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**EVOLUTIONARY ECONOMIC GEOGRAPHY, AGGLOMERATION, AND
GEOGRAPHIES OF KNOWLEDGE PRODUCTION**

Special Series of Sessions Co-organized with the Regional Studies Association

ORGANIZERS

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SESSIONS

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EVOLUTIONARY ECONOMIC GEOGRAPHY I

SHIFTING AGGLOMERATIONS AND THE EVOLUTION OF REGIONS

[Friday, 2/24/2012, from 8:00 – 9:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Dieter F. Kogler

*Sean Tierney, sean.tierney@unt.edu**

Shifting power centers: a post-WWII economic tale using a Fortune 500 lens

*Matthew Drennan, visiting professor, UCLA mattd@ucla.edu**

The Evolution of Agglomeration Economies in New York City, 1959 to 2009

*Richard Shearmur, Université du Québec, INRS-UCS richard.shearmur@ucs.inrs.ca**

Innovation outside of agglomerations: what does this tell us about agglomerations?

*Emil Evenhuis, Newcastle University e.evenhuis@ncl.ac.uk**

Conceptualising the Evolution of Regions: Taking Stock and Moving Ahead

*Celine VACCHIANI-MARCUZZO, UMR Géographie-cites, Paris / University of Reims
vacchiani@parisgeo.cnrs.fr**

*Fabien PAULUS, University of Strasbourg fabien.paulus@gmail.com**

Innovative activities and economic trajectories of cities (USA, France)

DISCUSSANT – Susan M. Christopherson

EVOLUTIONARY ECONOMIC GEOGRAPHY II

CONCEPTUALISING EVOLUTIONARY HETEROGENEITY

[Friday, 2/24/2012, from 10:00 – 11:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Andy Pike

*Peter Maskell, Professor, CBS - Copenhagen Business School maskell@cbs.dk**

Anders Malmberg, Professor, Uppsala University anders.malmberg@kultgeog.uu.se

Bo Malmberg, Professor, Stockholm University bo.malmberg@humangeo.su.se

And the first one now will later be last: On the tricky issue of changing positions in the evolution of clusters and regions

*Arnoud Lagendijk, Radboud University Nijmegen a.lagendijk@ru.nl**

Paivi Oinas, Economic Geography Research Group, Turku School of Economics Paivi.Oinas@tse.fi

The roles local nodes play in the interdependent world economy: the construction of local innovativeness, proximity and diversity

*Michael Storper, London School of Economics m.storper@lse.ac.uk**

Tom Kemeny, University of North Carolina tomkemeny@gmail.com

Reconsidering Specialization and Urban Economic Performance: the problem of unobserved heterogeneity

*Dieter Franz Kogler, University College Dublin dieter.kogler@ucd.ie**

Maryann P. Feldman, University of North Carolina, Chapel Hill maryann.feldman@unc.edu

rKnowledge – Recombinant Technology Evolution of rDNA Methods

DISCUSSANT – Ron Boschma

EVOLUTIONARY ECONOMIC GEOGRAPHY III

COLLABORATION AND NETWORKS OF INNOVATION

[Friday, 2/24/2012, from 14:40 – 16:20 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Arnoud Legendijk

*Roman Martin, CIRCLE, Lund University roman.martin@circle.lu.se**

Innovation and the nature of networks in differentiated knowledge bases

Rune Dahl Fitjar, Stavanger Centre of Innovation Research, International Research Institute of Stavanger rune.fitjar@iris.no

*Andres Rodriguez-Pose, London School of Economics a.rodriguez-pose@lse.ac.uk**

Firm collaboration and modes of innovation in Norway

*Pierre-Alexandre Balland, Utrecht University p.balland@uu.nl**

The Dynamics of Interfirm Networks along the Industry Life Cycle: The Case of the Global Video Games Industry 1987-2007

*Tom Broekel, Institute of Economic and Cultural Geography, University of Hanover broekel@wigeo.uni-hannover.de**

The evolution of subsidized R&D cooperation in Germany from a proximity perspective

*Stefano Breschi, Universita' L. Bocconi stefano.breschi@unibocconi.it**

Net in the city – Co-invention networks and the inventive productivity of US cities

DISCUSSANT – Maryann Feldman

EVOLUTIONARY ECONOMIC GEOGRAPHY IV

BREAKING ROUTINES AND CREATING NEW PATHS

[Saturday, 2/25/2012, from 8:00 – 9:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – David Rigby

*Danny Mackinnon, University of Glasgow daniel.mackinnon@glasgow.ac.uk**

Kate Driscoll Derickson, Dr, Georgia State University KDerickson@gsu.edu

Beyond Regional Resilience: Social Relations, Scale and Adaptation

*Stuart Dawley, Dr, CURDS, Newcastle University s.j.dawley@ncl.ac.uk**

Andy Pike, Professor, CURDS, Newcastle University andy.pike@ncl.ac.uk

Creating new paths?: Agents, the state and peripheral region development

*Paul S Plummer, University of Calgary pplummer@ucalgary.ca**

Path Dependence, Place Dependence, and the Evolution of a Patchwork Economy: Evidence from Western Australia, 1984-2010

*Josephine V Rekers, Lund University josephine.rekers@circle.lu.se**

Organizational innovation and collaboration: Localized assets in the health and welfare sector

*Isaac Tucker, University College Dublin tucker.isaac@gmail.com**

Dieter F. Kogler, University College Dublin dieter.kogler@ucd.ie

Spatio-Sectoral Evolution of Technology Networks

DISCUSSANT – Koen Frenken

EVOLUTIONARY ECONOMIC GEOGRAPHY V

METROPOLITAN DIVERSITY, PERFORMANCE AND PRODUCTIVITY

[Saturday, 2/25/2012, from 10:00 – 11:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Stuart Dawley

*Erik Stam, UTRECHT UNIVERSITY e.stam@uu.nl**

Entrepreneurship, Institutions and Space: EEG meets Austrian Economics

*Gregory M. Spencer, University Of Toronto greg.spencer@utoronto.ca**

Knowledge neighbourhoods: intra-regional cluster dynamics in Canadian cities and suburbs

*Frank Van Oort, Utrecht University f.g.vanoort@uu.nl**

Sector structure, Evolution and Agglomeration Externalities. Testing the impact of related variety, unrelated variety and specialization in a cross-section of European regions

*Jurgen Essletzbichler, University College London j.essletzbichler@ucl.ac.uk**

The impact of diversity and variety on US metropolitan employment growth

DISCUSSANT – Arnoud Legendijk

EVOLUTIONARY ECONOMIC GEOGRAPHY VI

SPIN-OFFS, FIRM FORMATION, AND SKILL MATCHING

[Saturday, 2/25/2012, from 12:40 – 14:20 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Andy Pike

*Andrea Morrison, Utrecht University a.morrison@uu.nl**

Spin-off dynamics and the emergence of industrial districts: an evolutionary perspective

*Koen Frenken, Prof. Dr., Eindhoven University of Technology k.frenken@tue.nl**

Ron Boschma, Utrecht University

Mathijs De Vaan, Columbia University

The Downside of Social Capital in New Industry Creation

*Maryann Feldman, UNC maryann.feldman@unc.edu**

Spawning from the Ivory Tower: What affects the rate of new firm formation by faculty & staff and students?

