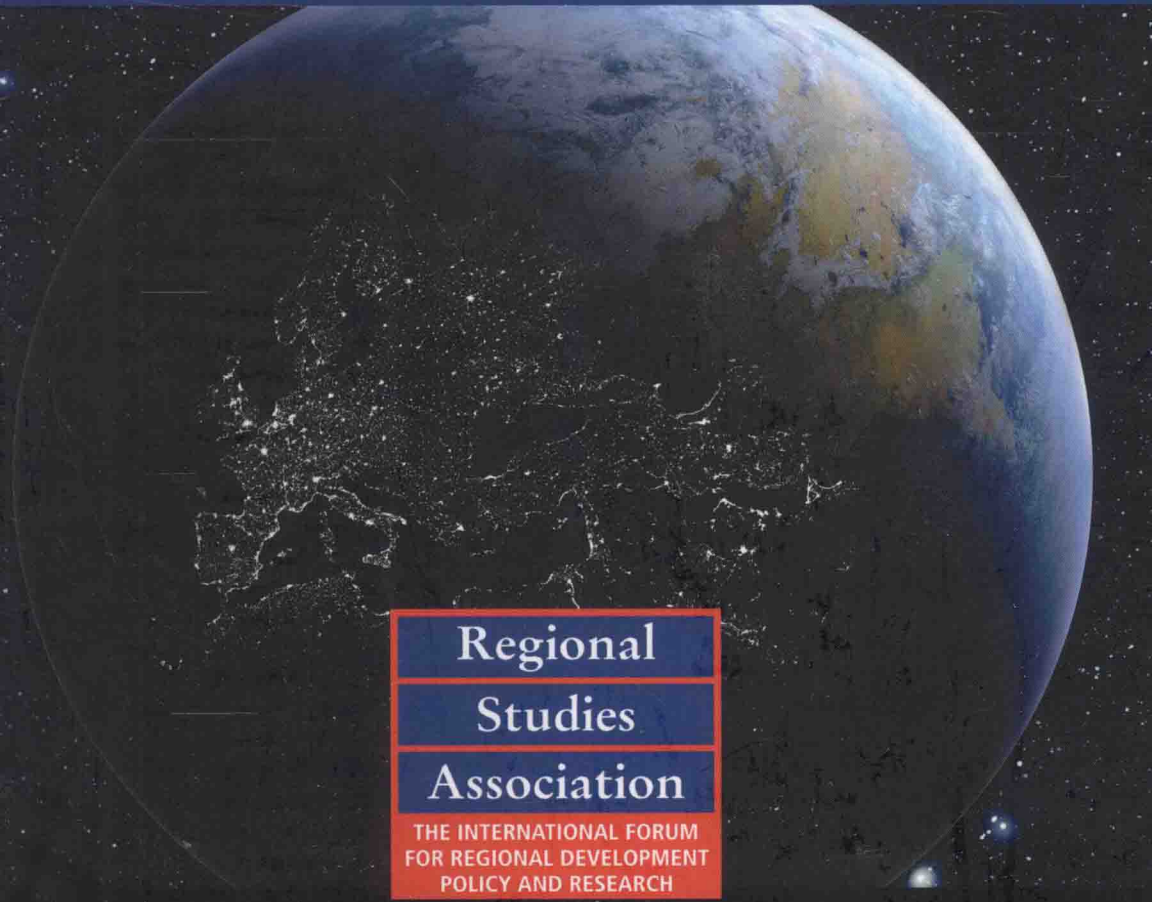


BEYOND TERRITORY

DYNAMIC GEOGRAPHIES OF KNOWLEDGE
CREATION, DIFFUSION, AND INNOVATION



**Regional
Studies
Association**
THE INTERNATIONAL FORUM
FOR REGIONAL DEVELOPMENT
POLICY AND RESEARCH

REGIONS AND CITIES

EDITED BY HARALD BATHOLT,
MARYANN P. FELDMAN AND DIETER F. KOGLER

Beyond Territory

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Creation, Diffusion

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**Edited by Harald Bathelt,
Maryann P. Feldman and
Dieter F. Kogler**



