



The growth and development of Nordic regional science research 1982–2022: bibliometric evidence from thirteen regional science journals

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Abstract

In a paper published in 2020, Philip McCann gives a qualitative overview of “the Nordic contribution to regional science”, which, however, only includes contributions by Swedish regional science researchers. The purpose of this paper is to complement McCann’s overview by highlighting Nordic contributions to regional science in the period 1983–2022 through a bibliometric analysis of publications in a set of thirteen regional science journals indexed in *Web of Science*, using several standard bibliometric tools. Our most interesting and surprising result is that the number of “Nordic” publications in the chosen set of journals has grown more than six times faster than the total number of publications in these journals between 1983–1992 and 2013–2022. This implies that the “Nordic” regional science researchers have increased their “market share” from 1.9 to 9.1 per cent. During the same period, the share of co-authored papers increased from 50.0 to 82.9 per cent and the share of international co-authorships increased from 0 to 50.0 per cent and went from being a mainly intra-European activity to a global activity. This process is also reflected in a certain international influence on the research topics during the four periods analysed, but to a considerable extent it seems that the Nordic regional scientists have pursued their own Nordic research themes. In terms of individual research productivity, there was the expected skewed distribution with a small number of researchers with a large research output. At the institutional level, there were notable changes in the ranking of institutions in terms of number of authorships, but one institution—Umeå University—ranked among the Nordic top-2 in all four periods.

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1 Introduction

In McCann (2020),¹ Philip McCann gives a qualitative overview of “the Nordic contribution to regional science”. Interestingly, he only mentions contributions by Swedish researchers, despite the title of the paper. In this paper, we broaden the perspective by means of a quantitative bibliometric analysis of publications in regional science journals by researchers affiliated with Nordic academic institutions. We are interested in establishing the publishing activity of “Nordic” researchers in a set of core regional science journals over a period of forty years in terms of their preferred research themes, engagement in co-authorships, the extent of co-authorship with researchers in other countries, research productivity and citation frequency, including the research productivity of different Nordic academic institutions, citation patterns indicating the “intellectual base” of published research, and how these measures have changed and developed over the four decades covered in this study. Consequently, the main purpose of this paper is to complement McCann’s paper with a bibliometric analysis of Nordic contributions to regional science through publications² in a set of regional science journals in the 40-year period 1983–2022 and to highlight the role played by researchers and research institutions in each of the five Nordic counties.

Over the years, researchers have applied bibliometric methods to analyse regional science research but none of them focused on regional science research in the Nordic countries (Rey and Anselin 2000; Suriñach et al. 2003; Florax and Plane 2003; Isserman 2004; Sarafoglou and Paelinck 2008; Haddad et al. 2017; Chen and Jackson 2018; Chen and Schintler 2023; Karlsson and Hammarfelt, 2023). Kong and Quin (2019) is an example of urban geography/urban studies and Shafiri et al. (2023) is an example of urban studies and regional and urban planning. Moreover, Schintler and Chen (2024) applied data mining to a selection of regional science journals to uncover patterns concerning gender and ethnicity related to thematic focus.

We focus entirely on publications in a set of international peer-reviewed regional science journals. By applying state-of-the-art bibliometric methods on data collected from these journals, we analyse how the publication landscape of Nordic regional science has developed and changed over the 40-year period. In particular, we highlight (i) how the volume of publications has changed, (ii) the distribution of publications across different academic milieus in the Nordic countries, (iii) how the focus on different topics in regional science has evolved, (iv) how the individual co-author

¹ A preliminary version of this paper with the title “Swedish contributions to regional science” was presented at the ERSA (European Regional Science Association) congress in Jönköping, Sweden 2010.

² Nordic regional science researchers have also contributed to the international regional science community beyond their publications through i) leaderships in international regional science organisations such as being the president of the RSAI (The Regional Science Association International) (Torsten Hägerstrand, 1968–69; Per Holm, 1977–78; Åke E. Andersson, 1984–85, and Hans Westlund, 2023–24) and ERSA (The European Regional Science Organisation) (Folke Snickars, 1985–94; Börje Johansson, 2000–02 and Charlie Karlsson, 2009–13), ii) hosting ERSA congresses (Lund, 1963; Copenhagen, 1969 & 1976; Stockholm, 1988; Odense, 1995; Jyväskylä 2003, and Jönköping, 2010), and iii) hosting ERSA Summer Schools (Jönköping/Eksjö, 2002; Stockholm/Jönköping, 2010; Umeå, 2012, and Karlskrona, 2013). Furthermore, two Nordic regional science researchers have received the EIB-ERSA Price in Regional Science, namely Åke E. Andersson (2005), and Börje Johansson (2013).

networks have developed, (v) how the co-authorships that link the Nordic countries with other countries have changed, (vi) how the research productivity of individual researchers and of the research institutions has developed, and (vii) how the citation patterns have developed.

Regional science is an interdisciplinary research domain formally established in 1954 by the American economist Walter Isard (Boyce 2003). Originating in the USA, it has gradually expanded internationally to become a growing research field that today gathers researchers from related disciplines from different parts of the world and not least the Nordic countries through both an increased participation in international conferences and a growing number of publications in international regional science journals (Nijkamp, et al. 2015). This internationalisation of regional science has significantly facilitated the exchange of knowledge in terms of regional science theories, models and methods among researchers, institutions, and locations all over the world including the Nordic countries (Isserman 1993).

Preferably, a study like this should be based upon a concise definition of regional science. Unfortunately, there is no generally accepted definition of regional science despite the fact that the research field is now almost 70 years old. The existing definitions are general and lack clear delimitations not least because the boundaries of regional science are elastic and fuzzy and its research field is multidisciplinary (Chen and Schintler 2023). Definitions such that “Regional science is a field of the social sciences concerned with analytical approaches to problems that are specifically urban, rural, or regional” are of little help. Furthermore, this field is dynamic as regional science researchers over time become interested in new research problems and develop new theories, models, and methods, which makes it possible to analyse new research problems. There has, for example, been a shift away from abstract theory to modelling/simulation and empirical research with policy relevance as well as an increased focus on people in various locations and the spatial characteristics of social problems (Chen and Shintler, 2023).

Thus, in this paper we settled on applying a practical definition to avoid lengthy deliberations about what a proper definition of regional science could and should be. This left us with the problem of deciding “what scholarship should be deemed regional science subject matter, and which authors should be deemed regional scientists” (Isserman 2004, 93). On this issue, Pratt et al. (2012, 282) suggest that “journals are an excellent proxy for fields because of their continuity and stability over time coupled with their ability to include diverse and evolving research themes and methodologies”. Thus, in this paper we operationalise regional science as research that is published in a set of well-established and well-recognised regional science journals that are indexed in *Web of Science* and which, according to the *Academic Journal Guide*,³ are ranked at level 2, 3 or 4, meaning that we use the definition of a regional science journal used by the *Academic Journal Guide*. The chosen set of thirteen journals is presented in Table 1.

A problem with our straightforward approach is that it does not cover highly ranked general social science and economics journals which, because of their prestigious status, tend to cover a broad range of areas including topics generally

³ Academic Journal Guide 2021—Chartered Association of Business Schools (charteredabs.org).

Table 1 The regional science journals included in the analysis

	<i>Journal</i>	<i>Years covered in this study</i>	<i>Number of articles in WoS</i>
1	Annals of Regional Science	1983–2022	1673
2	Cambridge Journal of Regions, Economy, and Society	2008–2022	427
3	Economic Geography	1983–2022	692
4	Environment and Planning A	1983–2018	2051
5	European Urban and Regional Studies	1997–2022	601
6	Growth and Change	1983–2022	1246
7	Journal of Economic Geography	2002–2022	796
8	Journal of Regional Science	1983–2022	1383
9	Journal of Rural Studies	1986–2022	2690
10	Papers in Regional Science	1996–2022	1149
11	Regional Science and Urban Economics	1983–2022	1891
12	Regional Studies	1983–2022	3141
13	Urban Studies	1983–2022	4562

Source: *Web of Science*

The following journals were excluded from our study as they were more oriented towards local and regional planning than the selected journals: *Cities, Town Planning Review, European Planning Studies, and Local Economy*

considered as regional science. Leading general journals usually contain central contributions—especially in terms of theory and method—in various fields including regional science. These journals have a higher status than field journals since it is assumed that they normally publish papers of higher quality, which makes it interesting also for regional science researchers to submit to such journals. However, the general orientation of these journals makes them unsuitable for analysing contributions in specialised scientific fields such as regional science. Thus, general journal rankings are not a useful starting point when analysing a specific research area but excluding them entails that the resulting data base might be biased, since several high-quality contributions to regional science are excluded. Given that the regional science journals contain most of the regional science publications, we think that this is not a major problem, particularly as our purpose is to identify general trends over a long period of time. Notably, this approach is distinctly different from McCann's more qualitative review, in which many of the highlighted contributions were published outside the core journals of regional science which are analysed here.

A preferred strategy, if the necessary funds and time are available, is to make a survey among researchers in the field of what they think are the central journals in the field and base the selection of journals upon their recommendations. However, here a new problem arises. Which researchers to ask? How to select them? And how many researchers should be contacted? Given these problems, our selection of regional science journals is not based upon the opinion of regional science researchers but upon the criteria presented above.

We must also define the concept of “Nordic” researcher. Since, we do not know the nationality of researchers, we define a researcher affiliated to a research institution in one of the five Nordic countries as a “Nordic” researcher, irrespective of nationality.

In relation and response to McCann’s article, our main results show that there is an active and growing regional science community with rich links to the rest of the world in the Nordic countries. Our most interesting and surprising result is that the number of “Nordic” publications in the chosen set of regional science journals has grown more than six times faster than the total number of publications in these journals indexed in Web of Science between 1983–1992 and 2013–2022. This implies that the “Nordic” regional science researchers have increased their “market share” from 1.9 to 9.1 per cent. During the same period, the share of co-authored papers has increased from 50.0 to 82.9 per cent and the share of international co-authorships has increased from 0 to 50.0 per cent and gone from being a mainly intra-European activity to a global activity. This process is also reflected in a certain international influence on the research topics during the four periods analysed, but to a considerable extent it seems that the Nordic regional scientists have pursued their own Nordic research themes. In terms of individual research productivity, there was the expected skewed distribution with a small number of researchers with a large research output. At the institutional level we find notable changes in the ranking of institutions in terms of number of authorships but one institution—Umeå University—ranked among the Nordic top-2 in all four periods.

The rest of the paper is organised as follows: In Sect. 2, we describe the bibliometric methods, and the data material used in the study. A general characterisation of regional science publishing in the Nordic countries is presented in Sect. 3. The main topics in Nordic regional science publications during the four periods 1983–1992, 1993–2002, 2003–2012, and 2013–2022 are listed in Sect. 4. Section 5 illustrates the individual co-authorship relations involving Nordic researchers and this is followed up in Sect. 6 with a presentation of the international co-authorships involving Nordic regional science publications 1993–2022. The research productivity among Nordic regional science researchers as well as among Nordic research institutions is displayed in Sect. 7. In Sect. 8, we turn to a central issue, namely the intellectual base of Nordic regional research, clarifying on whose shoulders the Nordic regional researchers have been standing in each of the four periods. Section 9 sums up and presents some conclusions.