*Simona Iammarino, London School of Economics, Department of Geography & Environment s.iammarino@lse.ac.uk**

Elisabetta Marinelli, Dr, European Commission JRC-IPTS Elisabetta.MARINELLI@ec.europa.eu

Education-job match and the transition from study to work. A comparison of Lombardia, Lazio and Campania

DISCUSSANT – David Rigby

EVOLUTIONARY ECONOMIC GEOGRAPHY VII

BRIDGING THEORY AND PRACTICE

[Saturday, 2/25/2012, from 14:40 – 16:20 in Gibson Suite, Second Floor, Hilton NY]

CHAIR –David Rigby

*Edward J Malecki, Ohio State University malecki.4@osu.edu**

Geographies of Knowledge Production and Innovation

*Andy Pike, CURDS, Newcastle University andy.pike@ncl.ac.uk**

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Robert McMaster, University of Glasgow Robert.McMaster@glasgow.ac.uk

Doing evolution in Economic Geography

*Ron Boschma, Utrecht University r.boschma@geo.uu.nl**

Asier Minondo, Deusto Business School, University of Deusto, San Sebastian

Mikel Navarro, Deusto Business School, University of Deusto, San Sebastian

The emergence of new industries at the regional level in Spain. A proximity approach based on product-relatedness

*Jerker Moodysson, CIRCLE, Lund University, Sweden jerker.moodysson@circle.lu.se**

Lars Coenen, CIRCLE, Lund University, Sweden

Bridging science and traditional industry: regional innovation systems and institutional change for emergent biorefinery technologies

*Bjorn Asheim, Lund University, Sweden Bjorn.Asheim@keg.lu.se**

Specialisation or diversity? What is the 'smart' strategy to grow EU regions?

DISCUSSANT – Michael Storper

EVOLUTIONARY ECONOMIC GEOGRAPHY VIII

THE DYNAMICS OF CLUSTERS

[Sunday, 2/26/2012, from 8:00 – 9:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Arnoud Legendijk

*Shiri M Breznitz, DR, Georgia Institute of Technology shiri.breznitz@pubpolicy.gatech.edu**

Industrial Agglomeration vs. Clusters - "Real" Communication or is it all "in the air"?

*Harald Bathelt, University of Toronto harald.bathelt@utoronto.ca**

A Relational-Evolutionary Perspective of Cluster Dynamics

*Neil Reid, University of Toledo neil.reid@utoledo.edu**

Jay D Gatrell, Indiana State University Jay.Gatrell@indstate.edu

Bruce W Smith, Bowling Green State University bsmith4@bgsu.edu

Evolutionary Economic Geography in the Field(s): Sustained action and adaptive cluster management

*Christian R. Oestergaard, Aalborg University cro@business.aau.dk**

Clusters in Transition

*Ron Boschma, Utrecht University r.boschma@geo.uu.nl**

*Matté Hartog, University of Utrecht m.hartog@uu.nl**

M&A's as drivers of spatial clustering. The spatial evolution of the Dutch banking sector in the period 1850-1993

DISCUSSANT – Peter Maskell

EVOLUTIONARY ECONOMIC GEOGRAPHY IX

AGGLOMERATION, EXTERNALITIES, GROWTH, AND RESILIENCE

[Sunday, 2/26/2012, from 10:00 – 11:40 in Gibson Suite, Second Floor, Hilton NY]

CHAIR – Dieter F. Kogler

Ron Boschma, Utrecht University

*Rikard H Eriksson, Umea University rikard.eriksson@geography.umu.se**

Urban Lindgren, Umea University

Labour market externalities and regional growth. The importance of labour mobility between skill-related industries

Raphael Suire, Crem, University of Rennes France raphael.suire@univ-rennes1.fr

*Jerome Vicente, University of toulouse vicente@univ-tlse1.fr**

Clusters for life or life cycles of clusters In search of the critical factors of cluster resilience

*Rory Horner, Clark University rhorner@clarku.edu**

Knowledge geography, the Trade Related Aspects of Intellectual Property Rights (TRIPs) Agreement and the development of India's pharmaceutical industry

*Anders Larsson, Göteborg University anders.larsson@geography.gu.se**

Regional path dependency and technological change: the case of the automotive crash-safety sector in Västra Götaland, Sweden

DISCUSSANT – Andy Pike

ABSTRACTS IN ORDER OF SESSIONS

EVOLUTIONARY ECONOMIC GEOGRAPHY I

SHIFTING AGGLOMERATIONS AND THE EVOLUTION OF REGIONS

*Sean Tierney, sean.tierney@unt.edu**

Shifting power centers: a post-WWII economic tale using a Fortune 500 lens

First released in 1955, the Fortune 500 ranks the top 500 US firms by revenues. Back in 1955, industrial firms dominated the list and more than half were located in just three states (NY, PA, IL). By 2010, industrial firms represent only a fraction of the list and the companies dot the metropolitan landscape of nearly every state. This changing geography and sectoral composition of the most powerful corporate entities tells several stories about the post-WWII economy. And while regional fortunes have changed, many of the clustering and agglomeration expectations that existed in the early years are far less observable in the later years. Nevertheless, oligopolistic characteristics are strengthening with the largest firm(s) possessing distinct size advantages over other firms. As a result, a few familiar companies make the list each year, but many more are on the Fortune 500 for short periods - some are acquired, some are eclipsed, while others are in waning industries. Finally, when compared against government labor data, a growing temporal shift shows that many of the largest firms are in low wage economic sectors or are generating substantial revenues with relatively few employees.

*Matthew Drennan, visiting professor, UCLA mattd@ucla.edu**

Hugh F. Kelly, Adjunct Professor, Schack Real Estate Institute NYU hughkelly@hotmail.com

The Evolution of Agglomeration Economies in New York City, 1959 to 2009

In 1959 the dominant traded activities of New York City were in the command and control functions over national manufacturing (corporate headquarters) and in the production and distribution of goods. Fifty years later the dominant traded activities of New York were in the production of high level services (finance, business, services, law, media, etc.). In both periods the largest part of the private capital base has been situated in the office buildings in Manhattan. The urban concentrations of New York City and region were roughly the same size in population and employment in 2009 as they were in 1959. Presumed agglomeration economies of localization in both periods accrued to different economic activities. We measure those agglomeration economies of localization in both periods, using wages in the earlier period and both wages and office rents in the later period. Our goal is to determine how they have changed with the changing industrial mix of the U.S. economy and with changing technology. Our data set for the earlier period is more limited than for the recent period where we employ panel regression techniques. Also we analyze the forced relocation of firms caused by the massive destruction and damage of office and retail space by the 9/11 attack. That event provides a natural experiment regarding the financial

importance of intra-metropolitan agglomeration economies. Although the long-term metropolitan experiences in the United States are of dispersion of economic activities, we show that the 9/11 experience is quite different.

*Richard Shearmur, Université du Québec, INRS-UCS richard.shearmur@ucs.inrs.ca**

Innovation outside of agglomerations: what does this tell us about agglomerations?

