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**Innovation studies – an emerging discipline (or what)?
A study of the global network of innovation scholars**

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Abstract

Although innovation is not a new topic for scholarly research, the academic literature on innovation was, for a long time, not very voluminous. However, more recently innovation has become a major focus among scholars of different backgrounds, and this change is also reflected in an increasing number of academic publications in this area. In parallel with this we have seen the emergence of a number of new journals and professional associations devoted to the subject. The research reported in this paper is motivated by these trends. We wish to find an answer to the question to what extent it now exists a unified community of innovation scholars that identify themselves with innovation studies as a field rather than particular sub-fields within other, more traditional disciplines. Moreover, we want to explore the factors (sources of inspiration, academic leadership, professional societies, publishing outlets etc.) that bind scholars together or – alternatively – continue to keep them divided. The research reported in this paper is based on a web-survey carried out in during 2004 and 2005. The results suggest that a global innovation studies community exists as a collection of a large number of relatively small groups (characterized dense internal relationships) defined along geographical and disciplinary lines. Although the field has spread over many countries and disciplines, it is particularly developed in Europe and among scholars with a background in economics. These smaller groups, however, are embedded in larger transnational groups or clusters that are kept together by what is commonly referred to as “weak ties”. Leading scholars, professional associations and journals all play an important role in keeping these larger groups together (as well as distinguishing them from each other).

A few keywords: Innovation, Networks

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Introduction¹

“Innovation” is one of those catch words that suddenly seems to be on everybody lips. Glossy magazines, posters, newspapers, the concept seems to be everywhere. But there is more to it than a sudden hype. Among scholars within various disciplines, innovation has increasingly been recognized as an important social phenomenon worthy of serious study. But despite the pioneering work of the Austrian-American innovation-theorist Joseph Schumpeter during the first part of the previous century, there was very little scholarly work on the subject before the 1960s. Since then scholarly work on innovation has soared, though, with particularly rapid growth during the last ten years or so (Fagerberg 2004).² Many new departments or centres focusing on innovation studies have been founded and several new journals and professional associations wholly or partly devoted to innovation research have emerged. The topic we wish to address in this paper is how these recent developments are to be understood. Are we witnessing the development of a new scientific field within the social sciences, with its own social organisation, institutions, standards etc., something that perhaps in the course of time may develop into a new discipline?

Studies of the social organisation of science have demonstrated that scientists in rapidly changing fields tend to work together in relatively small groups, characterized by dense internal interaction and coordination (Griffith and Mullins 1972). Previous research using bibliographic data has in particular emphasized the crucial role commonly played by small number of highly productive researchers in such dynamics (Crane 1969, 1972, see Chubin 1983 for an overview). However, as pointed out by Soderqvist and Silverstein (1993), relying solely on bibliographic evidence may lead the researcher to underestimate the important role that institutions and organisations, such as for instance scientific associations and meetings, may play for the development of such fields, as well as the role played by other types of links not reflected in publications. To be able to allow for the inclusion of such factors into the analysis we have chosen to base the analysis presented in this paper on a (web-based) survey among innovation scholars worldwide. Particular emphasis was placed on mapping the diverse links that exist between these scholars, the sources of inspiration for their scholarly work, their participation in conferences and meetings and their views on what the most important publishing outlets are.

The next section presents the survey. Then, in the third section, we use a methodology based on social network analysis (Newman and Girvan 2004) to identify a set of closely knit groups of interacting scholars within the broader network of innovation scholars covered by the analysis. This division of the network into smaller groups is based on what is commonly called “strong links” (Granovetter 1973), e.g., links to people with whom the respondents regularly interact (or work). Having demonstrated that such close relationships to colleagues (as co-workers or co-authors) or PhD students (supervision) tend to support the formation of smaller, dense groups of interacting scholars, we then, in the fourth section, turn our attention to the question of what binds these smaller groups together (if at all) into broader intellectual communities. Providing effective coordination across geographical and disciplinary boundaries is a daunting task, and it is made all the more difficult by the lack of institutions and organisations of the type that characterize established academic disciplines (Cummings and Kiesler 2005). But could it be that effective coordination mechanisms have nevertheless evolved (despite geographical and disciplinary fragmentation)? Three possible ways through

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² For an overview of scholarly work in this area see Fagerberg, Mowery and Nelson (2004).

which this might occur are through *common sources of inspiration* (leading academic scholars), *participation in professional associations/conferences* and use of particular *scientific publishing outlets* (focusing especially on this area). We use cluster-analysis to explore the extent to which these factors contribute to embed the many smaller groups that exists in this area into one or more broader intellectual communities (spanning different disciplines and geographical locations).