2 Bibliometric methods and data

Bibliometrics offers methods and tools for making quantitative analyses and evaluations of scientific fields, disciplines, and institutions as well as of individual researchers, since these can examine massive literature sets using text-mining features (van Eck and Waltman 2010). Using the metadata behind academic publications, bibliometrics analyse publications, citations, and other relevant data to analyse the productivity and impact of researchers and research institutions in each research field, but also to investigate themes, trends, intellectual peers, and

collaboration patterns (Donthu et al. 2021). Bibliometrics generates systematic, objective, and reproducible results since it is a data-driven approach (Dela Corte, et al., 2019). Thus, it complements and augments qualitative evaluations of a research field (Donthu et al. 2021).

The limits of these analyses and evaluations are set by the availability and form of qualitative bibliographic data and are obvious in the case of regional science since regional science belongs to the social sciences. If we take the two most widely used bibliographic data bases—*Web of Science* and *Scopus*—they generally do not cover research monographs, chapters in research anthologies, and so on, nor publications in other languages but English (Archambault et al. 2006). There are other bibliographic databases, such as *Google Scholar*, with a substantially larger coverage, but unfortunately the data quality and data coverage are too low for performing more advanced bibliometric analyses and evaluations. Hence, although monographs and edited volumes, published in the 40-year period, contain important contributions not least to regional science, it is not possible to analyse these due to lack of reliable bibliographic data. However, literature—including books—which is not part of the main dataset is reflected when co-citations analysis is performed to identify the “intellectual base” (Sect. 8).

The analysis and evaluations in this paper are based on a set of thirteen regional science journals indexed in the *Web of Science* core collection 1983–2022 for which the full records and cited references of all articles were downloaded and used as input data for bibliometric analysis. *Web of Science* is the leading bibliometric database (Falagas et al. 2008) because of the details in its documentation and its restricted use of publications and citations from “high-quality” sources only, i.e., journals derived through rigorous “editorial standards and scientific impact criteria” (Chavarro et al. 2018). *Web of Science*, whose records used in this paper contain i) standard information, the title of the paper, the author’s/ authors’ names, journal name, abstract, keywords and sometimes a digital objective object identifier, but ii) also specific information such as document type, reference lists, citation data and citation indexes. A further advantage of using *Web of Science* is its historical coverage, which allows for the type of longitudinal analysis provided here.

The choice of this set of journals was a result of the ambition to have enough regional science publications to analyse a period sufficiently long for comparing several periods to capture trends in the number of “Nordic” publications, changes in the distribution of regional science publications across different academic institutions, changes in research topics and changes in the co-author networks at a reasonable workload. Thus, we abstained from using a stable set of journals for our analyses. We assumed that the selected core set of regional science journals is representative enough to visualise trends in “Nordic” publication patterns in the field of regional science. We based our study on a data set containing 22,302 articles from these journals of which 1435 with at least one author affiliated to a Nordic academic institution. This set of 1435 documents indexed as articles is the

main Nordic set used and other materials, such as editorials and reviews, were excluded.

The regional science journals included in our empirical analyses are presented in Table 1 together with the years covered in our study and the number of articles indexed in *Web of Science*.

Statistical analysis was done using the Biblioshiny application for the Bibliometrix software (Aria and Cuccurullo 2017). This software facilitates a range of computations, including more basic descriptive data on papers, authors, and citations as well as more complex network analysis of intellectual and social structure. In a next step, we visualised and analysed parts of the bibliometric data using the *VOSviewer* software (Van Eck and Waltman 2017), which is a suitable tool for determining the knowledge and interaction structure of a research field and its changes over time.⁴ This tool makes it possible to visualise relational data in terms of co-occurrences, co-authorships and co-citations. These more advance analyses were performed on the core set of Nordic publications (1435 articles) while more basic comparative analyses were conducted on the whole international set (22,302 articles).

Biblioshiny and *VOSviewer* generate maps with network visualisations of connections/relationships (links) between and clusters (colouring) of the nodes representing the connected observation units⁵ (Börner et al. 2003; Donthu et al. 2021). The thickness of the links connecting the different nodes is proportional to the connection's strength and the size of the nodes is proportional to the number of times the actual unit has appeared together with other units. Units are grouped into clusters if they have a stronger connection than expected (given their overall connectedness) indicating specific thematic areas, co-author "clubs" and co-citation "circles." Hence, using keyword co-occurrence networks, co-authorship networks, international co-authorship networks, and citation (co-citation) networks for the four periods 1983–1992, 1993–2002, 2003–2012, and 2013–2022, we can illustrate how the boundaries and the patterns of Nordic research in regional science have evolved over time.

3 A general characterisation of regional science publishing in the Nordic countries

In this section, we discuss some typical characteristics of regional science research in the Nordic countries. We started our analysis with a comparative approach to "Nordic" publications with all regional science publications in Table 2, which, interestingly, showed that while all publications as well as "Nordic" publications have grown substantially from the period 1983–1992 to the period 2013–2022, the number of "Nordic" publications have grown more than six times faster than all publications in regional science. This means that "Nordic" researchers have

⁴ Coba et al. (2011) review, analyse, and compare some of the software tools used in bibliometrics, considering aspects such as the bibliometric techniques available and the various kinds of analysis.

⁵ Commonly used words with no scientific meaning such as "and" are excluded by using a "stop list," which excludes a set of familiar words without a scientific meaning.

increased their “market share” from 1.9 per cent to 9.1 per cent. We can only speculate what the underlying reasons for this increase in market share might be. One obvious reason is increasing international collaboration, which suggests that all regions or nations showing an increase in collaboration would automatically show an increase in terms of production (as we do not fractionalise authorship shares). However, this cannot—as shown in Table 3—provide the full explanation of why the Nordic region is particularly strong in regional science research.

Figure 1 highlights how the yearly number of publications in the thirteen regional science journals in Table 1 developed during 1983–2022. All publications as well as the “Nordic” publications are included. We define a “Nordic” publication we as a publication with at least one author affiliated to a Nordic institution. Hence, this is a fairly inclusive definition as a paper where one out of four co-authors have a Nordic affiliation would count as “Nordic”.

It is remarkable how slowly the number of “Nordic” publications developed in the beginning. It took nineteen years before more than twenty publications were published per year and 29 years before more than fifty publications were published in one year. However, the growth rate for the whole 40-year Nordic regional science publications in the thirteen journals is 8.6 per cent per year compared to a growth rate of 3.1 per cent for all publications in the thirteen journals. This growth reflects an increase of institutions engaging in regional science research as well as the increasing pressure on academic researchers to publish (Von Bergen and Bressler 2017) and to collaborate. This later development might partly mirror the fact that journal publications have become much more of a requirement for an academic career in the Nordic countries, especially in the last two decades.

On average, articles authored by “Nordic” researchers in the studied period received thirty-two citations, which can be compared to US authors with thirty citations or UK researchers thirty-nine citations for the same set of journals. Table 1 reports the average number of citations for Nordic articles and compares that number with the average number of citations for all articles. Generally, it seems as if Nordic articles have approximately the same impact as the average article published in the thirteen journals studied here. However, it should be noted that the citation distributions are highly skewed as rather few highly cited articles contribute heavily to the grand total of citations. We should also note that generally, internationally co-authored articles are more heavily cited than those with authors from the same country (Aksnes, 2003) and that the average number of citations tends to increase with the number of authors (Sanfilippo, et al., 2018).

However, citation numbers vary over time. The last row of Table 1 shows that the citation frequency tends to increase over time. It seems as if the number of citations increase with the length of reference lists (Fox et al. 2016) and Dai et al. (2021) show that the size of the average reference list tends to increase over time. For example, the average reference list increased from twenty-eight references in 2003 to forty-seven in 2019. Moreover, it seems that short reference lists with less than fifteen references are becoming rarer (Nicolaisen and Frandsen 2021).

Table 3 shows the publication trends in the thirteen regional science journals globally as well as in the Nordic countries. If we compare the period 2013–2022

Table 2 The total number of publications and the total number of “Nordic” publications in the regional science journals presented in Table 1

	1983–1992	1993–2002	2003–2012	2013–2022	Growth between period 1 and period 4 (%)	Yearly growth rate (%)
All publications	3092	4199	5436	9574	209.6	3.1
“Nordic” publications	60	164	339	872	1353.3	8.6
Share “Nordic” publications (%)	1.9	3.9	6.2	9.1	379.0	–
Average citation (all publications)	17.4	38.2	50.0	20.0		
Average citation (Nordic publications)	17.7	35.2	53.0	24.9		
Average number of citations per year for the 25 most cited Nordic articles	1.13	5.07	18.07	29.6		

Source: Authors’ own calculations using data from *Web of Science*

Table 3 Characteristics of “Nordic” articles in the thirteen regional science journals in Table 1

	1983–1992	1993–2002	2003–2012	2013–2022
Total number of papers /whole set)	3,092	4,199	5,436	9,575
Total number of unique authors (whole set)	2,957	4,530	6,912	15,280
Total number of Nordic papers	60	164	339	835
Total number of unique authors (Nordic)	72	198	447	1666
Single-authored Nordic papers (total)	30	65	121	143
Share single-authored (%)	50.0	39.6	35.7	17.1
Average number of authors	1.5	1.6	1.9	2.7
International co-authorships (%)	0	15	33	50

Source: Authors’ own calculations using data from *Web of Science*

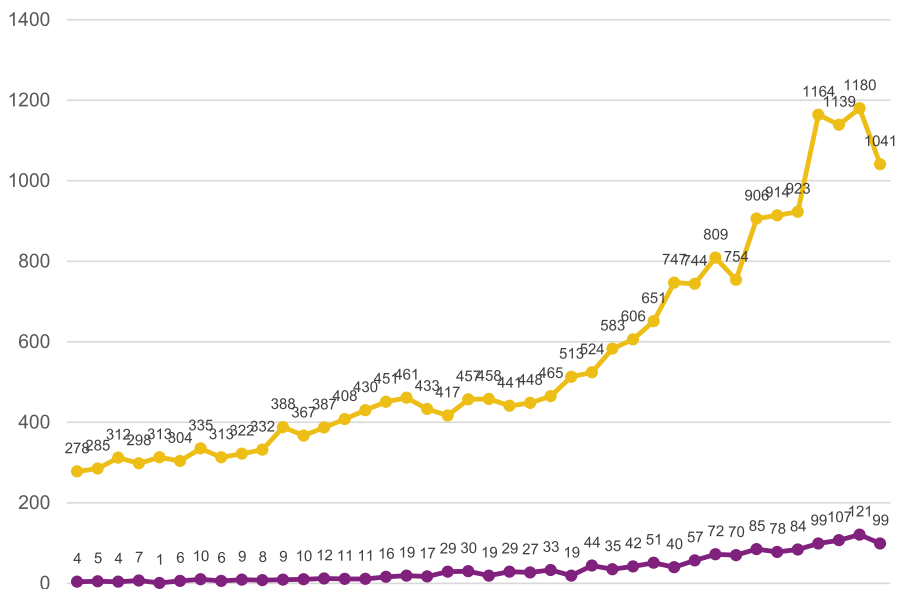


Fig. 1 The number of articles per year in the regional science journals in Table 1 (yellow for all articles and purple for “Nordic” articles). The evident “dip” in the last year (2022) is due to data issues as not all articles for the year of 2022 had been indexed in Web of Science at the time of our data collection. Source: Data from *Web of Science*

with the period 1983–1992, we can see that the number of publications has grown with 3.1% globally and with astonishing 13.9% in the Nordic countries. The number of unique authors has grown with 5.2% globally and with 23.1% in the Nordic countries, illustrating that the number of authors per paper has grown over time. Table 1 also illustrates the rapid growth of the number of co-authorships, and not least of international co-authorships.