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Preface

The ongoing debate about the role of spatial relations, geography and territory in processes of economic innovation motivated us to consider this book project about the dynamic geographies of innovation, from the perspective of many specialized, experienced scholars based in different disciplines. The goal of this project was to identify and discuss some of the key debates, new streams of inquiry and progress in research related to the transfers, circulation and generation of knowledge in a spatial perspective. Furthermore, our intention was to include different, sometimes opposing, views and positions, and let the diverse group of researchers speak about what they think is needed to move the research front further. We are, of course, aware of the subjective character of such a narrative and about its limitations, but our main agenda was to instigate further academic debate.

This book was conceived during the annual meeting of the Association of American Geographers in San Francisco in 2007, building on four related sessions followed by lively discussions about new tendencies in the organization and spatial dynamics of innovation. The fact that the realization of this project took much longer than anticipated is, unfortunately, one of the challenging realities in academic life. We owe much of the original motivation for this project to Aydan Kutay, Peter Maskell, Meric Gertler and Allen Scott, who were our discussants, and to the questions and comments from the audience. We are aware that the debates presented in the book chapters only represent a segment of the manifold shifts that are percolating at the intersections of economic organization, knowledge creation and innovation. With this book, however, we hope to provide some stimulus for academics, students and policy-makers who are interested in contributing to the field. Our inquiry is characterized by heterogeneity in the use of concepts, methods and heuristics. We view this heterogeneity as an asset, and encouraged each of the contributors to contextualize their studies. As a consequence, each chapter is positioned within the context of more general debates about knowledge creation, circulation and innovation. Through this format, we aim to explicate existing connections between innovation research and wider economic, societal and geographic research questions.

Furthermore, we also asked the contributors to explicitly draw conclusions regarding further developments in innovation research, areas of interest for

future research and new research questions, as well as policy implications related to their findings. Through this, we not only aim to portray some of the recent trends in innovation research, but also help students and practitioners develop their own ideas regarding their research or professional focus.

This edited volume is not just based on our own initiative; it involved numerous individuals and significantly benefited from their advice, without which it would not have been possible to generate the sense of a joint project and put this diversified collection together. Among those who have dedicated their time to this project, we would like to particularly mention the editorial team of Routledge, namely Simon Holt, Thomas Sutton and Emily Senior, as well as Rachael Gibson, Nicole E. Kogler, Andrew Munro, Ben Spigel and Clare Wiseman. Further, this book has benefited substantially from financial support through the Canadian Social Sciences and Humanities Research Council and the Canadian Research Chair program.

Recently, during the preparation of this volume, we were shocked to hear about the sudden and unexpected passing away of our dear friend and contributor Bent Dalum. We would like to take this moment to dedicate this book in his memory.

Contents

<i>List of figures and tables</i>	xi
<i>List of contributors</i>	xiv
<i>Preface</i>	xvi
1 Territorial and relational dynamics in knowledge creation and innovation: an introduction	1
HARALD BATHELT, MARYANN P. FELDMAN AND DIETER F. KOGLER	
PART I	
Agglomeration: aspects of specialization and diversity	9
2 Marshallian localization economies: where do they come from and to whom do they flow?	21
W. MARK BROWN AND DAVID L. RIGBY	
3 Local diversity and creative economic activity in Canadian city-regions	46
GREG M. SPENCER	
4 Technological relatedness and regional branching	64
RON BOSCHMA AND KOEN FRENKEN	
5 Evolution of the geographical concentration pattern of the Danish IT sector	82
CHRISTIAN R. ØSTERGAARD AND BENT DALUM	

PART II

Beyond territory: evolutionary spatio-sectoral dynamics 105

6 The emerging industry puzzle: optics unplugged 107

MARYANN P. FELDMAN AND IRYNA LENDEL

7 Food geography and the organic empire: modern quests for cultural-creative-related variety 149

PHIL COOKE

8 Beyond spillovers: interrogating innovation and creativity in the peripheries 168

ANDREY N. PETROV

9 The BioValley: knowledge dynamics in a headquarter location of transnational pharmaceutical corporations 191

BERNHARD FUHRER AND PAUL MESSERLI

PART III

Making connections: bridging the local and the global 205

10 Islands of expertise: global knowledge transfer in a technology service firm 207

JOHANNES GLÜCKLER

11 Knowledge bases, modes of innovation and regional innovation policy: a theoretical re-examination with illustrations from the Nordic countries 227