The sample

The web-based survey was carried out January 2004 and July 2005. The recipients were sent an email, asking them to fill in a questionnaire, and submit it electronically.³ Respondents who identified themselves with innovation studies were asked for relatively detailed information about the persons with whom they cooperate (at various levels of intensity).⁴ In addition, the respondents were asked questions about their sources of scholarly inspiration, important publishing outlets and their favourite “meeting places” (organisations / professional associations). In this way, we obtain a range of network relationships of varying “strength”, ranging from “strong” to “weak” ties (Granovetter 1973).

We started with an initial (relatively small) population obtained by studying lists of contributors to central journals in this area, reference lists in central books / papers and lists of participants in relevant projects within EU framework programmes. Particular attention was paid to the need to identify central researchers outside economics and in countries not belonging to the European Union (to avoid a biased sample). However, most of the people invited to participate in the survey were identified by the respondents themselves, i.e., we invited all people mentioned as contacts by other respondents to take part in the survey as well (we asked for email addresses along with the names, but also searched ourselves for email addresses when these were not given).^{5, 6} In this way the entire community of innovation scholars was allowed to “self-organize”. We took stock of the database in July 2005. At that time, there were 5199 identified persons in our database, among which 3484 had been approached with an invitation to participate in the survey (for the remaining we were not able to identify an email address). 1115 responses were obtained, implying a response rate of 32%, which we consider to be quite satisfactory. About one fifth (218) of these respondents said they did not consider to be working in innovation studies, or, in a few cases, failed to demonstrate any strong links with one or more of the respondents. The analysis in the paper will be based on the responses from the 897 remaining respondents.

³ The questionnaire is available from the authors on request.

⁴ Those who responded but said they did not belong to the area were allowed to exit after having confirmed their identity.

⁵ This method of defining the sample is known in the literature as the “name generator mechanism” (Lin, 1999).

⁶ A related survey aimed towards “evolutionary economists” (an important strand within innovation studies) had been carried out earlier by Verspagen and Werker (2003, 2004). When our survey “encountered” a respondent of the earlier survey, we invited these to revise their answers to the earlier survey in light of our broader focus, as well as to answer some additional questions.

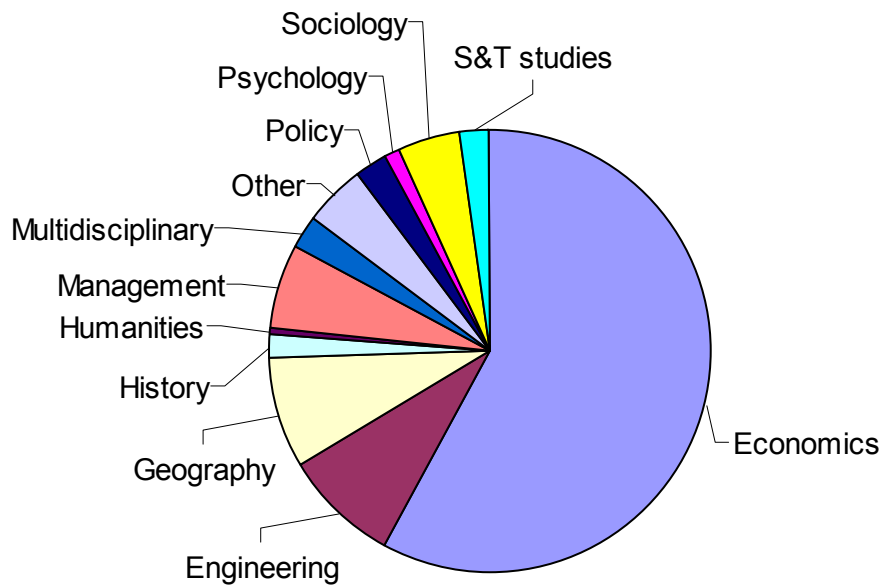


Figure 1. Distribution of the total sample over disciplines

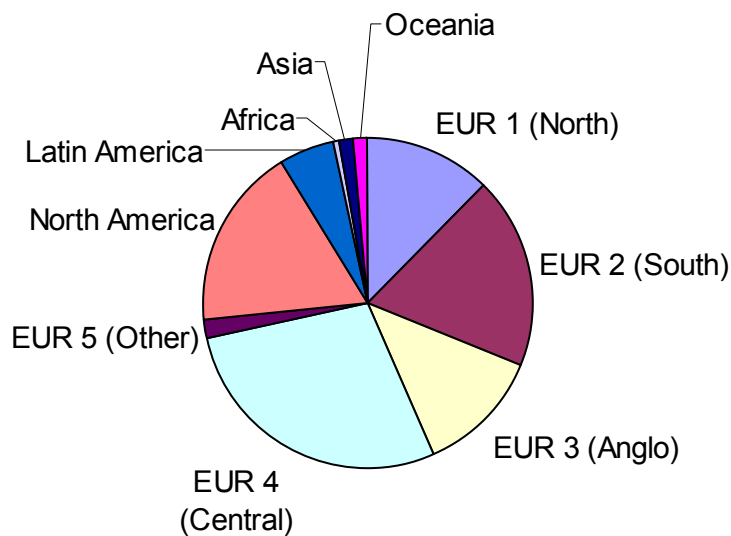


Figure 2. Share of world regions in the total sample population for various world regions

