V., Koch, P., Coll, E., & Hidalgo, C. A. (2024). Estimating digital product trade through corporate revenue data. *Nature Communications*, *15*(1), 5262.

[16] Stojkoski, V., Koch, P., & Hidalgo, C. A. (2023). Multidimensional economic complexity and inclusive green growth. *Communications earth & environment*, *4*(1), 130.

[17] Elekes, Z., Boschma, R., & Lengyel, B. (2019). Foreign-owned firms as agents of structural change in regions. *Regional Studies*, *53*(11), 1603-1613.

[18] Lengyel, B., Bokányi, E., Di Clemente, R., Kertész, J., & González, M. C. (2020). The role of geography in the complex diffusion of innovations. *Scientific Reports*, *10*(1), 15065.

Literature quiz and homework timing

Week	Date	Literature quiz	Homework
2	Sept 23	_yes_	_NO_
3	Oct 7	_yes_	_yes_
4	Oct 14	_yes_	_NO_
5	Oct 21	_yes_	_yes_
6	Nov 4	_yes_	_NO_
7	Nov 11	_yes_	_yes_
8	_Nov 18_	_NO_	_NO_
9	Nov 25	_yes_	_NO_
10	Dec 2	_yes_	_yes_
11	Dec 9	_yes_	_NO_
12	Dec 16	_NO_	_NO_