Course Descriptions None 2022-2023

Course Title	Technology, Networks and the New Economy
Course Code	EBC4142
ECTS Credits	6,5
Assessment	Whole/Half Grades

Period

Period	Start	End	Mon	Tue	Wed	Thu	Fri
2	31-10-2022	16-12-2022	C				

Level	Advanced
Coordinator	Robin Cowan For more information:r.cowan@maastrichtuniversity.nl
Language of instruction	English
Goals	The purpose of this course is to understand the interaction between network structures, knowledge creation and diffusion, and economic performance at various levels of aggregation.
Description	PLEASE NOTE THAT THE INFORMATION ABOUT THE TEACHING AND ASSESSMENT METHOD(S) USED IN THIS COURSE IS WITH RESERVATION. A RE-EMERGENCE OF THE CORONAVIRUS AND NEW COUNTERMEASURES BY THE DUTCH GOVERNMENT MIGHT FORCE COORDINATORS TO CHANGE THE TEACHING AND ASSESSMENT METHODS USED. THE MOST UP-TO-DATE INFORMATION ABOUT THE TEACHING/ASSESSMENT METHOD(S) WILL BE AVAILABLE IN THE COURSE SYLLABUS. This is a course on the economics of networks. The goal is to introduce students to the field of network analysis. Modelling economic activity using social network analysis tools can be very useful in furthering understanding of a wide variety of phenomena. Our interest, of course, will be largely in how network analysis is useful in understanding innovation and knowledge creation and diffusion. As such we see (social) networks as the infrastructure over which knowledge flows. We seek to understand how different actors in an innovation system interact, and how those interactions can be analyzed with network tools and concepts. We begin with a general introduction to social network analysis, laying out the basic concepts. The bulk of the course uses these concepts to look at various issues of innovation and development. We look at different network structures and how they might be good or bad for encouraging innovation; we look at models of network formation, starting with the basic building block of links between pairs of actors. The course presents both theoretical and empirical results. Finally, in the last sessions we examine various topics specific to development or developing countries. Which topics precisely are determined by the interests of the students in the class.

Literature

Introduction

Cowan, R. 'Network models of innovation and knowledge diffusion' in Clusters, Networks and Innovation, S. Breschi and F. Malerba (eds.) Oxford University Press: Oxford, pp. 29-53, 2005. Available also as a MERIT working paper. Only the first half is necessary at this point.

*Vega-Redondo, F. (2007) Complex Social Networks 'Chapter 1: Introduction'

*Kirman, A. 1992. 'Whom or what does the representative agent represent?' Journal of Economic Perspectives vol 6(2), pp. 117-136.

C. A. Hidalgo, B. Klinger, A.-L. Barabási, R. Hausman (2007) 'The Product Space Conditions the Development of Nations' Science 317: 482 – 487 DOI: 10.1126/science.1144581

Supplementary material at http://www.nd.edu/~networks/productspace/index.htm

Social Networks: An overview

What is a network? How do we describe it? How does network analysis differ from other types of analysis.

*Borgatti, S.P. and Foster, P. 2003. The network paradigm in organizational research: A review and typology. Journal of Management. 29(6): 991-1013 [pdf]

Cross, R., Parker, A., & Borgatti, S.P. 2002. Making Invisible Work Visible: Using Social Network Analysis to Support Strategic Collaboration. California Management Review. 44(2): 25-46. [pdf]

Gulati, R. 1998. Alliances and Networks. Strategic Management Journal. 19 293-317.

Gulati, R., M. Garguilo 1999. Where do interorganizational networks come from? American Journal of Sociology. 104(5) 1439-93.

Theory of Small worlds and Scale Free Networks

Two types of network structures that have dominated the discussion in recent years. They seem to be common empirically, and both have particular properties that make them both likely to form, and efficient in certain ways.

*Watts and Strogatz, 1998, 'Collective dynamics of 'small-world' networks, Nature, Jun 4, 393 (6684), 440-2.

Baum, JAC , AV Shipilov, TJ Rowley 2003. 'Where do small worlds come from?' Industrial and Corporate Change, Volume 12, Number 4, pp. 697-725.

*Barabási, A.-L. and R. Albert (1999): 'Emergence of scaling in random networks,' Science 286, 509-12.

*Barabasi, A.L. (2002) Linked: The New Science of Networks (Perseus, Cambridge, MA. selected chapters. (This should be available in the university library.)

*Kleinberg, J. 'The Small-World Phenomenon and Decentralized Search'. A short essay as part of Math Awareness Month 2004, SIAM News 37(3), 2004.