Figure 1 shows the distribution of the respondents over disciplines. The largest discipline was economics (58% of the respondents). After economics, engineering (under which heading we include also the natural sciences) was the most common disciplinary background (9%), followed by geography (8%), management (6%) and sociology (5%). However, although less

frequent, there were also researchers with other backgrounds. Similarly, Figure 2 gives the distribution of the respondents over world regions. As is evident from the figure, Europe (71 percent) joined by North America (17 percent) dominate the sample. Latin-America is also relatively well represented, while there are very few researchers in the sample coming from Africa and Asia. Because of the large number of respondents in Europe, we divide this group of countries further into five categories. The largest of these (in terms of respondents) is central Europe (Austria, Belgium, Switzerland, Luxemburg, Germany and the Netherlands), followed, respectively, by South Europe (Spain, France, Portugal, Greece and Italy), North Europe (Denmark, Finland, Sweden and Norway), and Anglo-Saxon Europe (United Kingdom and Ireland).

The role of “strong ties”...

The central idea underlying our analysis is that strong and weak ties play quite different roles when it comes to fostering scholarly interaction. Strong ties, we assume, tend to bind scholars together in relatively small groups characterized by strong interaction between group members, and – at least for most group members – a relatively modest amount of interaction with members of other groups. The role of weak ties, then, is to counteract this tendency toward insularity by embedding such smaller groups in broader intellectual communities characterized by shared cognitive frameworks, sources of scholarly inspiration, “meeting places” and publication channels. Three sets of research questions come out of this:

- To what extent do strong ties divide the scholars of our sample into a set of smaller groups with dense internal relationships?
- Do weak ties bring these smaller groups into broader intellectual communities, if so how many and what characterizes them?
- What do these results tell us about “innovation studies” as a field? How much do the researchers in this area actually have in common? What are the likely future prospects?

To answer the first question we limit the focus to what we consider as strong links,⁷ e.g., student-supervisor relationships, colleagues within your own institution and co-authors (independently of where they work). To identify the “community structure” of our network we adopt a method developed by Newman and Girvan (2004). Assume, for instance, that a network consists of pockets of dense (or “thick”) interaction (e.g., groups) linked together by a smaller number of cross-group links. The more efficient a particular cross-group link is in bringing groups together, the more “busy” it will tend to be. What the Newman-Girvan method does, then, is to identify these “busy” cross-group links (so-called “edges”) and eliminate them one by one using an iterative procedure. As a consequence, the network will split into successively smaller groups. To find out when to stop partitioning they calculate an index of “community strength” (the maximum of which is assumed to reflect the optimal partitioning of the network).

⁷ We assume that a link exists if at least one of the participants in a relationship reports it.