BJØRN ASHEIM, ARNE ISAKSEN, JERKER MOODYSSON AND MARKKU SOTARAUTA

12 Global buzz at international trade fairs: a relational perspective 250

NINA SCHULDT AND HARALD BATHELT

Concluding remarks 265

13 Beyond territory: a geographical perspective on knowledge creation and innovation 267

DIETER FRANZ KOGLER, HARALD BATHELT AND MARYANN P. FELDMAN

Index 280

Figures and tables

Figures

3.1	Knowledge-production industry classification system	53
5.1	IT employment specializations in functional urban regions in 1992 and 2002	90
5.2	IT sector specialization in functional urban regions in Denmark from 1992 to 2002	93
6.1	Distribution of OSA academic programs	125
6.2	The distribution of OSA companies' patents by IPC classes	131
6.3	The distribution of OSA companies' patents by USPTO classes	132
6.4	The distribution of optics industry: total number of patents and applications by MSA, 2004–2007	136
7.1	Regional 'worlds of production' in the contemporary era	153
7.2	Worlds of production in the agro-food and tourism industries	154
7.3	Representation of the Rogaland, Norway, regional culinary innovation platform	157
8.1	Tech pole and talent indices in Canadian regions	175
8.2	Classification of local innovations in northern Ontario	181
9.1	BioValley companies 2007/2008	193
10.1	The knowledge-transfer network of MILECS	217
10.2	The knowledge network of MILECS without 15 key individuals	219

Tables

2.1	Description of variables	25
2.2	Descriptive statistics	32
2.3	Labor productivity as a function of plant and place characteristics: general model results	33
2.4a	Labor productivity as a function of plant and place characteristics: domestic, single-plant and foreign/multi-plant firms	35
2.4b	Labor productivity as a function of plant and place characteristics: single-plant and foreign/multi-plant firms (less scale-based industries)	37

xii *List of figures and tables*

2.4c	Labor productivity as a function of plant and place characteristics: domestic, single-plant and foreign/multi-plant firms (scale-based industries)	38
2.5	Labor productivity as a function of plant and place characteristics: domestic, single-plant firms by plant size	39
2.6	Labor productivity as a function of plant and place characteristics: domestic, single-plant firms by decade of birth	40
2.7	Labor productivity as a function of plant and place characteristics: domestic, single-plant firms by plant size and decade of birth	41
3.1	Model 1 correlation matrix	54
3.2	Model 2 correlation matrix	55
3.3	Industrial location quotients for Canadian city-regions	57
3.4	Summary of results for economic performance models	58
3.5	Summary of results for economic structure models	59
5.1	Top-ten total employment regions	91
5.2	Top-ten total employment regions	92
5.3	Specialization of the largest regions in engineering and natural-science educated people	96
5.4	The educational composition of IT sector employees in the largest regions	98
5.5	Diversity in the top-ten total employment regions	99
6.1	Definition of optics according to 2007 NAICS	114–115
6.2	Definition of optics according to 2002 NAICS	116
6.3	Number of patents by USPTO optics classes, 2004–2006	118–119
6.4	Definition of optics in IPC classes	120–124
6.5	Specialization of dedicated academic optical science programs	128–129
6.6	OSA member patents by IPC group	132
6.7	Detailed definition of emerging optics science industry	134–135
6.8	Specialization of innovation among the top US patenting companies in optics	138–139
6.9	Regional optical science specialization	140
6.10	Regional specialization of US self-identified optics and photonics clusters	142–143
7.1	<i>Bocuse D'Or</i> chef contest placings 1987–2005	158
8.1	Selected characteristics of creative capital in northern Canadian communities	177
8.2	Selected typological characteristics of innovation 'success stories' in northern Ontario	184–185
8.3	Local projects funded by Kirkland Lake and District Community Development Corporation	186
9.1	Overview of conducted interviews	192
9.2	Spin-off chemicals process: new chemicals TNCs spun out from Roche and Novartis	195
9.3	'Spin-off pharmaceuticals' process	196
10.1	Variable labels and definitions, dyad level	216