It has been common, ever since Marshall but especially since the early 1980s, to put forward the idea that innovation activity is greater in certain locations than others. These locations are generally characterised by their high density of actors, supportive institutions and capacity to enhance knowledge circulation, learning and competition. However, there is evidence that rates of innovation (i.e. the proportion of firms that innovate) can also be high outside of such locations, and this occurs at various scales. In the province of Quebec, for instance, innovation rates can be higher (for some types of firms and innovation) away from metropolitan areas, and at the intra-metropolitan scale in Montreal innovation occurs both in proximity to, but also away from, clusters. Such evidence suggests that there is no necessary connection between innovation and agglomeration: rather, it suggests that whereas certain types of innovation and certain innovation processes occur more frequently in agglomerations (particularly innovation based on networks and rapidly decaying knowledge), other types may occur more frequently outside of agglomerations (particularly innovation based upon a firm's internal capacities, and premised upon information that decays more slowly or upon secrecy). From a policy perspective the attempt to create and sustain clusters may therefore have the effect of encouraging only one type of innovation, thereby ignoring types of innovation that more readily occur in regions and places that are not fortunate enough to be able to create or sustain agglomerative forces.

*Emil Evenhuis, Newcastle University e.evenhuis@ncl.ac.uk**

Conceptualising the Evolution of Regions: Taking Stock and Moving Ahead

In the past few years several papers have appeared that theorise and conceptualise the evolution of regions in Economic Geography. Roughly speaking, three elements may be distinguished within this literature: how regions (or clusters / sectors within a region) are responsive to developments that are external to the region ('adaptation', 'adaptability', 'resilience'), how past choices and events condition and shape future options ('path dependence', 'lock-in'), and how new options are generated ('(related) variety', 'diversity', 'connectedness', 'recombination', 'innovative capacity', etc.). This paper will offer a broad review of the different definitions and models proposed to understand the dynamics within and between these three elements. Next this conceptual debate will be reflected upon from the point of view of the philosophy of science: what is needed for the development of a theory of the economic evolution of regions, how are empirical insights used in constructing such a theory, what is implied for the further empirical testing, and how may descriptive and prescriptive statements be related in such a theory (the role of agency)? Conclusions will be drawn on how the conceptual debate on the economic evolution of regions is to be taken forward.

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*Fabien PAULUS, University of Strasbourg fabien.paulus@gmail.com**

Innovative activities and economic trajectories of cities (USA, France)

Studies in the field of geography of innovation focus on locating innovative products, firms or activities, using mostly one-dimensional indicators (patents, scientific publication,...). These studies analyse the spatial context where innovation occurs in terms of diverse or specialized regions. In that way, not so much attention is given to the size inequalities of geographical units.

We propose another approach at the scale of systems of cities and over a period of 40 years (1960-2000). The main hypothesis is that city size matters, because larger cities are much more diverse, both in terms of economic profile and of human and social capital: their functions demonstrate a higher level of complexity of urban activity. In that way, larger cities capture innovations in a continuous way and they concentrate a larger part of anything « new » at any time.

In order to assess this theory, we discuss the changes occurring in the socio-economic profiles of cities in two types of systems (USA and France) with different historical features. We propose an original approach which combines several statistical methods applied to employment data (economic activities and occupational groups): diversity index, factor analysis and scaling laws. We construct urban trajectories in their respective socio-economic spaces. This approach strengthens an interpretation of urban dynamics which emphasizes the linkages between city size, diversity and complexity, and the ability to be innovative. We will also discuss some specific city trajectories (old industrial cities or knowledge cities for example) to evaluate the future of these very specialized cities.

EVOLUTIONARY ECONOMIC GEOGRAPHY II

CONCEPTUALISING EVOLUTIONARY HETEROGENEITY

*Peter Maskell, Professor, CBS - Copenhagen Business School maskell@cbs.dk**

Anders Malmberg, Professor, Uppsala University anders.malmberg@kultgeog.uu.se

Bo Malmberg, Professor, Stockholm University bo.malmberg@humangeo.su.se

And the first one now will later be last: On the tricky issue of changing positions in the evolution of clusters and regions

Our contribution will take on the notoriously difficult and elusive issue of how radical shifts in relative positions come about in the evolution of regions or clusters (or cities or nations or any other spatio-economic aggregates).

Two observations motivate us to focus on this issue. The first is that evolutionary economic geography has put relatively more emphasis on understanding the incremental steps along with a path or trajectory develops over time, than to understand the breaking of path dependence. The

other is that economic geographers generally have at best been only partly successful in coping with these issues.

Still two major problems prevail. First, the discipline is, so far, rather empty-handed when it comes to identify - let alone predict – when we should expect successful specialisation to turn into disastrous lock-in and the other way around. Second, it is somewhat discomfoting that the very same type of factors – relating to institutions, infrastructures and skills – are used to explain both success and failure.

The overall aim of our contribution will be to review the literature in search of models, mechanisms and metaphors that can help developing explanations with predictive power when it comes to shifts in the established relative positions of clusters and regions. Special emphasis will be placed on assessing the merits of recent research on changing age structures in the population as the 'hidden pulse' in economic development, forcefully argued by leading demographers.

*Arnoud Lagendijk, Radboud University Nijmegen a.lagendijk@ru.nl**

*Paivi Oinas, Economic Geography Research Group, Turku School of Economics
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The roles local nodes play in the interdependent world economy: the construction of local innovativeness, proximity and diversity

How do certain regions and agglomerations achieve high levels of innovativeness and competitiveness? In its search for explanations, economic geography has sought to uncover fixed regularities on the spatial nature of innovation and economic interaction. While this has yielded valuable insights, it has underplayed the constructive nature of such regularities, that is, the material, institutional, and discursive settings and forms in which spatial-economic relations unfold. In philosophical terms, our findings on regional development reflect actualisations of a world of extensive possibilities, and regions present individualizations enabled by specific tendencies and attractors. Based on these insights, elaborating on complexity theory, we develop a radical evolutionary approach of regional development in which we focus on how forms and settings for regional development evolve. We then present an alternative typology of regional development, and discuss how this bears on established models.

*Michael Storper, London School of Economics m.storper@lse.ac.uk**

Tom Kemeny, University of North Carolina tomkemeny@gmail.com

Reconsidering Specialization and Urban Economic Performance: the problem of unobserved heterogeneity

Specialization is one of the clearest markers of the comparative advantage of an economy, and where it stands in the hierarchy of income levels. In this paper, we address four issues --- empirical and theoretical -- in analyzing the role of specialization.

First, much of the literature uses overly-aggregated measures of specialization. This leaves too much unobserved heterogeneity, often to the point that statements made about specialization are of limited usefulness. Second, aggregation is crucial to measuring agglomeration and its effects on performance. If disaggregation reveals heterogeneity, it opens up the question: what is the agglomeration in question? Where are the boundaries of agglomeration effects? Third, NEG and regional development literatures have suggested that there can be more than mere automatic sorting of activities to comparative advantages - from history and scale economy and agglomeration effects. If we are to make any progress in analyzing such pathways of change, however, we need to proceed with attention to the twin risks of unobserved heterogeneity, and exaggerated connections within regional economies. Fourth, taking heterogeneity seriously creates a ripple effect on our overall methodological toolkit. If in fact we need to disaggregate much more than is customary, associated problems of sample size and generalization become more common. What can we do about this, without using heterogeneity as an excuse to go back to descriptive comparisons?