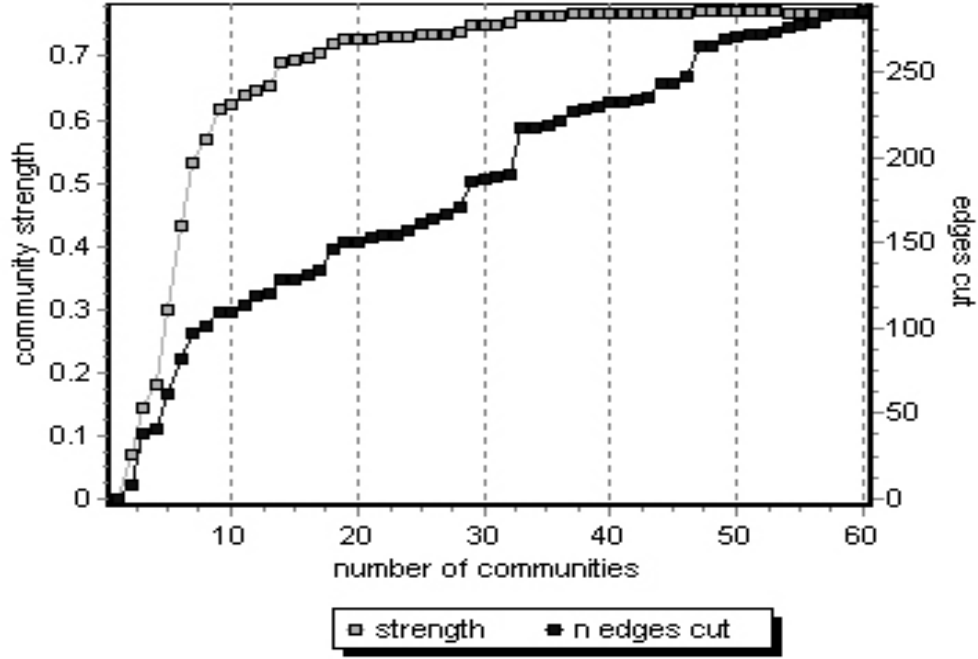


Figure 3 Community Strength

Figure 3 presents the community-strength indicator for our network at different levels of partition. The indicator rises sharply in the beginning, indicating strong support for the idea that strong ties tend to lead to the formation of smaller groups characterized by dense internal interaction. The indicator peaks at forty-seven implying that an average group has slightly above twenty members.⁸ However, in reality the group size varied a lot, from three to sixty-one members. Further details on the forty-seven groups may be found in Table A1 in the Appendix to this paper.

The question we wish to address now is to what extent these groups tend to be bound to particular geographical locations and/or disciplinary settings. To explore this we report in Figure 4 on the distribution of a measure of geographical (disciplinary) concentration, the so-called (inverse) Herfindahl index (with respect to geography and discipline, respectively). The Herfindahl index is calculated on the basis of the share of each discipline (region) in membership of each group.⁹ The greater the spread of the members of a particular group across different locations or disciplines, the larger the value of the index will be. If all the members of a group belong to the same region (or discipline) the index will be equal to 1 (minimum value). The maximum value of the index is given by the numbers of regions or disciplines in the data set (10 and 12, respectively).

⁸ Detailed information on the membership, location and disciplinary orientation of the forty-seven groups may be found in Table A1 in the appendix to this paper.

⁹ The formal definition of the inverse Herfindahl index is $1/\sum_{i=1}^n s_i^2$, where s_i^2 is the squared share of discipline / region i in the community.

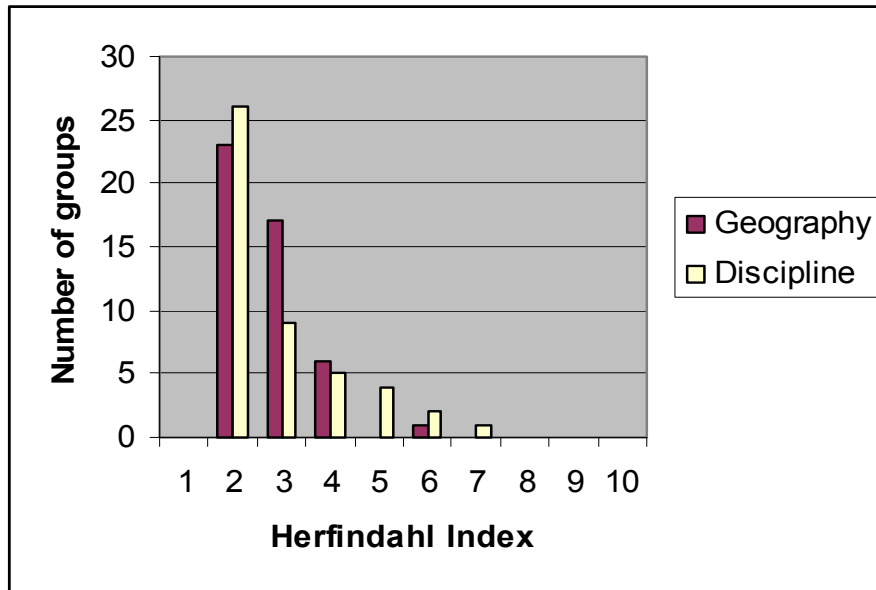


Figure 4 Geographical and Disciplinary Concentration – Groups defined through “strong ties”

As is evident from the graph the groups bound together by strong links tend to be fairly concentrated in terms of geography and/or discipline. In fact, in both cases the majority of the groups cluster close to the lower end of the index and the upper end of the (potential) distribution is totally empty. Thus, geographically distributed, cross-disciplinary groups of researchers that work closely together (e.g., bound together by strong ties) appear to be extremely rare.

.... and “weak ties”

Having answered affirmatively our first research question (about the existence of smaller groups defined through strong ties) we now move to the central topic of this paper, namely what binds these groups together (and to what extent). To explore this we take into account the information supplied by the respondents on sources of scholarly inspiration, favourite “meeting places” and the most important publication channels. In each case the respondent was asked to mention five (ranked from most important to least important on a five to one scale). Tables 1-3 report the fifteen most frequent answers in each category. The column “share” counts the share of respondents that include a particular source of inspiration, meeting place or publication channel among the five most important ones. The column “Herf” displays the corresponding value of the (inverse) Herfindahl index. This time the index reflects the extent to which a source of inspiration, meeting place or publication channel is widely shared among the smaller groups (large values), or appreciated by one or a few groups only (small values). The more widely shared, the larger the index will be. As before, the minimum of the index is 1 (unity), while the maximum will be equal to the number of groups (47).