10.2	MRQAP regression models, dependent variable	219
10.3	OLS unstandardized regression coefficients for predicting knowledge transfer across offices	222
11.1	Differentiated knowledge bases: a typology	234

1 Territorial and relational dynamics in knowledge creation and innovation

An introduction

Harald Bathelt, Maryann P. Feldman and Dieter F. Kogler

Innovation quo vadis? What have we learned and what remains?

Innovation and knowledge generation are perceived as driving forces in the economy, yet diverse temporal and territorial dynamics condition their effects. Advanced economies have experienced significant structural change in their shift from standardized Fordist mass production to a post-Fordist regime (Jessop 1994). Globalization and the rise of new technologies have been major underlying, complementary forces behind this paradigm shift. Among the key features of this new mode of economic accumulation is an increased emphasis on innovation processes as the prime drivers of capital and welfare gains. In addition, while the Fordist system was supply-side driven, the new system appears more demand-side driven, in particular shaped by worldwide demand structures which call for flexibility in terms of workforce and production. Following this shift, nation states have reorganized themselves into supranational, national, regional and trans-local entities, and these pragmatic changes have initiated widespread research interest in a multitude of disciplines. The accompanying shift away from the Keynesian welfare state towards a Schumpeterian workfare state has led to a reformulation of the primary economic functions of governments (Jessop 1995). However, despite the significance of these changes and the myriad attempts to analyze the corresponding socio-spatial processes, efforts to theorize about questions of scale and territory still leave many questions unanswered (Peck 2002). While there is a contemporary widespread consensus in the academic literature that knowledge, learning and innovation are key elements to economic development and competitiveness, there is less agreement about the nature of socio-economic interactions across different spaces and scales that condition the effects of these elements for firms, regions and nations.

The study of innovation encompasses an increasingly wide and rich field of conceptual and empirical studies and debates, which span across disciplinary boundaries in the social sciences. Yet if we ask ourselves what we know about the nature of innovation processes – and in particular about the complex interplay between the agents involved, their social structures and the role of

institutions – it is certainly not easy to give simple answers. There is broad recognition that the innovation process is not linear in character, involving a series of discrete stages, but is a multifaceted process characterized by non-linear feedback mechanisms, through which ideas are constantly checked, questioned and improved (Kline and Rosenberg 1986; Malecki 1991; Bathelt and Glückler 2003). The phenomenon of innovation combines different processes through which these feedback loops are produced and which often take place simultaneously. These include (1) the production or recombination of knowledge, (2) the transformation of new knowledge into artifacts and (3) the continuous adjustment of these artifacts to market changes. As a consequence, innovation is a process that involves continuous learning: learning by doing, by using, by interacting, by monitoring and observation and even by failing. As such, innovation is a cumulative process, which is evolutionary in character (Nelson and Winter 1982; Dosi 1988) and fundamentally grounded in space.

The evolving knowledge economy is characterized by an increasing social division of labor. This is supported by a number of organizational characteristics that contribute to increasing specialization of knowledge and innovation. These include (1) industrial R&D in large-firm laboratories, (2) technological convergence and vertical disintegration, leading to an increasing social division of labor in innovation and (3) systematic industry–university linkages (Pavitt 2005). As product architectures become more complex and as firms outsource activities, innovation becomes a deeply social process involving many different agents and collaboration between these agents, be it within firms or between them, within the same geographic space or spanning over great distances.