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Maryann P. Feldman, University of North Carolina, Chapel Hill maryann.feldman@unc.edu

rKnowledge - Recombinant Technology Evolution of rDNA Methods

In December 1980 the United States Patent and Trademark Office (USPTO) issued the patent entitled Process for Producing Biologically Functional Chimeras (US 4237224). The recombinant DNA (rDNA) technique, which was developed by Dr. Stanley Cohen of Stanford and Dr. Herbert Boyer of the University of California, San Francisco, marked the birth of a new technology class in the USPTO patent classification system. Over the past three decades the rDNA method has entered the group of general purpose technologies (GPTs), and today there are close to 14,000 patents that have been granted by the USPTO in this specific technology class. GPTs are commonly described as essentially transforming industries and providing a platform for increased productivity. While these attributes are highly desirable in any type of technological advancement, they rarely come in the form of a single technique, thus making GPTs a very infrequent occurrence.

Taking advantage of a 30 year paper trail in USPTO patent documents, the objective of the present study is to investigate the spatial and sectoral evolution of the rDNA method. In particular, a model is developed that takes into consideration the existing organizational and regional knowledge mix, and how this is combined with the rDNA technique in the development of novel products and processes.

The results indicate specific spatio-sectoral evolutionary paths of knowledge creation and diffusion, and provide further insight into the black box of how existing regional knowledge and organizational expertise serves as a crucial point of departure in the quest for technological advancement.

EVOLUTIONARY ECONOMIC GEOGRAPHY III

COLLABORATION AND NETWORKS OF INNOVATION

*Roman Martin, CIRCLE, Lund University roman.martin@circle.lu.se**

Innovation and the nature of networks in differentiated knowledge bases

We argue in this paper that the role and nature of innovation networks can vary substantially with regard to the type of knowledge that is critical for innovation. Subject to the knowledge base of an industry, networks between companies can differ in various aspects such as their geographical configuration, their persistence over time, their structure and density, the type of actors holding a strategic position and the type of linkages between actors. Furthermore, we argue that network embeddedness has a positive effect on innovation performance in general; however network embeddedness is not equally important for innovation in all industries. The paper comprises a conceptual discussion on network theory and differentiated knowledge bases, followed by an empirical examination based on social network analysis in association with exclusive data about patterns of cooperation and knowledge exchange in a number of industrial clusters located in different parts of Europe.

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*Andres Rodriguez-Pose, London School of Economics a.rodriquez-pose@lse.ac.uk**

Firm collaboration and modes of innovation in Norway

This paper examines the sources of firm product and process innovation in Norway. It uses a purpose-built survey of 1604 firms in the five largest Norwegian city-regions to test, by means of a logit regression analysis, Jensen et al.'s (2007) contention that firm innovation is both the result of 'science, technology and innovation' (STI) and 'doing, using and interacting' (DUI) modes of firm learning. The paper classifies different types of firm interaction into STI-mode interaction (with consultants, universities, and research centres) and DUI-mode interaction, distinguishing between DUI interaction within the supply-chain (i.e. with suppliers and customers) or not (with competitors). It further controls for the geographical locations of partners. The analysis demonstrates that engagement with external agents is an important source of firm innovation and that both STI and DUI-modes of interaction matter. However, it also shows that DUI modes of interaction outside the supply chain tend to be irrelevant for innovation, with frequent exchanges with competitors having a detrimental effect on a firm's propensity to innovate. Collaboration with extra-regional agents is much more conducive to innovation than collaboration with local partners, especially within the DUI mode.

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The Dynamics of Interfirm Networks along the Industry Life Cycle: The Case of the Global Video Games Industry 1987-2007

In this paper, we study the formation of network ties between firms along the life cycle of a creative industry. We focus on three drivers of network formation: i) network endogeneity which stresses a path-dependent change originating from previous network structures, ii) five forms of proximity (e.g. geographical proximity) which ascribe tie formation to the similarity of actors' attributes; and (iii) individual characteristics which refer to the heterogeneity in actors capabilities to exploit external knowledge. The paper employs a stochastic actor-oriented model to estimate the - changing - effects of these drivers on inter-firm network formation in the global video game industry from 1987 to 2007. Our findings indicate that the effects of the drivers of network formation change with the degree of maturity of the industry. To an increasing extent, video game firms tend to partner over shorter distances and with more cognitively similar firms as the industry evolves.

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The evolution of subsidized R&D cooperation in Germany from a proximity perspective

The evolution of knowledge networks has received considerable attention in the field of Economic Geography (see, e.g., Ter Wal and Boschma, 2009). A main motivation for this research is the question if geographic proximity remains a significant driver behind knowledge link formation when taking other forms of proximity into account. According to Boschma (2005) in particular social, cognitive, institutional, and organizational proximity might be at least as important as geographic proximity in this respect.

The present paper adds to this literature by providing a longitudinal study on the development of subsidized cooperation networks for more than 7,000 German organizations between 2004-2008. The according networks are analyzed using a Stochastic Actor-Oriented Model (SAOM) as proposed in Snijders et al. (2010).

Most existing studies in this field focus on a knowledge network within a single technology (see, e.g., Ter Wal, 2011; Balland, 2011). The present empirical analysis extends this research by investigating the evolution of multiple networks within different technologies. The latter differ significantly in the degree to which public actors contribute to their advancement. Accordingly, it is evaluated whether and if so how this matters for the evolution of knowledge networks and in particular if it relates to the relevance of the five proximity types.

*Stefano Breschi, Universita' L. Bocconi stefano.breschi@unibocconi.it**

Net in the city. Co-invention networks and the inventive productivity of US cities

In this paper, we re-examine the relationship between the structure of the co-invention network and the inventive productivity at the urban scale and argue that the lack of empirical support for the role of the topological features of the co-invention network in explaining inventive productivity of cities relates to two fundamental reasons.

First, the effect of the network structure is captured either by very simple variables or by focusing on a limited subset of the whole co-invention network and we propose two alternative measures to investigate the effect of two large-scale network properties, i.e. clustering and reach, on the inventive productivity of cities. In particular, we argue that cities whose co-invention network exhibit a combination of both high clustering and high reach should also present a higher inventive productivity.

Second, the existing studies focus almost exclusively on the structure of the co-invention network within a metropolitan area. We argue that the way metropolitan inventors are embedded in the broader network of co-invention at the national and global level crucially interacts with the structural features of the network internal to the city to enhance its inventive performance.

We test these hypotheses on a panel covering 331 US Metropolitan Statistical Areas in the years 1990-2004. Results confirm our hypotheses and indicate that cities with a network characterized by high clustering and high reach show superior inventive performances which in turn are further enhanced according to a city's capacity to interact with and to be closely linked (in the co-invention network) to other cities.

EVOLUTIONARY ECONOMIC GEOGRAPHY IV

BREAKING ROUTINES AND CREATING NEW PATHS

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Beyond Regional Resilience: Social Relations, Scale and Adaptation

The concept of resilience has become increasingly prominent in economic geography and related disciplines as the ongoing economic crisis has focused attention on the capacities of places to respond to sudden externally-induced events. Economic geographers have been keen to distance themselves from the equilibrium conceptions developed by mainstream economists, favouring a more open-ended evolutionary approach which focuses attention on the capacities of regions to adapt and learn over time. This paper questions the adoption of resilience in evolutionary economic geography, providing a theoretical and political critique of how the concept has been applied to places. In so doing, we emphasise three main points. First, the ecological concept of resilience is conservative when applied to social relations, viewing existing social networks as harmonious and neglecting patterns of inequality and the role of state institutions. Second, resilience is externally-defined by state agencies and expert knowledge, conveying an underlying imperative whereby the need for communities to become more resilient in the face of external shocks is itself naturalised. Third, a concern with the resilience of regions or communities is misplaced in terms of spatial scale, since the processes which shape resilience operate primarily at the scale of capitalist social relations. Crucially, the resilience of capitalism is achieved at the expense of certain social groups and regions that bear the costs of adaptation and restructuring. In place of resilience, we offer the concept of resourcefulness which emphasises forms of learning and adaptation based upon local priorities and needs rather than externally-defined norms.