Table 1. The most important sources of scholarly inspiration

References	Share	Herf
Joseph A Schumpeter	0.159	21,23
Richard R. Nelson	0.138	19,76
Chris Freeman	0.088	17,48
Bengt-Åke Lundvall	0.066	13,76
Nathan Rosenberg	0.065	15,72
Keith Pavitt	0.064	14,57
Giovanni Dosi	0.062	17,04
Karl Marx	0.055	11,83
Zvi Griliches	0.052	10,00
Sidney G. Winter	0.035	11,58
Herbert Simon	0.031	7,13
Paul David	0.029	11,66
Alfred Marshall	0.029	9,94
Adam Smith	0.028	8,80
Michael Porter	0.026	9,98

Table 2. The most important meeting places

Meeting places	Share	Herf
International Schumpeter Society (ISS)	0.155	12,92
Danish Research Unit for Industrial Dynamics (DRUID)	0.137	14,18
European Association for Research in Industrial Economics (EARIE)	0.056	12,63
Academy of Management (AOM)	0.051	13,06
European Meeting on Applied Evolutionary Economics (EMAE)	0.030	8,38
European Association for Evolutionary Political Economy (EAPE)	0.025	10,52
National Bureau of Economic Research (NBER)	0.025	6,91
Regional Studies Association Conferences (RSA)	0.018	9,85
International Association for Management of Technology (IAMOT)	0.017	7,76
Strategic Management Society (SMS)	0.017	6,82
European Group for Organizational Studies (EGOS)	0.014	6,76
GLOBELICS	0.014	4,33
R&D Management Activities	0.013	3,27
Regional Science Association International (RSAI)	0.011	5,56
European Association for the Study of Science and Technology (EASST)	0.009	6,40

Table 3. The most important journals

Journals	Share	Herf
Research Policy (RP)	0.456	24,84
Industrial and Corporate Change (ICC)	0.193	11,46
Journal of Evolutionary Economics (JEE)	0.144	14,02
Economics of Innovation and New Technology (EINT)	0.138	15,72
Structural Change and Economic Dynamics (SCED)	0.079	12,21
Rand Journal of Economics (RAND)	0.048	14,11
American Economic Review (AER)	0.043	15,75
R&D Management	0.040	7,04
Regional Studies (RS)	0.039	10,65
Technovation	0.039	14,76
International Journal of Industrial Organization (IJIO)	0.037	10,37
Journal of Industrial Economics (JIE)	0.035	12,48
Management Science (MS)	0.032	9,24
Strategic Management Journal (SMJ)	0.032	14,75
Journal of Product Innovation Management (JPIM)	0.030	2,93

The most important source of inspiration is clearly Joseph Schumpeter, way ahead of the three other “classics” on among the top fifteen, Karl Marx, Alfred Marshall and Adam Smith. The two sources of inspiration that came closest to Schumpeter were Richard R. Nelson and Christopher Freeman, arguably two of the most influential scholars in this field from the 1970s onwards on their respective sides of the Atlantic. Nelson, together with Sidney Winter (also on the list), authored a very influential book in this area, “An Evolutionary Theory of Economic Change” (1982), bridging evolutionary thinking with (behavioralist) organisation theory in the tradition from Herbert Simon (also among the top fifteen). Freeman, working in the tradition from Schumpeter, was the first director of Science Policy Research Unit at the University of Sussex (SPRU), one of the oldest and most successful academic institutions in this area (founded 1965), and the first editor of the leading journal of the field, Research Policy (started in 1972). Keith Pavitt, a bit further down the list, succeeded Freeman as Professor at SPRU and editor of Research Policy. Giovanni Dosi, editor of the journal Industrial Dynamics and Corporate Change (ICC), also has a SPRU background. But the three remaining sources of inspiration from the upper part of the list, Bengt Åke Lundvall, Nathan Rosenberg and Zvi Griliches, all have different backgrounds from those mentioned so far (and from each other), hence illustrating the diversity of the field. For instance, while Lundvall is a heterodox economist from Scandinavia, known for his advocacy of the “national system of innovation” concept (Lundvall 1992), Griliches was a famous mainstream economist (econometrician) from the United States.

Among the favourite meeting places, two stand out, the International Schumpeter Society (ISS) and the Danish Research Unit for Industrial Dynamics (DRUID). Both are of fairly recent origin, dating back to 1986 (ISS) and 1995 (DRUID). The latter, although initially a relative local Danish affair (hence the name), has developed into a large, annual conference with broad international participation. Several of the smaller meetings are also fairly recent, albeit some, such as the American “Academy of Management” (AOM), the European Association for Research in Industrial Economics (EARIE) and the regional associations (RSAI and RSI) are fairly well established events catering for large audiences (transcending innovation studies proper).