The innovation process defies simple characterizations and descriptions (Pavitt 2005). A myriad empirical studies on innovation have shown that innovation processes are extremely heterogeneous, with features that differ drastically with industry, firm size and other contextual variables (Bunnell and Coe 2001). Research has shown that processes of learning, knowledge creation, circulation and diffusion, and innovation – namely, the transfer to and application of novel products and processes in the market place – are often localized in the context of metropolitan regions and/or industrial clusters (Feldman and Audretsch 1999). This localized character of learning is related to the fact that knowledge is concentrated and embodied in particular people and machines, and is thus tied to some degree to specific production contexts. As such, it is partially immobile, thus leading to place-specific learning processes. Complementary products and technologies, which result from regional specialization and agglomeration, stimulate further interactive learning and encourage the development of region-specific paths of knowledge and technology development (Maskell and Malmberg 1999). Due to the nature of innovation, such regional development trajectories are relational in character (Bathelt and Glückler 2003). They are experience-driven, context-specific and cumulative. Spatial proximity enables regular face-to-face meetings and, in dynamic innovation contexts, encourages the development of localized conventions, which serve to stimulate further learning and knowledge generation (Storper 1997).

As a consequence, innovation is often a process that includes a specific territorial dynamic, be it in the form of a national innovation system which is reproduced through formal and informal institutions (Lundvall 1992a; Nelson 1993), or in the form of regional specialization patterns and learning processes affected by specific regional assets, prior specializations or specific skill levels (Maskell and Malmberg 1999). Since the mid-1990s, numerous large empirical studies have investigated the existence of wider spatial patterns of patenting (e.g. Cantwell and Fai 1999), knowledge spillovers (Verspagen and Schoenmakers 2004), innovation networks and systems of innovation (e.g. Koschatzky 1998, 1999; Tödtling and Kaufmann 1999; Arndt and Sternberg 2000; Koschatzky and Sternberg 2000). These cross-regional, cross-sectoral and cross-national studies have, however, not been able to identify clear regularities with respect to geographic innovation characteristics. The results indicate that innovation is a firm-specific process, organized differently according to firm types and firm characteristics. Suppliers, users and universities are consulted in different ways in this process and integrated in different configurations (Tödtling and Kaufmann 1999). This is confirmed by studies that have shown that large firms are a central source of innovation, due to their accumulation of assets and capabilities (Cantwell and Fai 1999; Christopherson and Clark 2007). Within large firms, important technological learning processes take place which result in the formation of firm-specific competencies in innovation. Through this, cumulative paths of technology development are created which are relatively stable over time, and mostly change in a gradual pattern (Easterly and Levine 2001).

Related to innovation and its institutionalization, entrepreneurship is another complex that has a fundamental geographic dimension. Entrepreneurs are seen as fundamental to innovation (Lowe and Feldman 2007). Rather than scanning the landscape for an optimal location, entrepreneurs tend to stay in the locations where they were previously employed or move to places where they have other prior social ties. The ideas that entrepreneurs build on reflect their prior experiences and human capital. These ideas are further refined and shaped by the local economic and social contexts in which they take shape and are brought to market. Power relationships between small firms and their larger counterparts determine both the ability of entrepreneurs to break away as well as their viability and growth potential. Entrepreneurs sometimes develop radical innovation that does not fit within the confines of existing firms, thus making significant contributions to economic change. This occurs in certain places or regions: among these are the concentrations of small and medium-sized firms that established the so-called third Italy that Piore and Sable (1984) and others described. Entrepreneurial firms were also key to the genesis of places like Silicon Valley and Route 128. As of today, we can identify a myriad government policies that attempt to encourage entrepreneurship in similar ways.

In what follows, we would like to present some of the conceptual foundations discussed in this book. One of the important foundations are systems of innovation in both sectoral and territorial terms, either regional, metropolitan or national. This literature is controversial because of the empirical difficulties in

measuring its constructs and parameters. Similar to the varieties-of-capitalism literature, its utility lies in the elucidation of subtle, yet pervasive, differences that typically reside in the error terms in regression results.