Scientific collaboration has been seen as one of the backbones of a productive research milieu (Lee and Bozeman 2005) and as a result, the interaction and

integration in scientific collaboration have steadily increased (Bennett and Gadlin 2012). However, in recent decades scientific collaboration has increasingly taken place in networks between researchers in different geographical locations (Andersson & Beckman, 2009), making it a global phenomenon. The most visible form of scientific collaboration is certainly co-authorships (Dehdarirad and Nasini 2017; Li et al. 2020; de Oliveira et al. 2021).

The trend towards an increasing number of co-authorships was observed and analysed a long time ago (Anderson & Persson, 2003). In recent decades, the number of co-authored articles has dominated over single-authored articles (Wutchy, et al., 2007; Amjad et al. 2017). One explanation for this increasing trend is that co-authorships increase the productivity of researchers (Andersson and Beckmann 2009) as well as the efficiency and the quality of the research (Wuchty et al. 2007). Another explanation is that collaborative research increases the chances of securing better and more competitive results and is stimulated by increasing complexity of studies and the level of competitiveness among researchers and research teams (Acedo et al. 2006; Zhang et al. 2018).⁶ It should also be noted that the number of researchers in all disciplines has grown over time, which has increased the options for co-authorship much faster than the number of researchers. Also, researchers mutually benefit from interaction since scientific research for the most part is a collaborative activity (Andersson & Le, 2023).

However, not only the number of co-authorships has increased but also the number of authors per paper. One explanation for this, besides the productivity effect, is the indication that the number of citations for an article tends to increase with the number of authors (Fox et al. 2016). Be that as it may, the primary motivation for the increase is without doubt that funding and promotion of individuals and the survival of teams and institutions have become more dependent on publications and citations since the appraisal of the scientific impact of researchers, teams and institutions is increasingly made based upon productivity and citation metrics (Ioannidis 2008). The increasing number of international co-authorships can probably at least partly be explained by the growth of international air connections, lower air fares, more international research conferences and the emergence of the World Wide Web, which has increased the accessibility to researchers in other countries.⁷

4 Main topics in Nordic regional science publications

The purpose of this section is to highlight how the main topics in Nordic regional science research have changed over the four study periods. It is well known that bibliometric analysis can be used to identify key thematic areas of a research field and examine how the knowledge structure has evolved over time (Sharafi 2020). To this end, it is common to do a co-occurrence analysis of terms (concepts), which is

⁶ There might also be sociological reasons for the increase in co-authorship (Wiezorek et al. 2021).

⁷ To understand the drivers behind the increasing number of co-authorships at the local, regional, national, and international levels, statistical methods that apply a spatial perspective are needed (Pumain et al. 2006, Nomaler et al. 2014) and preferably rigorous measures of local, regional, national, and international accessibility (Andersson, et al. 2009 and Andersson et al. 2020).

based upon the frequency with which two terms occur together in the set of publications analysed. Higher co-occurrence values point to stronger links between terms, i.e., closely related terms exhibit higher co-occurrence values (van Eck and Waltman 2010). In this section, we identify keyword co-occurrence networks capturing the main themes in Nordic regional science publications and their interconnections during the four periods studied. Such networks connect the keywords in a set of articles and make it possible to generate clusters of these networks (Small 1973). The justification for this analytical approach is given by Benbasat and Zmud (2003, 144) who claim that “the primary way in which a scholarly discipline signals its boundaries – and in doing so, its intellectual core – is through the topics that populate discipline-specific research activities”.

Figure 2 is a case in point illustrating as it does the main topics in the Nordic regional science publications during the period 1983–1992. The figure shows one large red cluster, two medium-sized interconnected clusters in green and blue, and a small yellow cluster. The terms in the red cluster highlight a more model-focused analytical regional science research, emphasising regional dynamics and regional growth and development at the macro-level as well urban development from a network perspective, including commuting and urban planning. In both areas, we find a distinct European focus. The two interconnected clusters have a more micro-economic focus on location and mobility of households and firms with employment and housing as central themes. Much of the research has a public policy perspective with an associated interest in the impact of such policies. Obviously, a considerable part of the research in these two clusters deals with Sweden and Norway. The yellow cluster illustrates research with a focus on regional economic effects, mainly at the firm level and especially in Finland.

Figure 3 presents the topics in Nordic regional science publications during the period 1993–2002. The picture is now much more complex with six clusters with many connections between them. What is interesting here is that many new research topics have been introduced while some of the research interests in the earlier period still prevail. The light blue cluster indicates that there still is an interest in urban planning with a focus on analyses of land use and commuting using choice models. The violet cluster shows that some of the Nordic publications in this period focus on equilibrium models in regional science. The interacting blue and red clusters essentially address questions related to regional economic growth and are in that sense a continuation of the research highlighted in the red cluster in the earlier figure, but now with migration and mobility more in focus. Part of the research is theoretical, thus the interest in the question of convergence. New elements in growth research such as knowledge and increasing returns are now included in the Nordic regional science research.

In Fig. 3, we also find a green cluster interacting with a yellow cluster. The research mirrored here takes on industry studies with themes such as location, investment and organisation including networks and a firm perspective. What is new here compared to the earlier period is an interest in analysing innovation but also to

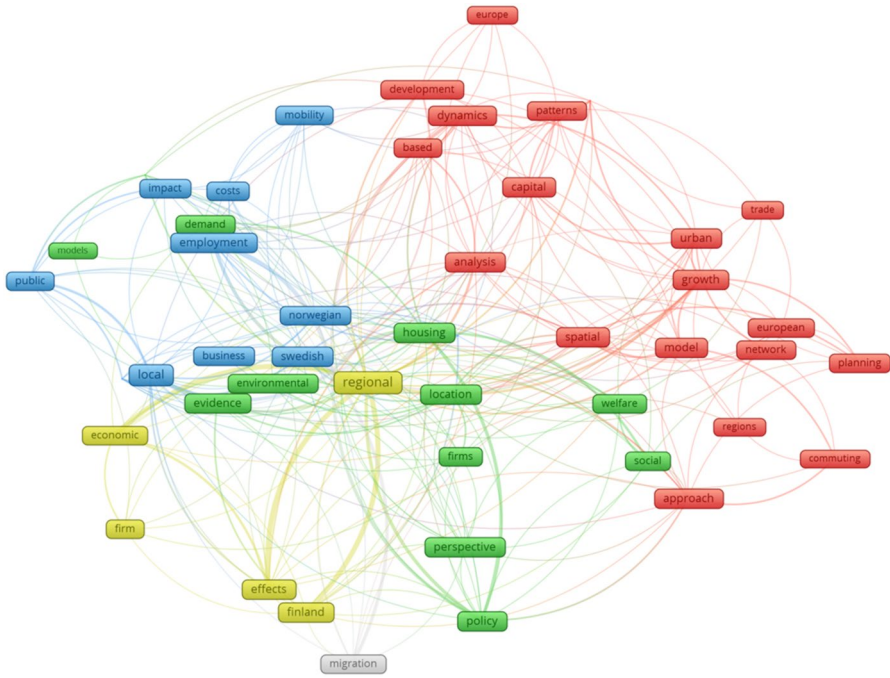


Fig. 2 Topics in Nordic regional science publications 1983–1992. Illustration generated with data from *web of science* using *VOSviewer*

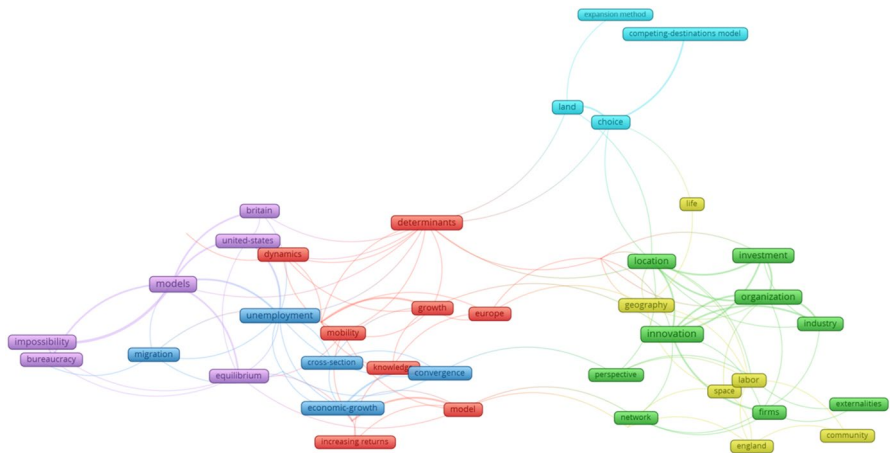


Fig. 3 Topics in Nordic regional science publications 1993–2002. Illustration generated with data from *web of science* through *VOSviewer*

consider the importance of externalities. The yellow cluster illustrates geographical research with a spatial social perspective on labour, life, and communities.

Table 4 Productivity overview for the 30 regional science researchers in Fig. 7.1 with affiliations (D=Denmark, F=Finland, N=Norway, and S=Sweden).

Researcher	Period	“Regional science” publica- tions (<i>within the analysed set</i>)	Total <i>Web of Sci- ence</i> publications	Total hits in <i>Google Scholar</i>
Ron Boschma (S)	2009–2022	31	78	215
Charlotta Mellander (S)	2008–2022	18	42	192
Martin Andersson (S)	2005–2022	15	35	190
Richard Florida (S)	2008–2022	15	53	938
Inge Thorsen (N)	1996–2016	14	33	74
Rune D. Fitjar (N)	2014–2022	14	31	105
Hans Westlund (S)	1998–2022	14	39	397
Yves Zenou (S)	2006–2012	13	41	198
Rikard H. Eriksson (S)	2011–2022	13	23	34
Börje Johansson (S)	1991–2018	12	13	107
Johan P. Larsson (S)	2014–2022	12	18	51
Olle Westerlund (S)	1995–2020	13	18	90
Arne Isaksen (N)	2004–2020	11	35	146
Markus Grillitsch (S)	2015–2022	11	36	128
Charlie Karlsson (S)	1994–2018	10	28	303
Urban Lindgren (S)	2003–2018	10	36	253
Michaela Tripl (S)	2013–2022	10	40	167
Teis Hansen (D)	2011–2022	10	46	131
Pierre-Alexandre. Balland (S)	2015–2022	9	26	92
Rod J.F. Burton (N)	2011–2021	9	25	47
Björn T. Asheim (S)	2001–2022	9	11	156
Martin Henning (S)	2011–2021	9	22	76
Timo Mitze (D)	2014–2021	9	29	77
Hannu Tervo (F)	1983–2018	9	10	124
Bo Malmberg (S)	1996–2018	9	39	146
Roland Andersson (S)	1998–2012	8	10	28
Alexandre Dubois (S)	2016–2022	8	12	30
Stig-Erik Jakobsen (N)	2005–2022	8	27	164
Johan Lundberg (S)	2000–2022	8	15	45
Anders Malmberg (S)	1992–2008	8	30	82

Source: *Web of Science* and *Google Scholar*. Ron Boschma, Richard Florida, and Michaela Tripl are included due to their extensive co-authoring with researchers having an affiliation in a Nordic country

Research topics in Nordic regional science publications during the period 2003–2012 are illustrated in Table 4. Here we find two large dominant clusters and four small clusters, which of course are all interrelated. The large green cluster illustrates that the Nordic regional science publications in this period focus on themes that are also central in the international regional science publications of this period. We can see an influence from the “new economic geography” as well as from