While the answers to the questions on sources of inspiration and favourite meeting places reveal a significant amount of diversity among the respondents, there appears to be

more coherence in the assessment of important publication outlets. In particular the journal Research Policy (RP) tends to be popular with many respondents. Three other specialized journals, all of fairly recent origin, also get high marks (although far behind Research Policy): Industrial and Corporate Change (ICC), Journal of Evolutionary Economics (JEE) and Journal of the Economics of Innovation and New Technology (EINT). Further down the list are some general economics journals, such as the American Economic Review, and a number of specialized journals focusing on fields bordering innovation studies, such as, for instance, management, regional studies and industrial economics.

Comparing the three types of “weak ties” that we have been able to take into account results in a quite telling picture. The first thing that strikes the eye is that the shares and concentration indexes generally tend to be rather low. This indicates a considerable diversity among the respondents in what they value highly as important sources of inspiration, meeting places and publishing outlets. The only strong exception to this trend, and this is our second important observation, is the journal Research Policy, which was pointed to as important by slightly less than one half of the respondents. The third finding that we wish to emphasize here is that sources of inspiration and journals both seem to be more important in bringing the field together than do meeting places. In fact, there are six sources of scholarly inspiration and five journals that are more widely spread across the groups of our network than the most widely shared meeting place. A similar observation may be made for journals, two of the three largest journals have in fact relatively low values on the inerse Herfindahl index, indicating that these are highly popular with a limited number of groups only. Thus, and this will be our fourth point, while some “weak ties” may be important for a large number of groups, and thus may be seen as important for the integration of the entire field, others may be important for some groups only (and may hence play a more “divisive” role).

Cluster Analysis

The descriptive evidence reported above gives some hints on the social organization of the field. For instance, we have been able to identify some leading academics, some of which have a common background (from the Science Policy Research Unit – SPRU – at the University of Sussex) and a clear relationship to the leading journals in this area (Research Policy and ICC). However, other leading academics have quite different backgrounds, thus raising the question to what extent the scholars in this area should be seen as part of a common social organisation, characterized by a shared cognitive framework and appropriate institutions and organisations, or if it is more a loose association of different (perhaps competing) strands.

But how to empirically distinguish between different hypotheses on how the field is socially structured? In order to do this we shall assume that a social organisation of the type discussed above is characterized by a specific combination of leading academics (sources of inspiration), publishing outlets and meeting places. To test for the existence (or lack of such) of one or more such combinations in this area, we use the information given by the respondents to produce a vector of (“weak tie”) characteristics (with three times fifteen, e.g. forty-five, elements) for each of the forty-seven groups previously identified.¹⁰ We then apply

¹⁰ In constructing the vector of (“weak tie”) characteristics, we use a 9 – 5 scoring method in order to eliminate the strong element of progressivity that would result from a 5 – 1 scoring method. In the latter case, listing an element first weights five times higher than listing it fifth, while in our method the difference is only about two. However, we have also experimented with the 5 – 1 scoring method, and the results are qualitatively similar to those using the 9 – 5 method. If an element was not listed by a respondent, it gets a score of zero.

hierarchical cluster analysis¹¹ to explore the question of how (and to what extent) these “weak links” contribute to embed the small groups defined by strong links into one or more clearly distinguishable social organisations or intellectual communities. Hence, groups that have similar scores on similar “weak ties”, will tend to be clustered together into larger wholes. At the highest level of aggregation there is one cluster only (Figure 5), which splits into four, seven and twelve clusters at progressively lower levels of aggregation. We chose to focus on the seven clusters case. Two of these seven clusters are very small, however, with only five and seven members respectively, and will be disregarded in the following. This leaves us with five main clusters (shaded).

¹¹ The method is "Hierarchical Cluster Analysis: Ward's Method" from SPSS 14.0.0.