Innovation systems in sectoral and territorial perspective

The most obvious context of innovation processes is defined by sectoral and technological complementarities that link different firms and organizations to one another in sectoral or technological innovation systems. In the late 1980s and early 1990s, Freeman (1988), Lundvall (1988, 1992a) and Nelson (1993) established the foundations for a new territorial interpretation of innovation systems, emphasizing particularly the national level. While Nelson (1993) tries to analyze national innovation systems by investigating the formal institutions and organizations important in the national research and development infrastructure, Lundvall's (1992a, b) approach emphasizes the role of systematic feedbacks within a national value chain that lead to incremental progress. Similar to Porter (1990), the approaches argue that the national level is key in understanding international competitiveness. Of the different conceptualizations that exist, the approach developed by Lundvall (1992b) is especially interesting in our context because it builds upon a micro-perspective as a point of departure and develops a relational notion of the national system based on micro-scale linkages between firms involved in the innovation process (Bathelt and Glückler 2003). This approach assumes that knowledge is a key asset to industrial production and that the knowledge mobilized in a specific production context is constantly produced, readjusted to new conditions and enriched through interactive learning processes within and between firms. Through this process, new knowledge is generated and existing knowledge bases are reconfigured, thus leading to innovation (Lundvall 1992b; Edquist 1997). Innovation plays an important role for firms to become competitive or strengthen their competitiveness. Since firms are embedded within specific social divisions of labor, relying on assets that are produced by other agents, their competitiveness also depends on factors that are beyond their internal control (Porter 1990).

As conceptualized by Lundvall and Maskell (2000), national systems of innovation assume a structural interdependence between a national state's production structure, its institutions and innovation path. This rationale assumes that existing institutions shape economic action and thus direct the productive system and its specialization processes. The production structure and its specializations, for instance, lead to particular bottlenecks, which need to be solved and which are different from those identifiable in other countries. These problems lead to specific search processes, which are based on existing institutional structures and past experience. As industrial specializations, traditions and institutional settings differ between countries, this leads to specific problem solutions, which are also different and support specialized innovation processes (Archibugi *et al.* 1999). In the next round of adjustments, these innovations stimulate further specialization of institutions and production patterns. In this process of reflexive

relationships, firms benefit from dealing with agents from the same innovation system because they operate under the same conditions, share a similar set of problems and understandings, and can easily link up with one another due to sufficient cognitive proximity (Nooteboom 2000).

As a result, systemic relationship with reflexive and self-referential (autopoietic) processes develop within national boundaries, which are, of course, linked to the global economy and to other countries. Similar to sectoral and technological systems, national systems of innovation are not fixated, but instead are subject to changing conditions for economic interaction (Bathelt and Depner 2003). This includes the possibility that there might not be a distinct individual innovation system in each country. Small countries might, for instance, adopt the institutional context of a larger neighboring country and become integrated into those firms' innovation system. Furthermore, national systems are dynamic and change over time. In the process of EU integration, for example, supranational connections might become more important and a hollowing out of the national state may take place to some degree (e.g. Gregersen and Johnson 1997). This could lead to the rise of wider continental innovation systems across formerly separated national contexts, although convincing evidence is lacking regarding the importance of such trends.

Analyses by Audretsch and Feldman (1996) have shown that innovation processes have strong local components, related to local or regional spill-over effects. This is related to the continuing dominance of city-regions in economic production. Even Breschi and Malerba (1997), being somewhat hesitant to accept that national and regional innovation contexts are key to our understanding of the phenomenon, acknowledge the significance of local production and innovation contexts. They suggest that

the more knowledge is ever-changing, tacit, complex, and part of a larger system, the more relevant are informal means of knowledge transmission, like "face-to-face" talks, personal teaching and training, mobility of personnel, and even the acquisition of entire groups of people ... such means of knowledge transmission are extremely sensible to the distance among agents.

(Breschi and Malerba 1997: 136f.)

Although cross-country investigations have shown that there are sometimes similarities in the structure and processes of sectoral innovation systems (Malerba 2004), differences exist between firms in different national contexts in their capability to produce and exploit technological and economic opportunities for innovation. Malerba (2002) explains this by the fact that national institutional settings support specific sectoral innovation systems and block technological change in others.

Rather than thinking of national innovation systems as pure territorial concepts, it might be more adequate to view them as combined sectoral-national approaches. Innovation practices drastically vary between the different sectors in