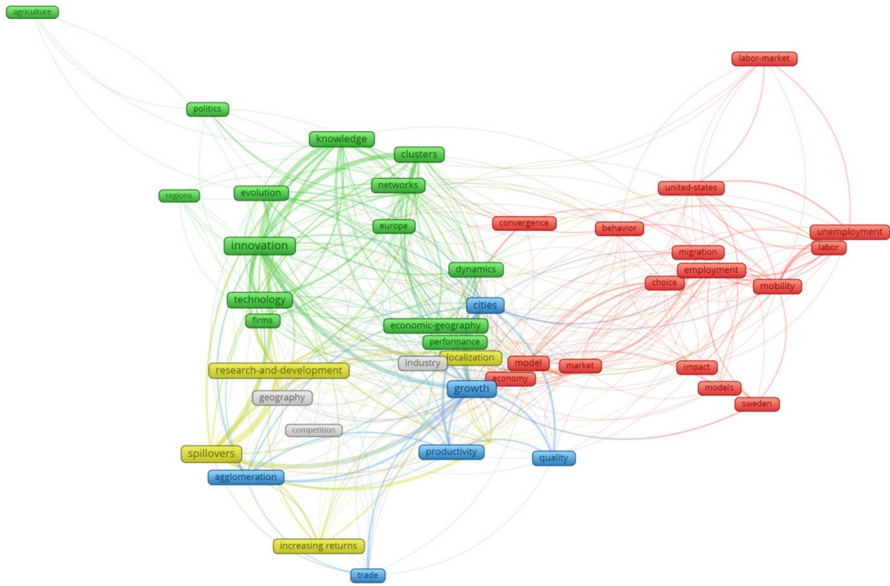


Fig. 4 Topics in Nordic regional science publications 2003–2012. Illustration generated with data from Web of Science using VOSviewer

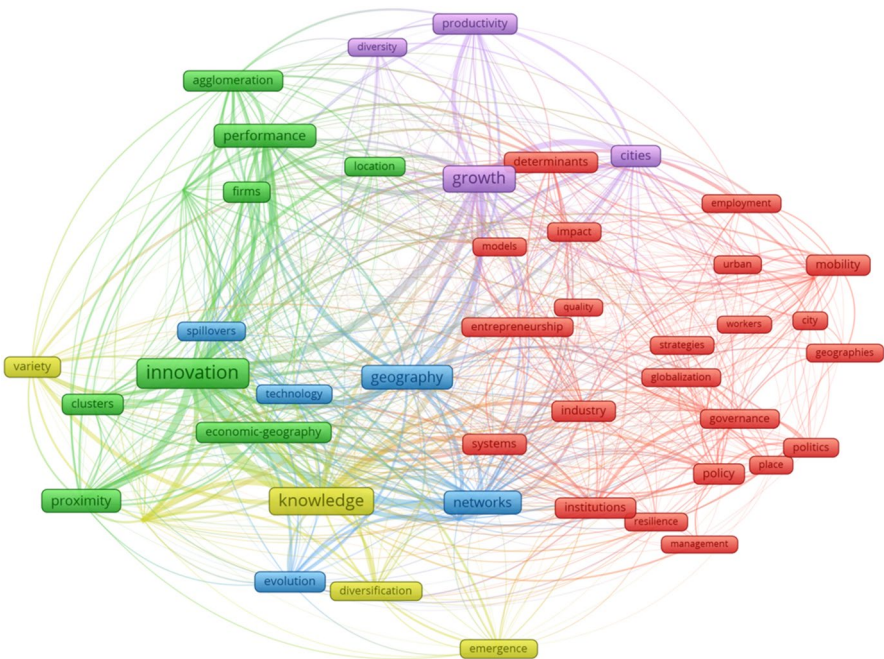


Fig. 5 Topics in Nordic regional science publications 2013–2022. Illustration generated with data from Web of Science using VOSviewer

evolutionary economics and geography with themes such as dynamics, knowledge, technology, innovation, clusters, and networks.

The large red cluster shows that another central field in the Nordic publications in this period is related to labour market issues and models including employment, unemployment, behaviour, mobility, and migration. The blue cluster mirrors a focus on research questions in urban economics and the role of agglomeration for productivity growth and urban growth. The yellow cluster represents the role of localisation for research and development and related spillovers and the exploitation of increasing returns. The nexus of the small grey cluster is industry, geography, and competition (Fig. 4).

As illustrated in Fig. 5, the three themes of innovation, knowledge, and growth have a somewhat dominant role in the Nordic regional science publications in the most recent period (2013–2022). There are five clusters which in some cases are connected by very strong links between some themes. The red cluster—the largest—is a conglomerate of twenty-two themes, many of which are recognisable from the earlier clusters although several new themes are taken up here, including globalisation and entrepreneurship but also governance, management, institutions, and resilience, which suggests a broadening of the research interests through new research questions. However, the links between the themes in the red cluster is in a comparative perspective relatively weak indicating that relatively few papers dealing with the different links in this cluster have been published.

The green cluster focusing on innovation is characterised by several strong internal links but also by links to the knowledge theme in the yellow cluster, the growth theme in the violet cluster and the spillovers’ theme in the blue cluster. In one sense, we could say that these four clusters form a sort of macro-cluster summarising the central research themes in Nordic regional science publications in this period. In the green cluster, we see one centre around innovation, proximity, clusters and economic geography with a strong link to knowledge in the yellow

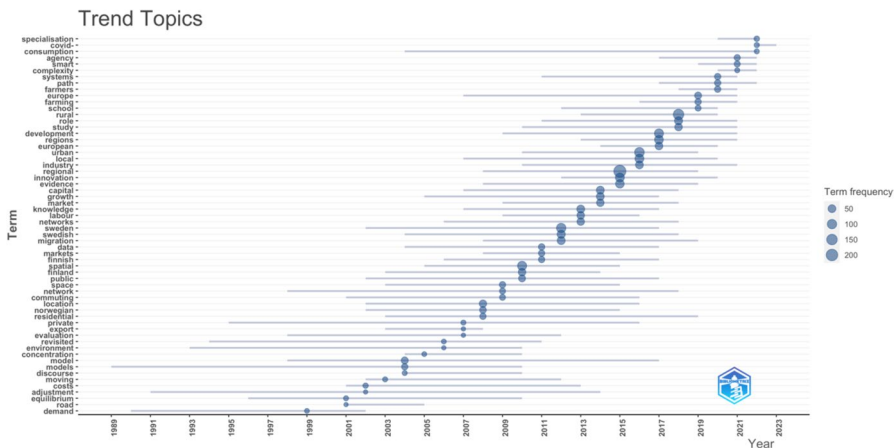


Fig. 6 Topics in Nordic regional science research, 1983–2022, frequency of unigrams (single words). Illustration generated with data from *Web of Science* using *Biblioshiny*

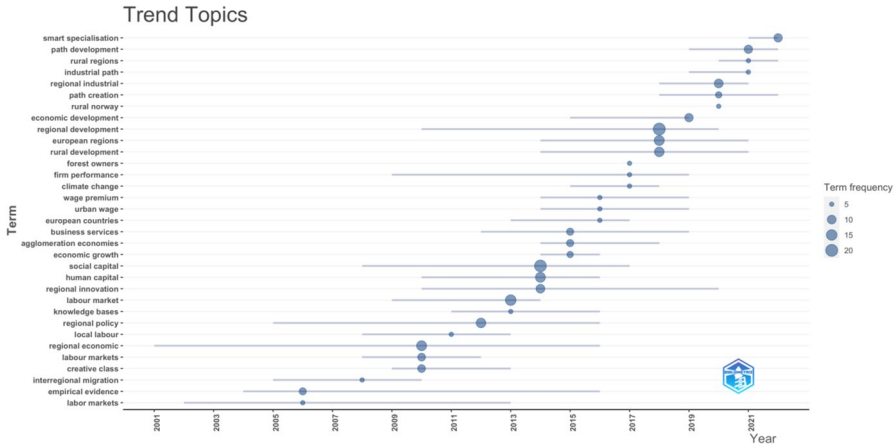


Fig. 7 Topics in Nordic regional science research, 1983–2022, frequency of bigrams (coupled words). Illustration generated with data from *Web of Science* using *Biblioshiny*

cluster and another around innovation, location, agglomeration, and performance. In the violet cluster, we recognise urban economics research as a strong area from earlier periods. It deals with economic growth and its relationship to cities, productivity, diversity, and innovation, where diversity is a new theme for this period. The blue cluster illustrates research involving geography, technology, networks, and spillovers. The yellow cluster is formed by the theme knowledge and the themes diversification, variety, and emergence, which are new for the period.

Figure 6 illustrates the dynamics of Nordic regional science research during the whole period 1983–2022 in terms of common research topics using single keywords. We can see that many topics are of interest for prolonged periods, while others are topical for shorter periods. A striking shift in focus is from “Norwegian,” “Finland,” “Finnish,” “Sweden”, and “Swedish” to “European” and “Europe”. This illustration of topical developments can be compared to Chen and Schintler’s (2022) findings in which a trend towards “real-world” problems, rather than theories could be discerned in the later periods. Comparing their findings for the most recent years, however, we found distinct differences. For example, while topics such as “inequality” and “income equality” are ranked as current topics internationally, these were less visible in the Nordic region where “specialisation,” “consumption,” “agency” and “complexity” have been the most frequently used terms in recent years. The focus on innovation and development becomes even more apparent if we consider bigrams (two-word concepts) as in Fig. 7. Here “smart specialisation” and “path development” are the two most frequently used concepts. Overall, only one term overlaps between Nordic regional science and the global overview provided by Chen and Schintler (2022) and this is, perhaps, not surprising given the global impact of the recent pandemic, “covid”. This indicates that regional science research in the Nordic countries at least partly has a focus on other research questions than regional science research in the rest of the world.