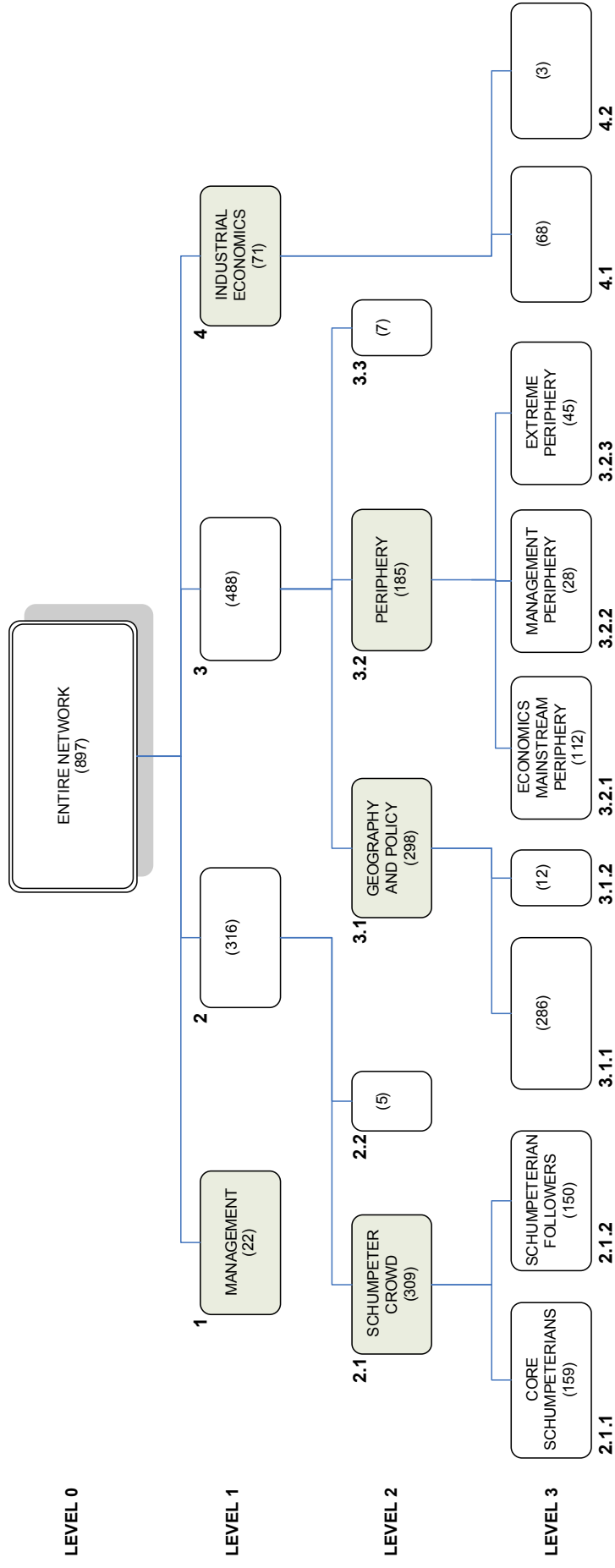


Figure 5. Clusters of Innovation Scholars

(Note: Numbers in brackets represent the number of scholars in the cluster)

Table 4 reports some characteristics for the five main clusters of our sample. For each cluster we report the two most important sources of inspiration, meeting places and journals (e.g. what the respondents value most). In addition we report the *bias* in these assessments, e.g., significant, positive deviations in these assessments from those of the rest of the sample (5% level of significance). We also report the size of the cluster and its disciplinary and geographical orientation (shares of ten percent or above of a discipline or region are reported).

Cluster 1 (Management) is a relatively small cluster composed mainly by sociologists and management scholars, with a geographical bias towards the USA. Members in this cluster go to the American Academy of Management (AOM) and DRUID meeting. They also like the European Group of Organisational Studies (EGOS). Apart from Research Policy they see management journals as the most relevant publishing outlets. Sources of inspiration generally get a low score, indicating perhaps that the most important sources of inspiration for the members of this group do not coincide with those of the sample as a whole.

Cluster 2.1 (Schumpeter crowd) is a large cluster with more than three hundred members. Although the majority among those are economists, there are also many scholars with a multidisciplinary background (or from other social sciences). The cluster is particularly strong in Europe. Members in this cluster share a strong interest in the meetings of the International Joseph Schumpeter Society (ISS) and DRUID. They are also much more likely than others to participate in other meetings with an evolutionary leaning, e.g., the European Meeting for Applied Evolutionary Economics (EMAEE) and the European Association for Evolutionary Political Economy (EAEPE). Schumpeter is their main source of inspiration, and they value him more highly than do members of any other cluster. They also show strong appreciation for a number of other well-known scholars with a Schumpeterian or evolutionary leaning, Nelson and Freeman in particular. Among the journals they fancy, Research Policy and Industrial Change and Corporate Dynamics (ICC) deserve particular mentioning, but they are also very fond of the Journal of Evolutionary Economics (JEE), Economics of Innovation and New Technology (EINT) and SCED (Structural Change and Economic Dynamics). At a lower level of aggregation this cluster divides into two, one with very high values on most indicators (“core Schumpeterians”), and cluster with essentially the same distribution of characteristics but lower absolute values (“Schumpeterian followers”).