*Stumpf, M.P.H and M.A Porter (2012) 'Critical truths about power laws' Science 335, 665 . DOI: 10.1126/science.1216142

Aaron Clauset, Cosma Rohilla Shalizi, and M. E. J. Newman (2009) 'Power-Law Distributions in Empirical Data' SIAM REVIEW Vol. 51, No. 4, pp. 661–703 (see Three-toed Sloth web log, June 15, 2007)

Centrality, Performance, Social Capital

Who are the 'central' or important actors in a network? Can they be identified somehow, and are there statistics that correspond to different ideas of 'importance'? If we have statistics to show that different nodes have different types of positions (or importance or centrality) in a network, does if affect their performance? Is there a connection between network position and performance? Finally, what is social capital? How does social capital (whatever that is), often measured using node-level centrality of position statistics, affect performance?

Elfenbein, W., & Zenger, T. (2013). What is a Relationship Worth ? Repeated Exchange and the Development and Deployment of Relational Capital. Organization Science, 25(1).

Freeman, L. (1979). Centrality in social networks: Conceptual clarification. Social Networks. 1, 215-239.

Bonacich, Phillip. 1987. Power and Centrality: A Family of Measures. American Journal of Sociology 92: 1170-1182.

Powell, Koput, Smith-Doer and Owen-Smith 'Network Position and Firm Performance: Organizational Returns to Collaboration in the Biotechnology Industry' www.stanford.edu/~woodyp/Rso1.pdf published in Research in the Sociology of Organizations 16:129–59, 1999.

*Gonzalez-Brambila, C.N., F.M. Velasco and D. Krackhardt 'The impact of network embeddedness on research output', Research Policy, 42: 155-167, 2013.

Ahuja, G. 2000. Collaboration Networks, structural holes, and innovation: A longitudinal study. Administrative Science Quarterly. 45 425-455.

*Granovetter, M. (1973). The strength of weak ties. American Journal of Sociology, 78:1360-1380

Walker, G., B. Kogut, W. Shan. 1997. Social capital, structural holes and the formation of an industry network. Organization Science. 8(2) 109-125.

*Guimerà, Roger , Brian Uzzi, Jarrett Spiro, and Luís A. Nunes Amaral, 'Team Assembly Mechanisms Determine Collaboration Network Structure and Team Performance' Science 29 April 2005: Vol. 308. no. 5722, pp. 697 - 702

Network architecture and aggregate performance

Policy makers (for example EU science policy makers) care about networks as means of diffusing knowledge, skills, information ... Should they care about the overall architecture of the network seen from the global level? This is relevant to any policy maker who sees individuals/firms/universities/research institutions/... as linked together in a system generating learning or knowledge of any kind.

Cowan, Robin and Nicolas Jonard, 'Structural Holes, Innovation and the Distribution of Ideas' vol (2), pp 93-101, Journal of Economics of Interaction and Co-ordination', DOI: 10.1007/s11403-007-0024-0, 2007.

*Cowan, Robin and Nicolas Jonard, 'Network Structure and the Diffusion of Knowledge' Journal of Economic Dynamics and Control, 28(8) pp. 1557-1575, 2004.

*Cowan, Robin and Nicolas Jonard 'The Dynamics of Collective Invention', Journal of Economic Behavior and Organization, vol 52(4) pp. 513-532, 2003.

*Wilhite, A. 2001.Bilateral Trade and 'Small-World' Networks Computational Economics Volume 18, Number 1 / August, 2001 DOI: 10.1023/A:1013814511151 Pages 49-64

Network Formation

A network is made up of a collection of links between pairs of agents. Any population of agents has many possible bilateral links. Can we understand why particular pairs form while others do not? What are the objectives of agents here? What properties of the agents are important in pursuing those objectives? When a pair of agents considers making a link, do existing or past properties of the surrounding network matter?

*Mowery, D.C. J. Oxley and B. S. Silverman (1998) 'Technological Overlap and Interfirm Cooperation: Implications for the Resource-Based View of the Firm', Research Policy; 27 (5) Pages: 507-523

Mowery, D.C. J. Oxley and B. S. Silverman (1996) 'Strategic Alliances and Interfirm Knowledge Transfer' Strategic Management Journal, 17(S2) pp. 77-91.

*Gulati, 'Social structure and alliance formation: A longitudinal analysis', Administrative Science Quarterly , 1995.

* Baum, J., R.Cowan and N.Jonard(2010), 'Network-independent partner selection and the evolution of innovation networks', Management Science 56: 2094-2110.

Powell, Koput, White, Owen-Smith 'Network dynamics and field evolution: The growth of interorganizational collaboration in the life sciences' American Journal of Sociology, 110, 1132-1205, 2005.