5 Individual co-authorship relations involving “Nordic” authors

As illustrated in Table 3, there is an increasing trend towards more co-authorships in Nordic regional science publications. It is common to analyse co-authorships based upon the frequency with which two authors appear together as authors in the set of publications analysed. Higher co-authorship values point to stronger cooperation links between authors. Here we present maps with network visualisations of connections/relationships (links) between and clusters (colouring) of the nodes representing authors. A few strong co-authorship ties in our material include authors—for example Ron Boschma, Richard Florida and Michaela Trippl—which are not “Nordic” in the sense of being affiliated with an institution in a Nordic country. Yet, these are important nodes in the overall mapping of authorship and removing them would distort the overall structure of the co-author network. In this section, we highlight how the co-authorship patterns have developed during the four periods analysed in

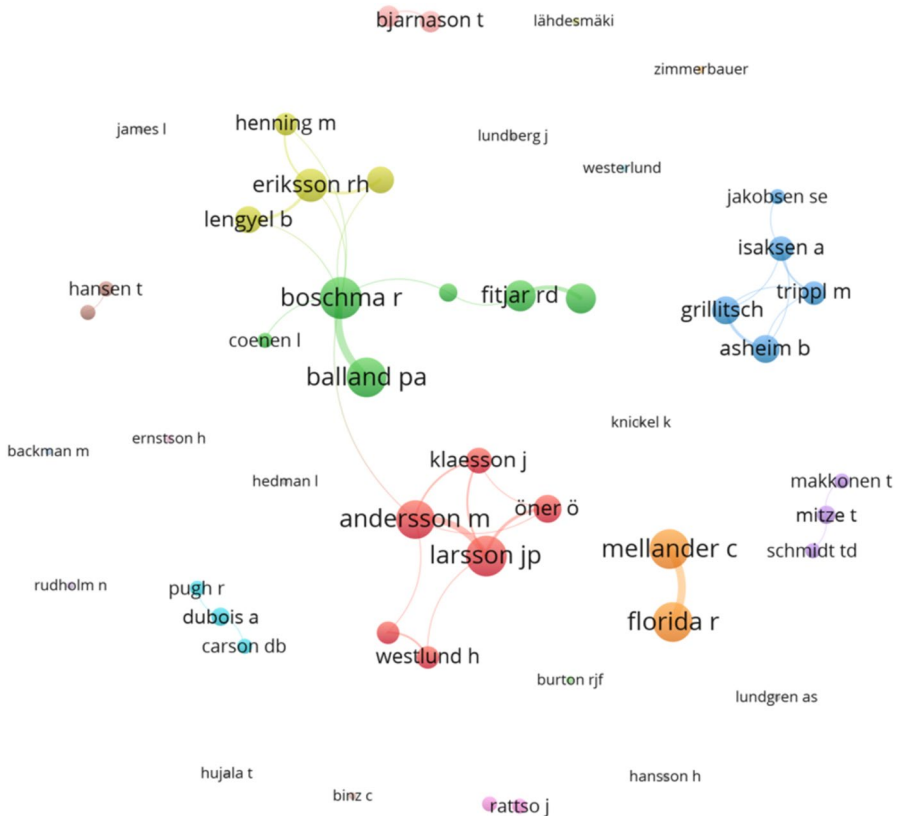


Fig. 8 Co-authorship patterns for Nordic regional science publications 2013–2022. Illustration generated with data from *Web of Science* using *VOSviewer*. Note: Ron Boschma, Richard Florida, and Michaela Trippl are included due to their extensive co-authoring with researchers having an affiliation in a Nordic country

this paper. We start with *Table A5.1* in the appendix where we find the co-authorship pattern in Nordic regional science publications during the period 1983–1992. Here there are eleven clusters but six of them only comprise two authors. The largest cluster with Christer Anderstig as central node contains four nodes representing the Royal Institute of Technology in Stockholm and Umeå University.

Figure 19 in the appendix presents the co-authorship pattern in Nordic regional science publications during the period 1993–2002. Here we find ten clusters but only one with more than three nodes. The red cluster with six nodes represents links between researchers at Jönköping International Business School and Umeå University.

The co-authorship patterns for Nordic science publications 2003–2012 in Fig. 20 in the appendix involve nine clusters. The largest cluster—the red cluster with seven nodes—has its main node at the University of Stockholm, and the second largest cluster—the green cluster with six nodes—has its main node at the University of Lund. A somewhat special cluster is the Florida-Mellander cluster with two strong nodes indicating many publications but with only one sub-node. One would have expected that two so strong nodes should have attracted many younger researchers to become co-authors.

We finish this section by clarifying the co-authorship patterns for Nordic regional science publications in the period 2013–2022 in Fig. 8, which displays nine clusters, three of which relate to Professor Ron Boschma as the central node. This central node connects the regional science research milieus at Lund University (green cluster), Jönköping International Business School (red cluster) and

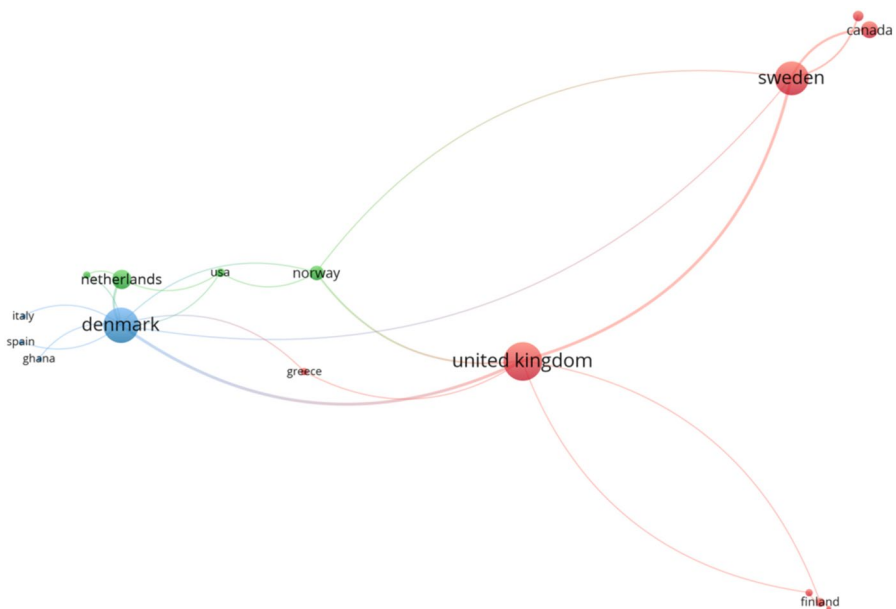


Fig. 9 International co-authorship patterns involving Nordic countries, 1993–2002. Illustration generated data from *Web of Science* using *VOSviewer*

Umeå University (yellow cluster) but also universities abroad such as University of Stavanger (Fitjar) and University of Utrecht (Ballard). Interestingly, University of Lund hosts a second regional science cluster illustrated by the dark blue cluster. The Florida-Mellander cluster is still there but without any sub-nodes.

A major result in this section is the extent to which the co-authorship clusters illustrated by Nordic regional science publications have grown over time to comprise more researchers and the way they also started to become integrated in the last period. An interactive map containing 119 connected authors with three documents or more published during the full period 1983–2022 is accessible (and zoomable) here: <https://tinyurl.com/yrztm360>

6 International co-authorship patterns among Nordic regional science publications 1993–2022

This section is devoted to an analysis of international co-authorships in Nordic regional science publications during the period 1993–2022. Analysing research cooperation between countries is commonly made by analysing the frequency with which two authors university affiliated in different countries appear together as authors in the set of publications analysed. Higher intercountry co-authorship values point to stronger research cooperation links between countries. Here, we have generated maps with network visualisations of connections/relationships (links) between and clusters (colouring) of the nodes representing the countries where the co-authoring authors have their affiliation(s). Since there were no international co-authorships in the period 1983–1992 as shown in Table 3, we started mapping international co-authorships from the period 1993–2002 as illustrated in Fig. 9. In this period, Denmark and Sweden are the dominant Nordic nodes

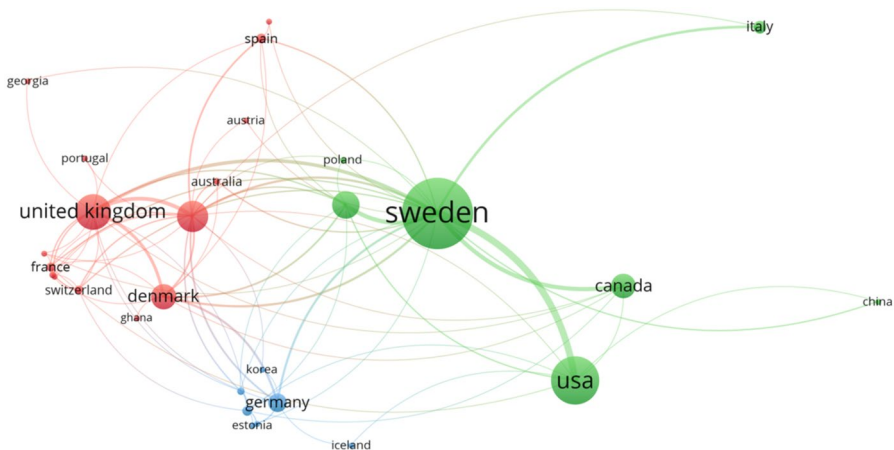


Fig. 10 International co-authorship patterns involving Nordic countries, 2003–2012 (Medium-sized Red Node for Norway and Small Green Node for The Netherlands). Illustration generated with data from *Web of Science* using *VOSviewer*

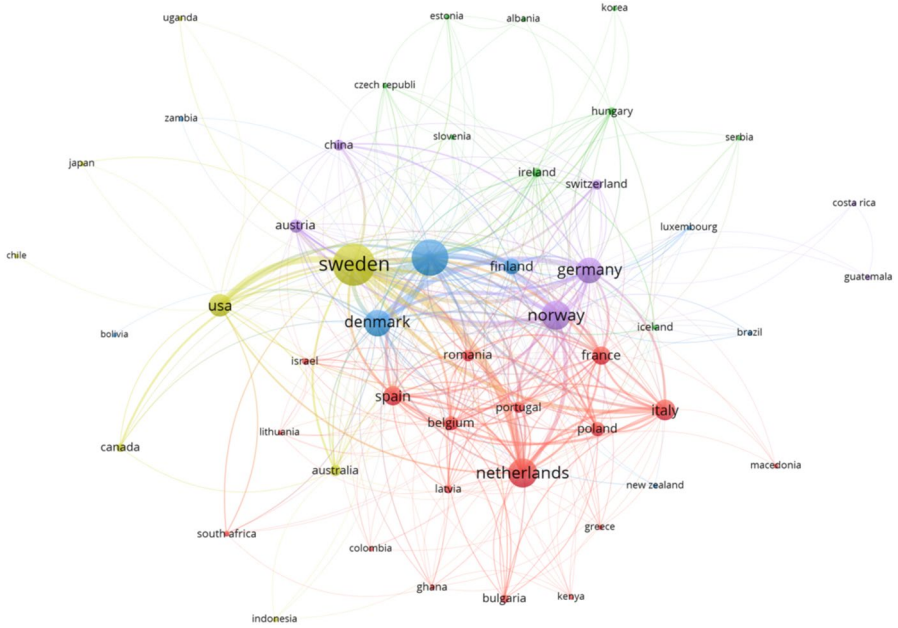


Fig. 11 International co-authorship patterns involving Nordic countries, 2013–2022 (Large Blue Node for UK). Illustration generated with data from *Web of Science* using *VOSviewer*

Country Collaboration Map

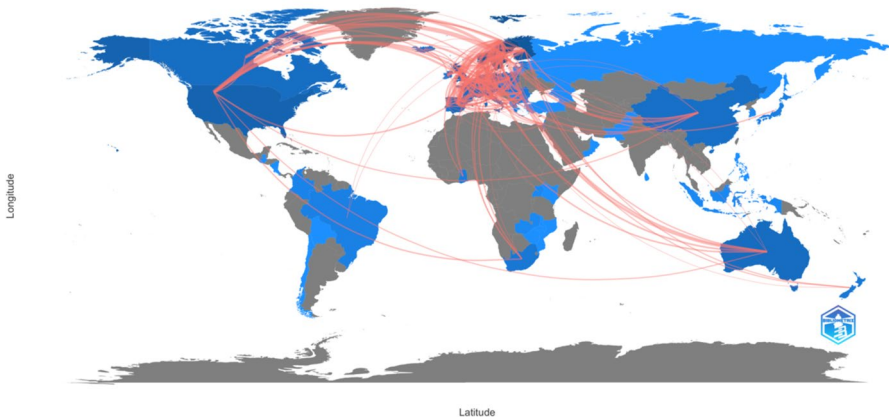


Fig. 12 The global co-authorship pattern of “Nordic” researchers, 1993–2022. Illustration generated with data from *Web of Science* using *Biblioshiny*

and UK is the main international collaboration node. Denmark proves to have ten international links, while Sweden only has five international collaboration links.