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Creating new paths?: Agents, the state and peripheral region development

In this paper we extend evolutionary approaches within economic geography by contributing a peripheral region perspective to current debates on the processes of path branching and creation. We argue that existing approaches have, understandably, drawn most conceptual and empirical analysis of path creation and development from high performing regions possessing high levels of adaptive capacity. An important and unresolved issue remains how peripheral regions, faced with a variety of structural challenges, stimulate new pathways of economic growth. We provide a sympathetic critique of existing approaches and use the example of the offshore wind sector in two regions of Northern England to respond to the recent call for more theoretically informed empirical analysis within evolutionary debates. In particular, we argue that adopting a peripheral region perspective requires a better connection and integration of firm-level analysis with broader institutional and structural contexts to better understand the multitude of forces by which agency is implicated during path creation. We develop a conceptual framework that situates the analyses of agentic processes and mechanisms within a geographical political economy approach to path

creation and evolution. We apply our framework to better understand the contrasting trajectories of North East England, characterised by R&D policy-activism to stimulate an 'enabling environment' for offshore wind, with that of Yorkshire and Humber's more reactive 'transplant' approach to path creation. In economic development terms, we reveal that despite divergent strategies, path creation in both regions continues to be mediated by complex sets of extra-regional relations and the competitive battle for FDI.

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Path Dependence, Place Dependence, and the Evolution of a Patchwork Economy: Evidence from Western Australia, 1984-2010

Economic geographers have a longstanding interest in understanding the ways in which the geography of uneven development is both created and reproduced at multiple spatial scales. Most recently, evolutionary economic geography posits that it is possible to account for socio-spatial dynamics by employing non-equilibrium notions of place dependence, path dependence, hysteresis, and local resilience. In this paper, we operationalize these concepts within the context of an empirical model derived using contemporary time series econometrics. Subsequently, we employ this empirical model to consider the efficacy of evolutionary economic geography for understanding the socio-spatial dynamics of a 'peripheral' resource dependent and export-oriented economy: Western Australia over the period (1984-2010). This case study is intended to provide an empirical stress-test for evolutionary economic geography that goes beyond existing, and dominant, 'core' economy centered empirical analysis. In the context of the recent Australian resource boom, we find evidence of both place dependent and path dependent evolutionary trajectories that depend on the degree to which local economies are integrated into resource economy. This evidence is consistent with recent contentions that Australia can be characterized as a two-speed or patchwork economy.

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Organizational innovation and collaboration: Localized assets in the health and welfare sector

The health and welfare sector clearly illustrates the contrast between the scientific foundations of medical research and the social foundations of innovation adoption. Research in the (bio)medical sciences advances rapidly, yet the adoption, implementation and diffusion of emerging medical technologies is generally much slower. This has negative consequences for the cost, quality and equality of patient care, as well as for the government authorities responsible for delivering this care. Especially at a time when many countries are trying to cope with aging populations and rising health care costs, these realities raise a critical question for the management of technological change: How can the adoption of new welfare technologies be supported and accelerated? This paper focuses on one dimension: organizational innovation. Research on open and distributed innovation demonstrates that interaction between producers, users and other stakeholders leads to new sources of innovation but also ensures a degree of market interest and readiness. Using this

perspective, collaboration between multiple stakeholders becomes an organizational form that supports the adoption process. This is often easier said than done. Collaboration requires communication within and with partners outside the organizational boundary, and building and maintaining these multiple relations requires new capabilities. This paper examines the bottlenecks in this process of organizational innovation, and draws on a series of case studies in the Swedish welfare sector. These have implemented novel organizational arrangements in an effort to create conditions for effective communication and collaboration between stakeholder communities, thereby creating new forms of regional advantage.

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Spatio-Sectoral Evolution of Technology Networks

Patent data provide the opportunity to analyze the spatio-sectoral evolution of technology networks in several ways. First, the data present the chance to observe the genesis of a novel technology, beginning with its inception through a level of maturity. Second, the data allow for an analysis of the spatio-sectoral origin and composition of prior technical knowledge that was instrumental in the development process of a particular new product or method. Third, the citations that are listed in patent documents offer insight into the timing of knowledge spillovers, which are considered instrumental in the development process.

Taking advantage of these opportunities and the availability of almost four decades of patent data the present study explores the spatio-sectoral evolution of specific technology networks at the metropolitan scale in the United States. Based on the analysis of micro-level patent data, this study especially focuses on the spatial and sectoral extent of intra- vs. inter-metropolitan knowledge externalities, and in particular the timing thereof.

The objective of this investigation is to find out which regions fall under the categories of knowledge net-importers or in contrast net-exporters, and if these patterns persist over the life-cycle of certain technologies. It is anticipated that the findings will increase our understanding and comprehension of the evolutionary economic geography framework as it relates to inventive processes and knowledge networks.

EVOLUTIONARY ECONOMIC GEOGRAPHY V

METROPOLITAN DIVERSITY, PERFORMANCE AND PRODUCTIVITY

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Entrepreneurship, Institutions and Space: EEG meets Austrian Economics

What would we learn from bringing together Austrian economics and evolutionary economic geography? In this chapter we argue that these approaches are very complementary and commensurable. We will investigate the spatial aspects of the conditions of entrepreneurship on the one hand, and the consequences of entrepreneurship on the other hand. These consequences are the effects of individual interactions that may lead to emergence of complex systems that are largely the "result of human action, but not of human design" (Hayek 1967). These emergent systems have spatial coordinates and localised effects on the growth of knowledge and economic activity. These emergent systems, like new organizations, institutions, cities and regions, in turn form the context for subsequent entrepreneurial actions.

In this paper we will show the strengths and opportunities of Austrian Economics to the indeterminate dynamic analysis of entrepreneurship and evolving selection environments, and the spatial aspects of these processes and structures. We will explicitly investigate the bridge between evolutionary economic geography (EEG) and Austrian economics. The paper is structured as follows: in the second section, we introduce Austrian economics and evolutionary economic geography with respect to the study of entrepreneurship. In the third section we investigate entrepreneurship and its conditions of space and place. In the fourth section, we elaborate on the urban aspects of the conditions of entrepreneurship in relation with the evolutionary approach. The fifth section centres on the spatial aspects of the consequences of entrepreneurship, with a particular focus on the impact on urban and regional development.

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Knowledge neighbourhoods: intra-regional cluster dynamics in Canadian cities and suburbs

This paper examines the intra-regional business location patterns of various industrial clusters (as identified by Spencer et al, 2010) in order to show how clusters with different knowledge bases occupy specific areas of cities. Specifically, creative and cultural clusters show a clear propensity to locate in city centres while innovation driven manufacturing clusters tend towards suburban locations. These patterns are partially explained by the differences in the social processes of creativity versus innovation and subsequently how they demand different spatial arrangements at various scales. At the level of the workplace innovative industries tend to have more employees per firm and involve more material equipment and output and thus demand buildings with larger footprints. Creative and cultural industries on the other hand are characterised by smaller firms and involve less material and therefore require less physical space. These dimensions are also accentuated by traditional notions of transportation access and rents which contribute to the overall spatial patterns of firms. The main focus of the paper however, is to show how these

geographies also shape the knowledge production processes involved in each type of industry. Creative and cultural industries in particular involve closer proximity (relational and spatial) to sites of consumption, more project-based work, and shorter product life-cycles which greatly increases the need for dense clusters of firms at the centre of large and diverse urban areas. The paper concludes by linking regional economic development policy with implications for urban planning and design.