Game Theory

Some simple game theory models about network formation. The concern here is with stability (which has to

do with micro incentives of the agents) and efficiency (which has to do with aggregate level network performance).

*Jackson, M. (2005): 'A survey of network formation models: stability and efficiency,' in G. Demange and M. H. Wooders (eds.), Group Formation in Economics: Networks, Clubs, and Coalitions, Cambridge: Cambridge University Press, available at Jackson's website at Stanford: 'A Survey of Models of Network Formation: Stability and Efficiency'
Jackson, M. O. and A. Wolinsky (1996): 'A Strategic model of social and economic networks,' Journal of Economic Theory 71, 44-74.
*Vega-Redondo, F. (2007) Complex Social Networks 'Chapter 6: Search, diffusion, and play in coevolving networks'
Networks and Development: 4 papers
The idea here is to present 4 papers that use network theory or network analysis in the context of technology, development and/or migration. The four papers are indicated by an asterisk. But I am open to other suggestions if there is something else (on or off this list) that particularly interests you.

David Mckenzie, Hillel Rapoport, Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico, Journal of Development Economics, Volume 84, Issue 1, September 2007, Pages 1-24, ISSN 0304-3878, 10.1016/j.jdeveco.2006.11.003.(http://www.sciencedirect.com/science/article/pii/S0304387806001891)

Michael Woolcock and Deepa Narayan (2000) 'Social Capital: Implications for Development Theory, Research, and Policy World Bank Research Observer, Vol 15(1) Pp. 225-249.
Angelucci, M., G. De Giorgi, M. Rangel, and I. Rasul (2010): 'Family Networks and School Enrollment: Evidence from a Randomized Social Experiment', Journal of Public Economics, 94(3-4),
Bandiera, O., and I. Rasul (2006): 'Social Networks and Technology Adoption in Northern Mozambique', Economic Journal, 116(514), pp. 862-902.
**Banerjee, Abhijit , Arun G. Chandrasekhar, Esther Duflo, Matthew O. Jackson 'The Diffusion of Microfinance' Science 341, 1236498 (2013). DOI: 10.1126/science.1236498
Barr, Abigail. 2000. 'Social Capital and Technical Information Flows in the Ghanaian Manufacturing Sector.' Oxford Economic Papers 52(3):539-59.
*Conley, Timothy & Christopher Udry. 2001. 'Social Learning through Networks: The Adoption of New Agricultural Technologies in Ghana.' American Journal of Agricultural Economics vol. 83(3) pp. 668-73.
**Conley, T.G. and C.R Udry, 2010. 'Learning about a New Technology: Pineapple in Ghana', American Economic Review, 100:1, 35-6.
**Eagle, N., M. Macy and R. Claxton (2010) 'Network diversity and develoment' Science, Vol 328, 2 May, pp 1029-1031.
*Fafchamps, M. and Flore Gubert (2007) 'Risk Sharing and Network Formation' American Economic Review Papers and Proceedings, 97(2): 75-79, May 2007
(long version: ""The Formation of Risk-Sharing Networks"", in collaboration with Flore Gubert, Journal of Development Economics, 83(2): 326-50, July 2007)
Fafchamps, M. and S. Lund (2003): 'Risk-sharing networks in rural Philippines,' Journal of Development Economics 71, 261-87.
**Krishnan, Pramila & Emanuela Sciubba. 2009. 'Links and architecture structure in village networks.' The Economic Journal, 119 (April), 917–949.
Nyblom, Jukka, Steve Borgatti, Juha Roslakka & Mikko A. Salo. 2003. 'Statistical Analysis of Network Data:An Application to Diffusion of Innovation.' Social Networks vol. 25 pp.175-95.
** Wonodi, B.B., L. Privor-Dumm, M. Aina, A.M. Pate, R. Reis, P. Gadhoke and O.S. Levine (2012) 'Using social network analysis to examine the decision-making process on new vaccine introduction in Nigeria', Health Policy and Planning 2012;27:ii27–ii38 doi:10.1093/heapol/czs037.

Prerequisites	Intermediate microeconomics. An intermediate level of economics is recommended. Exchange students should have an intermediate or advanced level of micro economics
Teaching methods	Papers / Coaching
Assessment methods	Final Paper
Evaluation in previous academic year	For the complete evaluation of this course please click http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM

This course belongs to the following programme / specialisation

Master Business Research - No specialisation	Year 2 Free Elective(s)
Master Business Research - Operations Research	Year 1 Elective Course(s)
Master Business Research - Operations Research	Year 2 Elective Course(s)
Master Economic and Financial Research - Econometrics	Year 2 Elective Course(s)
Master Economic and Financial Research - No specialisation	Year 2 Elective Course(s)