Figure 10 illustrates the international co-authorship patterns involving Nordic regional science publications in the period 2003–2012. Compared with Fig. 9, we here find a much larger collaboration network with more nodes (twenty-seven compared to sixteen in the earlier period) and many more links. Now Sweden is clearly the kernel of the green network with collaboration links to many countries but with a predominant link to the USA. The red network highlights a co-authorship triad consisting of the UK, Denmark, and Norway.

In Fig. 11 which elucidates international co-authorships involving Nordic regional science publications 2013–2022, we now find a truly global collaboration network involving all continents and containing fifty nodes. Sweden is the dominant Nordic node followed by Norway, Denmark, Finland, and Iceland. Here it is Sweden, UK, and Denmark that form a co-authorship triad, but Sweden also has strong co-authorship links to The Netherlands. Norway, in this period, is strongly oriented towards Germany in terms of international co-authorships.

Figure 12 presents the global collaboration patterns for Nordic regional science publications for the whole period studied (1993–2022). We see a dense intra-European collaboration network, strong collaboration links to North America and, interestingly, strong collaboration links also to the distant Australia.

7 Research productivity of the leading “Nordic” regional science authors and institutions

In this section, we turn to analysing individual research productivity among the leading “Nordic” regional science authors as well as the leading Nordic regional science research institutions. Note that “Nordic” here means being affiliated to a Nordic academic institution.

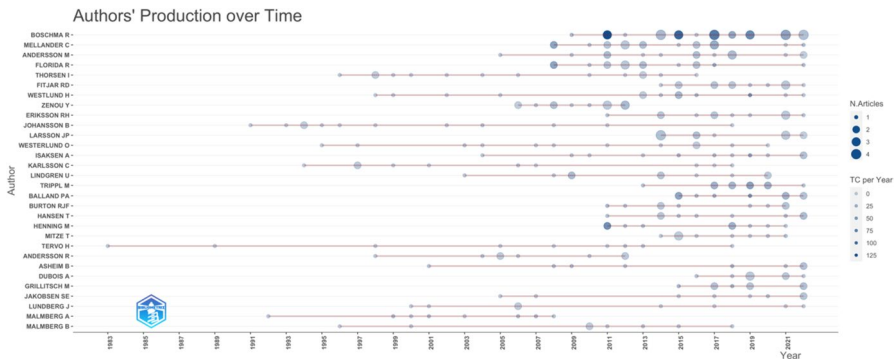


Fig. 13 Productivity of the Top-30 “Nordic” Regional Science Authors 1983–2022 (Because papers are our basic observation unit, it can happen that authors like Ricard Florida appears here via his co-authorship with Charlotta Mellander despite having no Nordic affiliation himself). Illustration generated with data from *Web of Science* using *Biblioshiny* (*Bibliometrix*)

An overview of the productivity of the top thirty “Nordic” regional science authors during the period 1983–2022 is presented in Fig. 13. Size of nodes represents number of articles and colour number of citations (darker colour, more citations). When analysing this figure representing such a long period, it is important to consider that there are i) researchers no longer active and at least one deceased, ii) mid-career researchers, and iii) early-career researchers. There are also examples of researchers, such as Yves Zenou, who were engaged in regional science research for part of the careers but then turned to other types of research interests.

The Finnish regional science researcher Hannu Tervo has the longest career according to Fig. 13. His first regional science paper included in this study was recorded as early as in 1983 and he then continued to publish regularly until 2018. Other authors whose long-standing contributions are visualised here are Malmberg, A., Johansson, B., Karlsson, C. who all have registered publications in the early nineties. We may note that of the thirty names in the list more than two-thirds are active at or have been active at Swedish academic institutions, mostly affiliated to Jönköping International Business School and University of Lund.

The research productivity presented in Fig. 13 is only in relation to the thirteen regional science journals that have served as the basis of this paper. In Table A7.1 in the appendix, we present a broader productivity picture for the thirty regional science researchers in Fig. 13, including their total number of *Web of Science* notated journal publications as well as their total number of hits in *Google Scholar* for the period when their regional science articles summarised in Fig. 13 were published. The general picture here is that these thirty regional scientists published in a much wider range of scientific journals than the thirteen regional science journals analysed here. For several of these researchers, we also find a substantial number of hits in *Google Scholar*, indicating a significant involvement in writing book chapters and reports but also in book editing.

It is notable that only two of the thirty most productive authors in Nordic regional science are women, but this is unfortunately the case in many research fields. It is difficult to ascertain if this figure reflects that regional science overall is a male dominated field, or if Nordic regional science research stands out in this respect. Studies of gendered author distributions in economics display few differences in choice of specialisation although women tend to focus more on public policy and labour compared with their male counterparts (Lundberg and Stearns 2019). Such findings may indicate that the focus of the research field may influence the degree to which female PhD students specialise in regional science. Yet, such speculations would need to be corroborated by empirical analyses.

We now turn from the individual Nordic regional science researchers to the Nordic regional science research institutions where they are/have been active. Tables A7.2–A7.5 in the appendix present the number of articles published in the thirteen selected regional science journals in each of the four 10-year periods analysed above. We find that three institutions, namely Umeå University, the Royal Institute of Technology in Stockholm and University of Oslo hold a position among the top-fifteen in terms of number of articles in all four periods. However, while Umeå University keeps its position as top-one or top-two in all four periods, the Royal Institute of Technology drops from being number two in

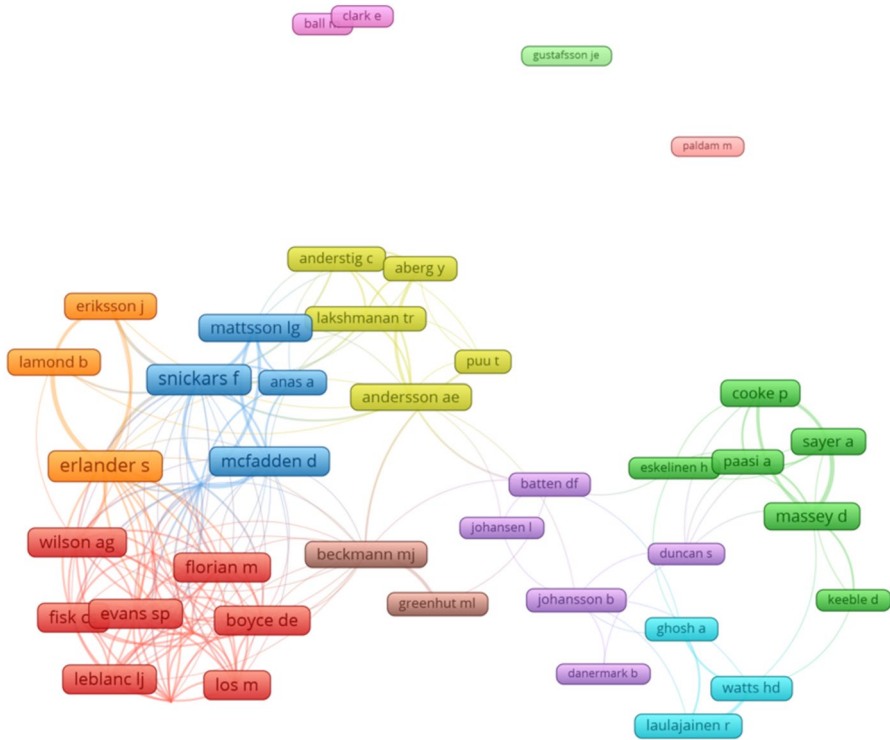


Fig. 14 The co-citation for the period 1983–1992. Illustration generated with data from *Web of Science* using *VOSviewer*

1983–1992 to being number five in 2013–2022. There are six institutions that belong to the top-fifteen in terms of the number of articles in three of the four periods, namely Jönköping International Business School, Lund University, Norwegian University of Science and Technology, University of Copenhagen, University of Helsinki, and University of Southern Denmark. In the final period as illustrated in *Table A7.5*, we find eight Swedish, four Danish, two Norwegian, and one Finnish institution.

When comparing *Table A7.5* with *Table A7.4*, we noted that there has been a substantial increase in the number of articles published by researchers at the leading regional science research milieus in the Nordic countries. In total, the number of articles has increased with almost 300% from the period 2003–2012 to the period 2013–2022. So, what is the reason behind this considerable change? If we compare the two periods, we find that the number of active authors has increased with more than 400%. This implies that these regional science research milieus have grown substantially but, interestingly, the number of articles has grown slower than the number of regional science researchers. However, as shown above, regional science researchers in the Nordic countries publish to a very substantial degree in other journals than the thirteen journals analysed here.

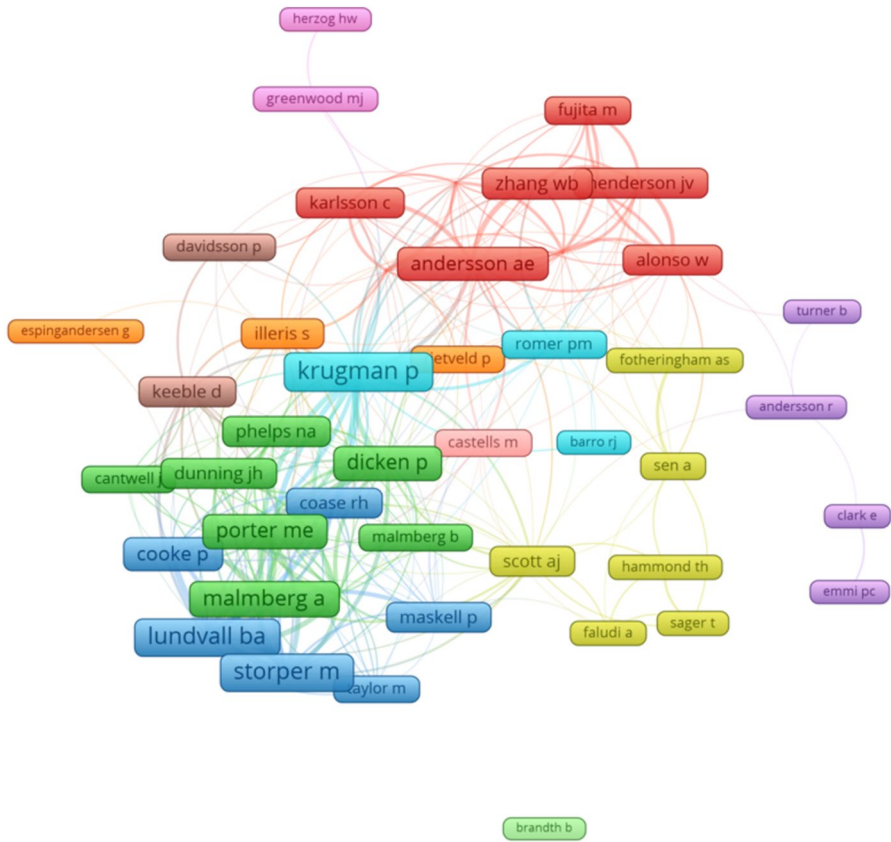


Fig. 15 The co-citation pattern for the period 1993–2002. Illustration generated with data from *Web of Science* using *VOSviewer*

Behind this growth of regional science milieus in the Nordic countries, we can see an increased interest in spatial phenomena among researchers but also deliberate attempts to develop regional science milieus at several Nordic institutions.