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Sector structure, Evolution and Agglomeration Externalities. Testing the impact of related variety, unrelated variety and specialization in a cross-section of European regions

Our understanding of the role of different sector structures in enhancing or impeding the generation of agglomeration externalities has been deepened by studies that followed Glaeser (1992) in comparing the different effects of regional specialization and diversity. The dichotomy of regional specialization and diversity employed following that study (see De Groot et al. (2009) and Melo (2009) for meta-analyses) is however running into both theoretical and empirical limitations. The literature has recently made progress towards building up a more coherent theoretical framework for agglomeration externalities by linking this concept with the evolutionary approach to Economic Geography. Frenken et al. (2007) have disentangled the concept of diversity into related variety and unrelated variety, and argue that based on insights from the evolutionary perspective related variety should be especially important in generating knowledge externalities. Support of this has so far been limited to country studies only. Based on a European database covering 19 EU countries, this study puts the hypotheses on agglomeration externalities more thoroughly to the test on the NUTS2 regional level. In line with Frenken et al (2007), we hypothesize that related variety fosters employment growth, specialization fosters productivity growth and unrelated variety hampers unemployment. This level of analysis is also important for recent EU policy initiatives, like the place-based development strategies and smart specialization initiatives related to future cohesion policies (Barca 2009, European Commission 2011). We link our outcomes to these policy debates.

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The impact of diversity and variety on US metropolitan employment growth

Diversity and variety are key theoretical concepts in evolutionary economics. A number of papers in evolutionary economic geography distinguish between "related" and "unrelated" variety and examine their impact on regional economic growth, stability, path creation, lock-in and regional technological branching. While attempts have been made to measure variety and examine its impact on regional economic outcomes, three shortcomings still exist. First, there is no systematic theoretical discussion of the relationship between diversity and its components, variety, balance, and disparity in an economic geography context. Second, the translation of those theoretical categories into empirically measurable categories is developed insufficiently. Third, there is

insufficient attention to the spatial and temporal scale over which the impact of diversity should operate. This paper attempts to address those three points. It will first offer a systematic discussion of the concepts of diversity, variety, balance and disparity, summarize existing measures for those categories in other disciplines and those applied in economic geography, and analyze the impact of those measures on US metropolitan employment growth with a particular emphasis on the temporal resonance of diversity.

EVOLUTIONARY ECONOMIC GEOGRAPHY VI

SPIN-OFFS, FIRM FORMATION, AND SKILL MATCHING

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Spin-off dynamics and the emergence of industrial districts: an evolutionary perspective

The emergence of industrial clusters or alike is often explained using the concept of agglomeration economies. In addition, the success of this organisational structure has been also explained in terms of good institutions, common roots and trustful cooperative relationships coupled with Marshallian externalities. More recently these two explananda have been reconsidered. On the one side, Klepper and colleagues (Buenstorf and Klepper, 2008; Klepper 2007; Boschma and Wenting, 2007) have read through new lenses the story of some of the most successful experiences of industrial agglomerations in the USA (e.g. Detroit; Silicon Valley). They argue that regional culture, local institutions and agglomeration economies are not the primary sources of the emergence and consolidation of these two clusters. They rather contend that the spin off phenomenon drove the process of agglomeration. On the other hand, Lazerson and Lorenzoni (1999) among others have criticized the over-socialised view prevailing in most of the industrial district literature (Piore and Sabel, 1984), and have elaborated a micro-based view of cluster evolution, in which leader firms and network-based relations constitute the main drivers of cluster dynamism. Following these two latter streams of literature, this paper investigates the emergence and evolution of some successful and paradigmatic examples of Italian Marshallian district. Drawing on the methodology proposed by Klepper, we aim at assessing whether founders characteristics affect the survival of firms, if social networks explain the localisation of spin off, and the degree at which, in the Italian case, a "Marshallian district" exception can still be identified.

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The Downside of Social Capital in New Industry Creation

Despite the support that social capital can provide for entrepreneurs in general, we argue that it is more likely that social capital hampers the creation of new industries. New industries are surrounded with controversy as established norms and values are being challenged and vested interests in substitute industries are being threatened. With social capital comes conformity bias within tight groups, both regarding values and ideas, and hence, a barrier for venture creation in new industries. Once an industry becomes more legitimate in that more entrepreneurs in a region are becoming active in this industry, the less contested will new ventures in this industry be, and the less restrictive social capital will be on new foundings. That is, social capital is expected to discourage entry in new contested industries, while it is expected to promote entry in established legitimate industries. In principle, the net effect of social capital on entrepreneurship can even become positive once a growing stock of firms renders the industry more legitimate. The context of our study is the US video game industry. Using regional founding rates of new firms allows us to provide a fine-grained analysis of the legitimation processes at work back to its founding in the year 1972. We find evidence for our thesis that social capital discourages entry in new contested industries, while it promotes entry once a critical mass of firms has already been established.

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Spawning from the Ivory Tower: What affects the rate of new firm formation by faculty & staff and students?

This paper examines the spawning of new company founders' from 200 U.S. academic institutions, using a unique database. We examine both local and non-local spin-offs by employees and students. Accordingly, institution quality, the strength of the local entrepreneurial cluster in the region where the institution is located, and the share of R&D expenditure financed by the federal government positively affect the rate of spawning. On the other, hand the capacity of the university technology licensing office (measured by license revenues per R&D expenditure) has a negative impact on the rate of academic spawning. Moreover, we find evidence that after controlling for the entire institution rank, the rank of the business school has a positive and significant impact on the institution-spawning rate. When comparing the local spin-offs to non-local spin-offs we find that while 42% of faculty spin-offs are created in the region of the academic institution. Not surprisingly, we find that local cluster strength and culture has very limited impact on non-local academic spin-offs. Moreover, institution R&D expenditure and sources of R&D finance has low impact on non-local academic spin-offs.

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Education-job match and the transition from study to work. A comparison of Lombardia, Lazio and Campania

As academic research, within and outside the evolutionary tradition, has long pointed out, the impact of graduates on economic performance and knowledge creation depends on the level of technological development of the area/region where they are located: an advanced region will benefit more than a backward one from a highly skilled labour force. This paper looks at the determinants of the education-job matches of recent University graduates, a highly skilled and highly mobile segment of the society. The country of interest is Italy and the paper compares regions at different stages of techno-economic development.

The aim is (1) to identify what educational backgrounds are most demanded in different areas and (2) to assess whether these are sourced from local higher education institutions or from other regions. The analysis will be based on a survey run by the Italian National Statistical Institute (ISTAT): the 7th edition of the Indagine sull'Inserimento Professionale dei Laureati (Survey on graduates' entry into the labour market). This covers the 2004 cohort of graduates, who are interviewed in 2007.