8 The intellectual base of Nordic regional science

This section centres on the researchers cited in articles authored by Nordic researchers in the selected regional science journals. These can be said to represent the “intellectual base” of the actual research—the work of these authors is the foundation from which new knowledge is produced (Persson 1994). Thus, these researchers have most probably contributed most to the development of regional science research in the Nordic countries. We present four cluster maps with the fifty most cited authors in each of the four periods and display the connections between these authors. However, organisations (OECD, State agencies)

and anonymous sources have been removed. Important to note is that the co-citation analysis performed here incorporates sources outside the core Nordic dataset of 1435 documents, as the analysis is based on the 56,515 references made by articles included in the core set of articles.

The intellectual anatomy of a research area changes over time as new research problems/programmes, paradigms, theories, models, and methods emerge (Liu et al. 2015). It is standard in bibliometrics to use document co-citation analysis (DCA) to analyse the intellectual structure and dynamics of a research field. DCA identifies mutually cited references in research articles and aggregates them across articles to generate co-citation networks and clusters (Trujillo and Long 2018). DCA analysis counts the frequency with which two articles are cited together by other articles (Small 1973) and the closer the proximity, the closer the intellectual connection (Van Eck and Waltman, 2020).

We start with Fig. 14, which demonstrates the co-citation pattern in the period 1983–1992. The three clusters to the left are dominated by several more theoretically oriented regional science researchers with a background in mathematics and civil engineering with a Nordic base at the Royal Institute of Technology in Stockholm. The blue clusters have links to the yellow cluster comprising economists affiliated to Umeå University, which is linked to the violet cluster with more economists affiliated to Umeå University. The co-citation pattern we see here has a strong Swedish bias even if many of the researchers in the clusters are non-Swedish. The

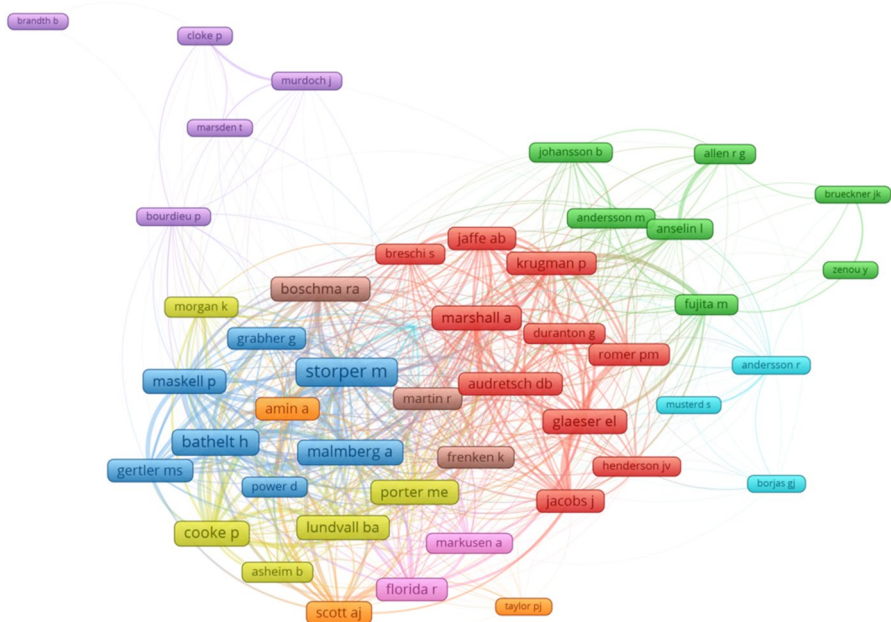


Fig. 16 The co-citation pattern in the period 2003–2012. Illustration generated with data from *Web of Science* using *VOSviewer*

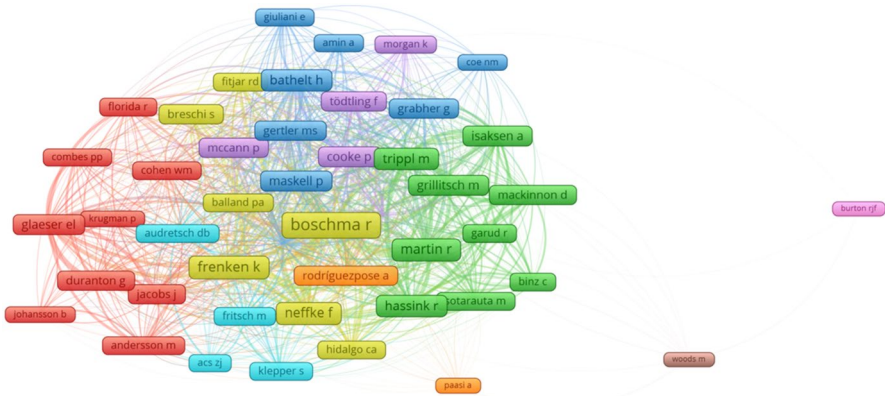


Fig. 17 The co-citation pattern in the period 2013–2022. Illustration generated with data from *Web of Science* using *VOSviewer*

only distinct economic geography co-citation cluster is the green cluster with a clear Finnish bias.

The co-citation pattern for the period 1993–2002 shown in Fig. 15 differs substantially from the pattern in the earlier period. We see many co-citations between mainly economic geographers and some international economists as illustrated by the integrated blue and green clusters and partly the yellow cluster. The Nordic researchers involved here are based in both Denmark and Sweden. The regional economists are mainly found in the red cluster, which has its Nordic base in Sweden. Interestingly, Paul Krugman links the red cluster to the blue and green clusters, which thus indicates a shared interest in the “new economic geography.”

The co-citation pattern for the period 2003–2012 is displayed in Fig. 16. Here we find a distinct pattern with the economic geography co-citation clusters located to the south-west and the regional and urban economics to the north-east with the brown cluster as a bridge. The blue, yellow and brown clusters involve Nordic regional science researchers based in Denmark and Sweden, while the clusters to the north-east involve regional science researchers based in Sweden. Interestingly, Paul Krugman is no longer a bridge between the economic geographers and the regional and urban economists, which indicates a reorientation of the research in economic geography compared with the earlier period. The most highly cited researcher in this period is Michael Storper. Interesting in this period is that one (!) classic regional scientist—Alfred Marshall—attracted many citations, which indicates a renewed interest in his research on co-locations, industrial districts, and clusters.

The co-citation pattern in the final period 2013–2022 represented in Fig. 17 is dominated by citations among economic geographers of whom the Nordic economic geographers now are located not only in Denmark and Sweden but also Norway. We can see that Ron Boschma has a certain central position here as the most highly cited

researcher in this period. The regional and urban economists are found in the red cluster of researchers affiliated to academic institutions in Sweden. A new dimension in Fig. 17 is the light blue cluster linking the red cluster to the other clusters, thus indicating numerous citations to researchers in entrepreneurship and industrial organisation. This marks a new interest in research questions involving spatial aspects of industrial organisation and entrepreneurship among regional scientists in the Nordic countries.

When we compare the four theme cluster maps in this section, there seems to exist some differences in citation behaviour between Nordic economic geographers and Nordic regional economists. Nordic economic geographers seem to have at least a slight preference for citing other European economic geographers, while Nordic regional economists seem to have a similar preference for citing American economists. A general observation to be made from the four cluster maps in this section is that except for Alfred Marshall in one period, we find no references to the classic regional scientists such as van Thünen, Laundhart, Weber, Hotelling, Christaller, Palander, Ohlin, Lösch, Isard, Hägerstrand, and Myrdal. Partly, this lack of citations to the classic regional scientists may be due to a low interest among Nordic regional science researchers in abstract regional science theories (cf., Chen and Schintler 2023).

9 Summing-up and conclusions

Let us now return to McCann (2020) and his overview of “the Nordic contribution to regional science” which only includes Swedish contributions. As shown above, researchers in all Nordic countries⁸ have given substantial and increasing contributions to regional science over the period 1983–2022. In addition, while McCann argues for the substantial influence of Nordic (Swedish) regional science researchers on the theoretical development of the field, we have shown that Nordic authors have not only made important empirical contributions to the field, but they also have considerable influence in terms of the total volume of regional science research produced globally, and their share has increased over time.

It is no easy task to summarise the rich material presented above. However, some points are worth stressing. It is astonishing how the Nordic researchers have been able to increase their share of the publications in the thirteen regional science journals analysed in this paper. One can only speculate about possible underlying reasons. For one reason or the other, research funding institutions as well as academic institutions must have allocated more funding for regional science research. It is also obvious that entrepreneurial initiatives to develop and cultivate regional science research engagement in academic institutions such as Lund University, Jönköping International Business School and University of Stavanger have paid off in terms of a substantial increase in the number of authorships. New generations of very productive regional science researchers like Charlotta Mellander, Martin Andersson,

⁸ This also includes researchers at Icelandic institutions, but due to small numbers these researchers and institutions are not accounted for here.

and Rune Dahl Fitjar have come forward with possibly a stronger focus on international publications than earlier generations. We can also point at the importance of strategic recruitments and affiliations such as Ron Boschma and Michaela Trippel to increase the research output at the actual institutions.⁹

Another point worth stressing is the strong trends concerning a higher share of co-authorships as well as international co-authorships. The development of international co-authorships is remarkable, moving from no international co-authorships 1983–1992 to what is virtually a global network of international co-authorships in the period 2013–2022. When it comes to research themes, it seems as if Nordic regional science research has to a significant degree pursued other research themes than regional science researchers in the rest of the world (cf., Chen and Schintler 2023).¹⁰

In terms of individual research productivity, the traditional skewed distribution is duplicated here, with a limited number of authors being responsible for most publications. However, on average, Nordic regional science publications seem to have been cited to the same extent as all publications in the studied journals. In terms of research productivity at the institutional level, we find that one institution—Umeå University—has managed to keep a position among top-2 in all four periods. The Royal Institute of Technology and University of Helsinki ranks top-fifteen in all four periods. There are six institutions that rank among the top-fifteen in terms of the number of authorships in three of the four periods, namely Jönköping International Business School, Lund University, Norwegian University of Science and Technology, University of Copenhagen, University of Oslo, and University of Southern Denmark defending their status as major regional science milieus in the Nordic countries over time.

Our main conclusion from this study based upon publications in thirteen regional science journals during the period 1983–2022 is that the Nordic countries have gained a strong position in the field of regional science research internationally and have several academic institutions in the field with an international reputation. We see no reason why these institutions should not maintain and even strengthen that position in the future, given the considerable number of younger and very productive regional science researchers.

Concerning suggestions for future research based upon our research in this paper, we strongly believe that it would be remarkably interesting to make bibliometric analyses of regional science publications also for other countries and regions. This would open up interesting options for making meaningful comparisons to see how the regional science research field has developed over time. Are the development patterns concerning i) publication volume, ii) scientific collaboration nationally and internationally, iii) main research topics, iv) the collaboration patterns of the researchers, v) international co-authorship patterns, vii) research productivity

⁹ The recruitment/affiliation of leading foreign researchers to an institution might positively affect its reputation, its national and international ranking, and its research performance evaluations (Hottenrott & Lawson 2017).

¹⁰ However, it should be noted that Cen & Schintler (2023) analyse a separate set of regional science journals.

of researchers and research institutions, and viii) co-citation patterns. These comparisons would make it possible to much better understand how the research field of regional science has developed internationally. Are the development patterns similar in different countries and regions or do they diverge? And if they diverge, what could be the reasons? Does it mirror the influence of the leading regional scientists, or does it mirror a separate set of regional policy problems? And what do the relationships between regional science research in different countries and regions look like? Where do we find the leaders, and where do we find the followers? All this is of great interest to researchers in the field of regional science, but it is also of a broader interest for researchers including bibliometricians interested in how research fields develop nationally and internationally over time.