The paper uses Heckman-selection models to study the determinants of job-education matches. Such techniques are necessary because our dependent variable is observed only for employed graduates and, as the same characteristics that affect employability may also affect the education-job match itself, standard regression techniques would deliver inconsistent results.

EVOLUTIONARY ECONOMIC GEOGRAPHY VII BRIDGING THEORY AND PRACTICE

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Geographies of Knowledge Production and Innovation

This paper surveys the topic of the geography of innovation - not the economics of innovation – and asks several questions: What is innovation? Who innovates? Where do they learn to innovate? The research focus has shifted from innovation and technology to the broader issues of knowledge and innovative capability. The empirical literature has been much narrower in scope, previously focusing on R&D and now rarely looking beyond patents. This paper surveys a broader set of innovation indicators – inputs, outputs, and hidden innovation, much of which is uncovered in large-scale surveys. Empirically, there is a global shift in innovative capability toward Asia, primarily in R&D (but less so in basic research) and in process innovation related to manufacturing. The overall pattern is one of persistent spatial concentration. As a result, a thriving business has

emerged to craft policies to enhance innovation and to "construct advantage" in an uncertain competitive landscape. Finally, the actors in innovation are considered: not only individual scientists and inventors, but also the organizations that employ them, such as universities and firms. It is entrepreneurs who largely determine how innovation is exploited. The fruitful concept of the knowledge filter and the role of entrepreneurship and the geography of entrepreneurship provide clues to the patterns seen.

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Doing evolution in Economic Geography

Concerns have been articulated recently in Economic Geography for more rigour, transparency and dialogue about the relationships between theory, concepts, method, politics and policy. Here, we seek to contribute and move beyond the consensus that the variant and emergent approaches to evolution in Economic Geography should employ plural methodologies - both quantitative and qualitative – better to engage diversity, heterogeneity and change in the economic landscape. Our aim is to identify some of the thorny issues for doing evolution in Economic Geography: i) clarifying and distinguishing theory and concepts as well as our objects and subjects of study; ii) grasping and assessing whether and how 'history matters' (or not) and in what particular ways; iii) operationalising concepts and theories systematically to analyse and interpret meaning from our empirics; iv) developing comparative methodologies and research designs through time, between places and across scales; and, v) divining the relevance of evolutionary approaches for politics, policy and praxis. Drawing upon examples from our ongoing empirical work, we argue that greater openness, substantiation, reflection and engagement is integral to strengthening our approaches to the challenges of theory, concepts, method, politics and policy that confront those researching evolution in Economic Geography.

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The emergence of new industries at the regional level in Spain. A proximity approach based on product-relatedness

How regions diversify over time? Inspired by recent studies, we argue that regions diversify into industries that make intensive use of the capabilities in which they are specialized. As the spread of capabilities occurs through mechanisms like spinoffs that have a strong regional bias, we expect that capabilities available at the regional level play a larger role than capabilities available at the country level for the development of new industries. To test this, we analyze the emergence of new industries in 50 Spanish regions at the NUTS 3 level in the period 1988-2008. We calculate the

capability-distance between Spanish regions and new industries, and provide econometric evidence that regions tend to diversify into industries that use similar capabilities. We also show that proximity to the regional productive structure plays a much larger role than proximity to the country productive structure in the emergence of new industries. This result suggests that capabilities should be built at the regional level to enable the development of new activities.

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Bridging science and traditional industry: regional innovation systems and institutional change for emergent biorefinery technologies

While institutions have played a prominent role in regional innovation systems research, little attention has been paid to the causes and conditions for institutional change, and its consequences for innovation and regional economic development. There is thus a need for empirical research and theory development to understand the relationship between institutional change and innovation system characteristics, dynamics and economic performance.

This paper focuses on institutional persistence and change in regional innovation systems by means of analyzing innovation biographies. Such biographies are used to generate detailed insights into the ways in which key actors have followed, ignored or changed institutions in the course of an innovation's development trajectory. Particular attention is given to actors' attempts to bridge the gap between basic science and industrial application of knowledge, a gap which is forcefully sustained by institutional mismatch between different segments of society. Triggering events and critical incidents representing major changes in practice and/or major breakthroughs or failures are identified and analyzed.

Empirically, the paper analyzes the strategies adopted by key actors in the Swedish VINNVÄXT program 'Biorefinery of the Future'. This initiative seeks to develop the regional innovation system in the Örnsköldsvik area (Northern Sweden), by wedding knowledge and competencies from established pulp & paper, chemical and energy companies and universities within and outside the region on the basis of biorefinery technologies (i.e. a facility that integrates biomass conversion processes and equipment to produce environmentally friendly fuels, power, heat, and value-added chemicals from biomass).

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Specialisation or diversity? What is the 'smart' strategy to grow EU regions?

EU has launched 'smart specialisation' as the new strategy for promoting innovativeness, competitiveness and growth in EU regions. However, what is meant by this concept is not the traditional specialisation of exploiting localisation economies in regional clusters. On the contrary, it seems to be more a question of combining a related variety perspective with generic technologies to develop unique and original activities and, in the long term, entirely new sectors. This aim resembles the constructing regional advantage approach, which means turning comparative

advantage into competitive advantage through an explicit policy push promoting a Chamberlinian monopolistic competition based on product differentiation creating unique products.

However, 'smart specialisation' understood in this way, also have to be further specified. In addition to talking about 'smart specialisation' from a production perspective, which resembles the traditional specialisation of regional clusters most closely, one can talk about smart specialization based on knowledge bases, on markets, and, finally, on demand.

Accordingly, regional innovation policies have to be upgraded. In Europe new initiatives of developing cluster policies into 'Centres of Expertise' can be observed in the Nordic countries, and VINNOVA of Sweden has focused their regional innovation policies as 'Strong Research and Innovation Milieus', underlining the importance of proximity between knowledge exploration and exploitation spatially as well as organisationally. In this paper these theoretical perspectives will be developed to achieve a more systematic understanding of what could be understood by 'smart specialisation' as a step towards replacing it with a more adequate concept.

EVOLUTIONARY ECONOMIC GEOGRAPHY VIII

THE DYNAMICS OF CLUSTERS

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Industrial Agglomeration vs. Clusters - "Real" Communication or is it all "in the air"?

The notion of clusters and agglomeration has taken on an iconic character in discussions of local strategies for economic growth. Confusion over the meaning of the terms in fact confuses policy. Ordinarily, academic debates about definitions seem arcane and irrelevant to the conduct of real policy. However, in this case it is central. Clarifying the meanings is an essential first step toward understanding and developing local policies. The debate about whether agglomerations clusters drive growth can only be resolved by carefully defining growth. Agglomerations, as we use the term in this essay, are simply large numbers of firms or people doing the same things in the same places. They need not be connected, they need not be collaborators, and they may be just anomic isolated bits and pieces. Clusters imply interconnections that support the competitive position of each of the elements. Clusters can be the basis of growth. Regions with characteristics of clusters often have economic success. Agglomerations may be just economic blobs that just sit there. We find the evidence in four case studies: two well known and two emerging locations for the biotechnology industry.