Appendix

See Figures and Tables (Figs. 18, 19, 20 and Tables 4, 5, 6, 7, and 8).

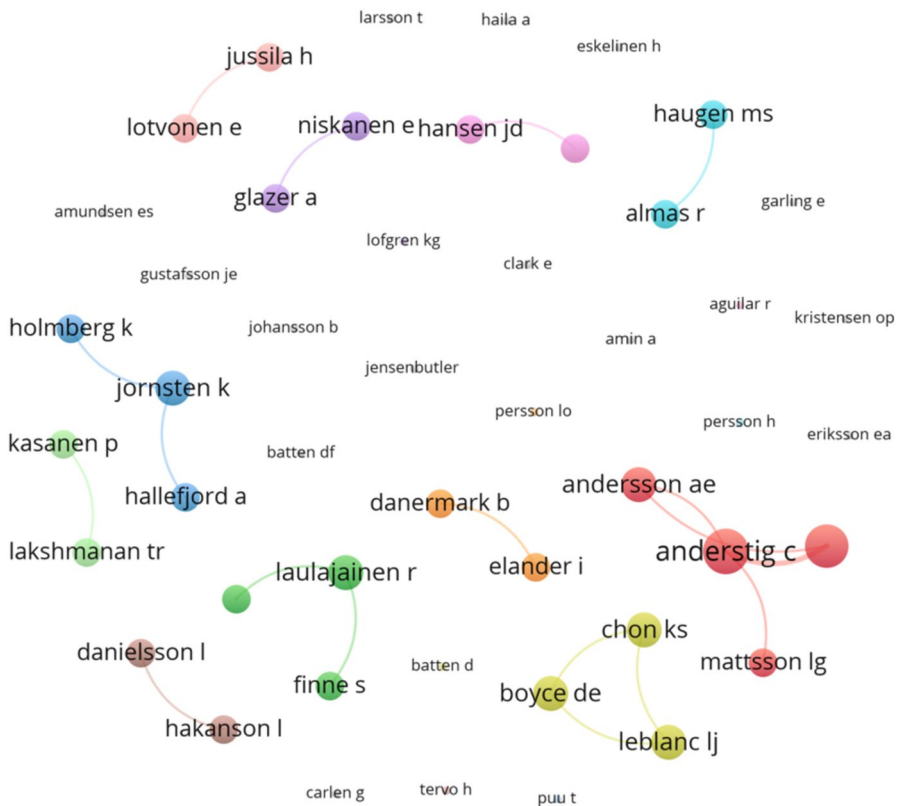


Fig. 18 Co-authorship patterns for Nordic regional science publications 1983–1992. Illustration generated with data from *Web of Science* using *VOSviewer*

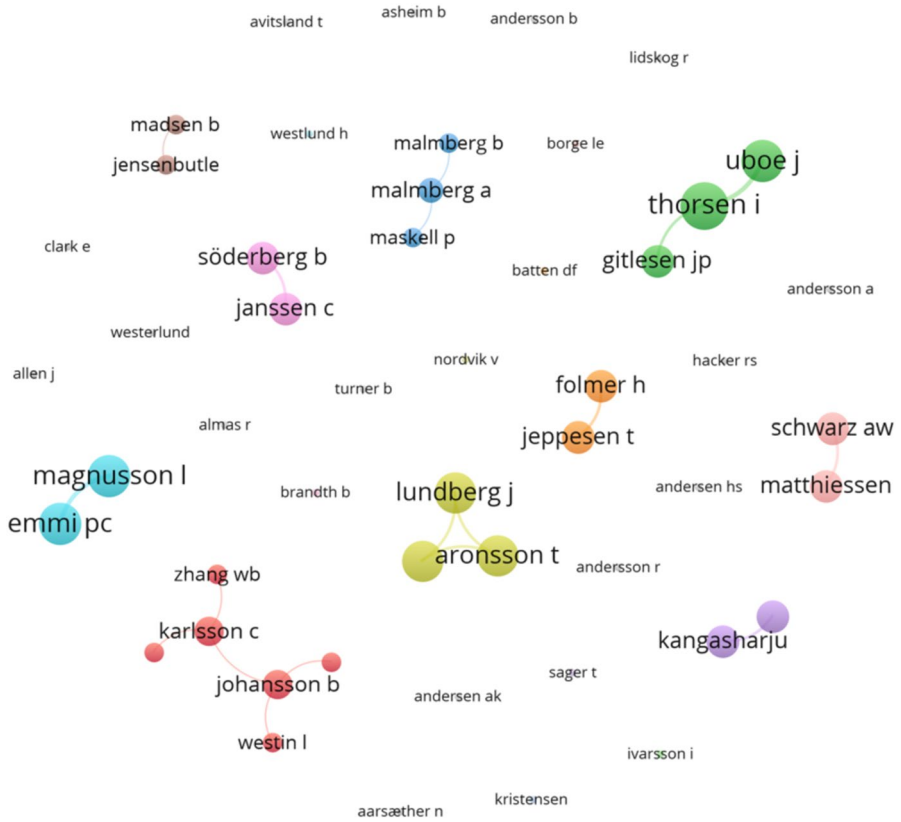


Fig. 19 Co-authorship patterns for Nordic regional science publications 1993–2002. Illustration generated with data from *web of science* using *VOSviewer*

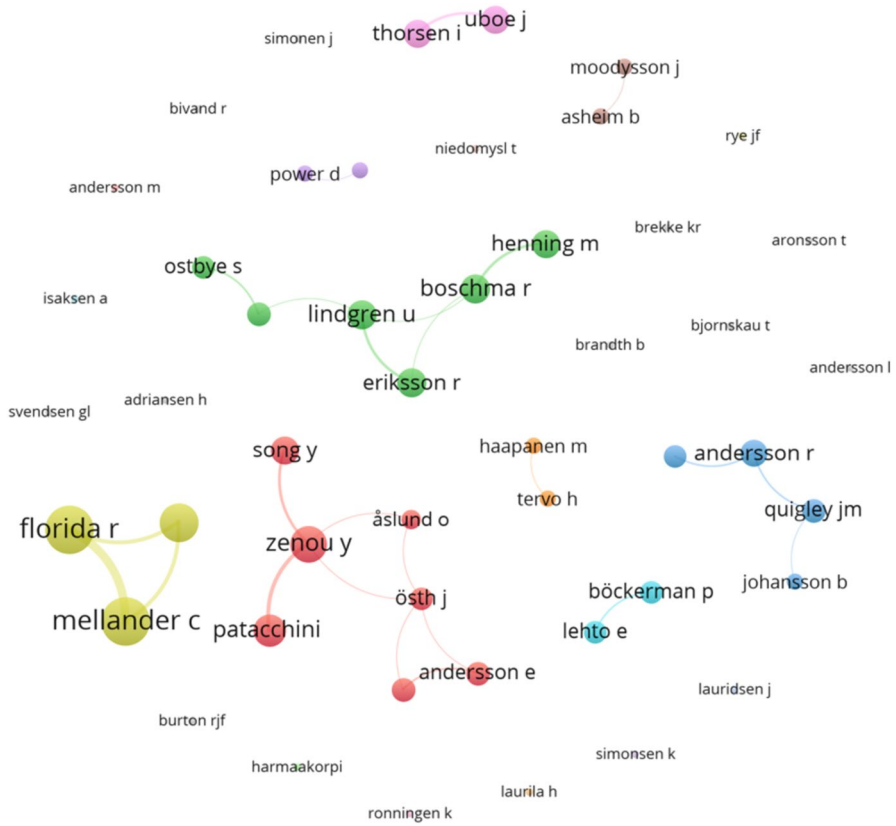


Fig. 20 Co-authorship patterns for Nordic regional science publications 2003–2012. Illustration generated with data from *web of science* using *VOSviewer*

Table 5 Nordic institutions with two or more regional science articles 1983-1992

Ranking	Institution	Number of articles	Number of unique authors	Articles per author
1	Umeå University	13	13	1
2	Royal Institute of Technology, Stockholm	7	8	0.9
3	Gothenburg University	5	5	1
3	Linköping University	5	11	0.5
5	Aarhus University	3	3	1
5	University of Joensuu/University of Eastern Finland	3	5	0.6
5	University of Oulo	3	6	0.5
8	Lund University	2	3	0.7
8	National Swedish Institute of Building Research	2	2	1
8	University of Jyväskylä	2	2	1

Source: *Web of Science*

Table 6 The 15 Nordic institutions with the largest number of regional science articles 1993–2002

Ranking	Institution	Number of articles	Number of unique authors	Articles per author
1	Umeå University	17	25	0.7
2	Uppsala University	13	16	0.8
2	Jönköping International Business School	13	13	1
2	Royal Institute of Technology, Stockholm	13	18	0.7
5	University of Copenhagen	10	16	0.6
6	Norwegian University of Science and Technology	8	7	1.1
7	University of Jyväskylä	6	7	0.9
7	Western Norway University of Applied Sciences	6	5	1.2
9	Aalborg University	5	8	0.6
9	University of Oslo	5	10	0.5
9	Institute for Futures Studies	5	3	1.7
9	University of Helsinki	5	6	0.8
9	Odense University/University of Southern Denmark	5	6	0.8
14	Copenhagen Business School	4	4	1
14	Norwegian School of Economics and Business Administration	4	7	0.6

Table 7 The 15 Nordic institutions with the largest number of regional science articles 2003–2012

Ranking	Academic Institution	Number of articles	Number of unique authors	Number of articles per author
1	Umeå University	27	40	0.7
2	Uppsala University	26	30	0.9
3	Lund University	21	29	0.7
4	Royal Institute of Technology, Stockholm	20	31	0.6
5	Norwegian University of Science and Technology	19	26	0.7
6	Stockholm University	18	22	0.8
7	Jönköping International Business School	16	21	0.8
8	Odense University/University of Southern Denmark	12	15	0.8
9	Norwegian School of Economics and Business Administration ^a	10	20	0.5
9	University of Jyväskylä	10	8	1.3
11	Stockholm School of Economics	9	14	0.6
11	Tampere University	9	8	1.1
11	University of Oslo	9	12	0.8
11	University of Oulu	9	8	1.1
12	Copenhagen Business School ^b	8	10	0.8

Source: *Web of Science*

^aÖrebro University and Roskilde University also registered four published articles in this period

^bResearch institute of Industrial Economics, University of Helsinki, and University of Copenhagen also registered eight articles in this period

Table 8 The 15 Nordic institutions with the largest number of regional science articles 2013–2022

Ranking	Academic Institution	Number of articles	Number of unique authors	Number of articles per author
1	Lund University	109	180	0.6
2	Umeå University	56	94	0.6
3	Jönköping International Business School	52	55	0.9
4	Uppsala University	45	89	0.5
5	University of Stavanger	42	79	0.5
5	Royal Institute of Technology, Stockholm	42	74	0.6
7	Norwegian University of Science and Technology	40	68	0.6
8	Swedish University of Agricultural Sciences	39	56	0.7
8	University of Southern Denmark	39	95	0.4
10	Stockholm University	36	69	0.5
11	University of Copenhagen	34	108	0.3
12	University of Helsinki	29	62	0.5
12	Aalborg University	29	55	0.5
12	University of Gothenburg	29	64	0.5
15	Copenhagen Business School ^a	27	61	0.4

Source: *Web of Science*

Source: *Web of Science*

^aUniversity of Oslo also registered 27 articles in this period

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