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A Relational-Evolutionary Perspective of Cluster Dynamics

In the past decade, economic geography has encountered increasing interest and debates about evolutionary and relational thinking in regional development. Rather than comparing both approaches, this chapter investigates how they can complement one another and be applied to specific research fields in economic geography. A comparison would be difficult because the approaches address different levels of the research process and are in a relatively early stage of their development. To demonstrate the potential of combining the two approaches, this chapter aims to conceptualize cluster dynamics in an integrated relational-evolutionary perspective. In recent years, research on clusters has experienced a paradigmatic shift from understanding their network structure to analyzing dynamic changes. Within this context, inspired by relational and evolutionary thinking, a comprehensive tri-polar analytical framework of cluster evolution is developed that combines the three concepts of context, network and action, allowing each to evolve in interaction with the others. Through this, the paper argues that, rather than viewing relational and evolutionary accounts as competitive approaches to economic geography, they can, in an integrated form, become fundamental guides to economic geography research.

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Evolutionary Economic Geography in the Field(s): Sustained action and adaptive cluster management

The metaphor of evolution provides economic geography with an alternate lens through which to view economic development theory and practice. The purpose of this paper is to demonstrate how the practices of cluster managers and the strategic deployment of adaptive practices that expand local networks (i.e., reconfigure scale), identify new pathways for growth (i.e., expand scope), and increase the connectivity of an "original" cluster to expand the number of actors in the network. The paper examines the case of the NW Ohio Greenhouse project and outlines the changing nature and structure of the agricultural cluster's activities beyond its limited focus on competing in existing markets to include key industrial inputs, alternate distribution networks, and production related pilot projects. Finally, the paper emphasizes the importance of cluster management and represents a significant departure from much of the evolutionary literature in economic geography. Indeed, cluster "administrators" play a critical leadership role, coordinate shared resources, serve as a region's visible social agent, and shape (albeit in partnership with firms and labor) the trajectory of the broader cluster and its participants.

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Clusters in Transition

Many recent studies of clusters argue that new firm formation is a key process in the emergence and functioning of successful clusters since it replicates successful routines, creates variety and also adds to agglomeration economies. However, little attention is given to the role entrepreneurship in declining or mature clusters. Spinoffs and new firm formation also occur when more mature clusters are declining and might help clusters in the transition from old technologies into related areas. This process becomes even more important when large and central firms in a cluster close down.

The case to be studied in detail is the high technology cluster of wireless communications firms around Aalborg Denmark. We have collected data on all firms in the cluster in the period 1970-2011. We have information on entry, type of entry, exit, background of founder and number of employees. In addition we analyze where all the employees went from to large key companies that closed down in 2009. We find a transition of the cluster where spinoffs play an important role. Many of the new entrepreneurs founded their firm based related to activities they had in their old job, but not necessarily related to the wireless technologies of the cluster. Some of the former cluster employees get a job in related IT industries in the region thus adding to the transition. As a result the old cluster focused on wireless communication technologies is in a transition into a broader ICT cluster.

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M&A's as drivers of spatial clustering. The spatial evolution of the Dutch banking sector in the period 1850-1993

We describe and explain why the Dutch banking cluster clustered in the Amsterdam region. This analysis is based on an unique database of all banks in the Netherlands that existed in the period 1850-1993. We examine the extent to which merger and acquisition activity and the location of Amsterdam had a significant effect on the survival rate of Dutch banks during the last 150 years. Our analyses demonstrate, among other things, that Amsterdam banks were disproportionately active in acquiring other banks, leading to a further concentration of the banking sector in the Amsterdam region.

EVOLUTIONARY ECONOMIC GEOGRAPHY IX

AGGLOMERATION, EXTERNALITIES, GROWTH, AND RESILIENCE

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Labour market externalities and regional growth. The importance of labour mobility between skill-related industries

This study investigates the relationship between labour market externalities and regional growth based on real labour flows. More in particular, we test for the importance of labour mobility across so-called skill-related industries. We make use of a sophisticated indicator that measures the degree of skill-relatedness between all industries, and we employ actual labour flows between 435 4-digit industries within 72 Swedish labour market regions to estimate the effect of labour market externalities on regional growth in the period 1998-2002. Our fixed effect models demonstrate that a strong intensity of intra-regional labour flows between skill-related industries impacts positively on regional productivity growth, but less so on regional employment growth. Labour mobility between unrelated industries tends to dampen regional unemployment growth.

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Clusters for life or life cycles of clusters In search of the critical factors of cluster resilience

This paper investigates the driving forces behind the life cycles and resilience of technological clusters. It concentrates in particular on the combination of critical parameters that allows clusters to succeed in disconnecting their cycle from the cycle of the technologies they produce, in order to maintain stability and growth in unstable economic environments. Three propositions on location decision externalities, the life cycle of composite technologies, and the structural properties of knowledge networks, are developed and introduced in an inclusive study of cluster trajectories. Discussions show that resilient clusters are the ones that combine network and external audience effects in location decision-making, and evolve towards a specific core/periphery and disassortative structure of knowledge interactions along the knowledge and market phases. Understanding these evolutionary pathways could be at the heart of the renewal of cluster and regional policy in a macro-economic context characterised by high instability and new growing consumer paradigms

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Knowledge geography, the Trade Related Aspects of Intellectual Property Rights (TRIPs) Agreement and the development of India's pharmaceutical industry

This paper examines the World Trade Organisation's (WTO) Trade Related Aspects of Intellectual Property Rights (TRIPs) Agreement and its implications for knowledge geography. In the economic geography literature, patents have been used as a measure of innovation, while patent citation

trends have been analysed to investigate the geography of knowledge spillovers. To explain why local concentrations of patent citations occur, economic geographers have focused on how the technical characteristics of tacit and codified knowledge influence their transferability. While this literature largely assumes the presence and implementation of patent laws, the TRIPs Agreement has created a new patent regime in many countries in the global South. The TRIPs Agreement has been particularly controversial, yet its proponents and critics alike have implicitly debated knowledge geography in a different way to the economic geography literature, focusing on how patents influence international flows of knowledge and permission to appropriate that knowledge. Through the case of India's pharmaceutical industry, I consider the implications of the TRIPs debate for knowledge geography. Changes in patent law have played a crucial role in the Indian pharmaceutical industry, with the growth of the domestic industry widely attributed to the absence of product patents, while substantial restructuring has taken place in recent years with the implementation of TRIPs. The paper emphasizes the influence of political-economic governance structures on patterns of knowledge flow and appropriation, and shows that patents need to be considered not just as independent measures of patterns of innovation, but as actively influencing those geographies themselves.

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Regional path dependency and technological change: the case of the automotive crash-safety sector in Västra Götaland, Sweden

The global automotive sector is currently facing a number of challenges including financial instability, overcapacity and not the least new environmental and safety concerns from both customers and the society at large. This has profound implications for the future position of traditional European automotive regions. This paper investigates the relation between technological change, social networks and regional policy in an automotive-based regional economy. The analysis is based on a case study of the change from a passive to an active crash safety paradigm, highlighting the transition from an engineering-based sectorial knowledge logic towards a situation where the combination of different knowledge domains, actors and institutions is necessary in order to solve technological problems. A biographical methodology is used to construct time-space ego-networks of the interrelations involved in concrete innovation processes. This allows for a detailed understanding of the sequence and multi-scalar geography of interrelations between the technological, social and policy spheres. Preliminary findings from the research show evidence of the importance of geographical proximity for the establishment of relations between technology, policy and social networks in the long-term development of regional sectorial specialized competence. Furthermore multi-scalar interactions have been increasingly important over time, for example coordination of EU and national traffic safety policy. One further observation is the, to some extent conservative, role and power of large corporations on regional and local industrial development and change.