Cluster 3.1 (Geography & Policy) The members of Cluster 3.1, which is comparable in size to the previous one, are generally less inclined than the members of that cluster to take part in conferences and meetings. Although the DRUID and ISS receive most attention in this cluster too, what particularly characterizes the members of this cluster is their pronounced interest for the regional science meetings. This is perhaps understandable given the high share of geographers in this cluster (20%). In fact, 80% of the geographers in our sample belong to this cluster, as do 48% of the sociologists and 42% of the management scholars. Hence, this cluster is clearly more cross-disciplinary in its orientation than, say, cluster 2.1 or the network as a whole (the economists are actually in a minority in this cluster in contrast to the sample as a whole). It also has more dispersed geographical basis (for instance the majority of the Latin-American scholars in our sample belong to this cluster). The members of this cluster have high esteem for Schumpeter’s work (although not more than for the sample as whole). However, what really characterizes the members of this cluster compared to the rest of the sample is the importance attached to inspiration from Lundvall and Porter, two scholars that in different ways have done influential work on spatial issues and related policy matters.

Generally, there are few journals that are held in particularly high esteem by the members of this cluster, with a partial exception for those that focus on spatial/regional issues (although they join in on the general enthusiasm for Research Policy).

Cluster 3.2 Periphery This cluster contains around one fifth of the members of the total network. US scholars are more inclined to take part in this cluster than in the sample as a whole. Economists dominate but a range of other disciplines is also present (though in smaller numbers). Among all the clusters this contains the members that are least interested in taking part in meetings/associations. Neither the ISS nor the DRUID seems to appeal to the members of this cluster. The highest values were reported for the National Bureau of Economic Research meetings (NBER) and the Academy of Management. Hence, the members of this cluster have few if any meeting-places in common with the members from largest clusters of our network. Still they join in on the general appreciation of Schumpeter's work. However, what particularly inspire them is the work by the American neoclassical economist (and econometrician) Griliches. Their preferences for journals also differ from the sample as a whole (and in particular from those of Cluster 2.1) by emphasizing more strongly economics mainstream journals such as the American Economic Review (AER) and Rand Journal of Economics (in addition to Research Policy). At a lower level this cluster divides in three, with one group consisting of mainstream economists, a second of management scholars and a third ("extreme periphery") with more mixed participation (characterized by very low values - appreciation – of all factors taken into account by the present analysis, confirming their peripheral status in the network).

Table 4. Characteristics of main clusters of innovation scholars

	<i>Cluster 1 Management</i>	<i>Cluster 2.1 Schumpeter Crowd</i>	<i>Cluster 3.1 Geography & Policy</i>	<i>Cluster 3.2 Periphery</i>	<i>Cluster 4. Industrial Economics</i>
Number of groups	3	13	14	11	5
Number of scholars	22	309	298	185	71
Most important conferences	AOM, DRUID	ISS, DRUID	DRUID, ISS	NBER, AOM	EARIE, ISS
Conference bias	AOM, EGOS	ISS, DRUID, EMAEE, EAPE	RSAI, RSA, IAMT	NBER, R&D Man.	EARIE, ISS
Most important sources of inspiration	Nelson, Griliches	Schumpeter, Nelson	Schumpeter, Lundvall	Griliches, Schumpeter	Griliches, Schumpeter
Inspiration bias	None	Schumpeter, Freeman, Nelson, Rosenberg, Simon, Pavitt, Dosi, Winter, Smith, David	Lundvall, Porter	Griliches	Griliches
Most important journals	RP, MS	RP, ICC	RP, JEE	RP, RAND	RP, AER
Journal bias	JPIM, MS, SMJ	RP, JEE, ICC, EINT, SCED	RS, Technovation	AER, RAND, R&D Man.	EINT, AER, RAND, JIE
Most important disciplines	Sociology (27%), Management (18%), Engineering (18%), Economics (10%)	Economics (68%)	Economics (40%), Geography (20%), Engineering (10%)	Economics (61%), Engineering (11%)	Economics (93%)
Most important locations	North-America (73%)	South Europe (26%), Central Europe (19%), UK and Ireland (19%), North Europe (12%)	Central Europe (34%), North America (16%), North Europe (15%), Latin America (10%)	North America (31%), Central Europe (26%), South Europe (16%)	Central Europe (39%), South Europe (23%), North Europe (17%)

Cluster 4 Industrial Economics The members of this medium-sized cluster are predominantly economists (more than 90%) with a bias towards Europe. They hold the meetings of the European Association for Research in Industrial Economics in high regard. However, in contrast to the members of the previous cluster (with whom they otherwise have much in common) they also participate in the ISS meetings, thus connecting up with some of the larger groups of our network. As for the network as a whole they recognize the importance of Schumpeter. But what they particularly value highly is - as in the previous cluster - the inspiration from Griliches. Their interests in journals have also much in common with the members of that cluster with a generally high appreciation of Research Policy supplemented by a taste for mainstream economics journals (AER, Rand) and – in this case – also the Journal of Industrial Economics. Compared to the sample as whole the members of this cluster also hold EINT in especially high esteem (as do the “Schumpeter crowd”).

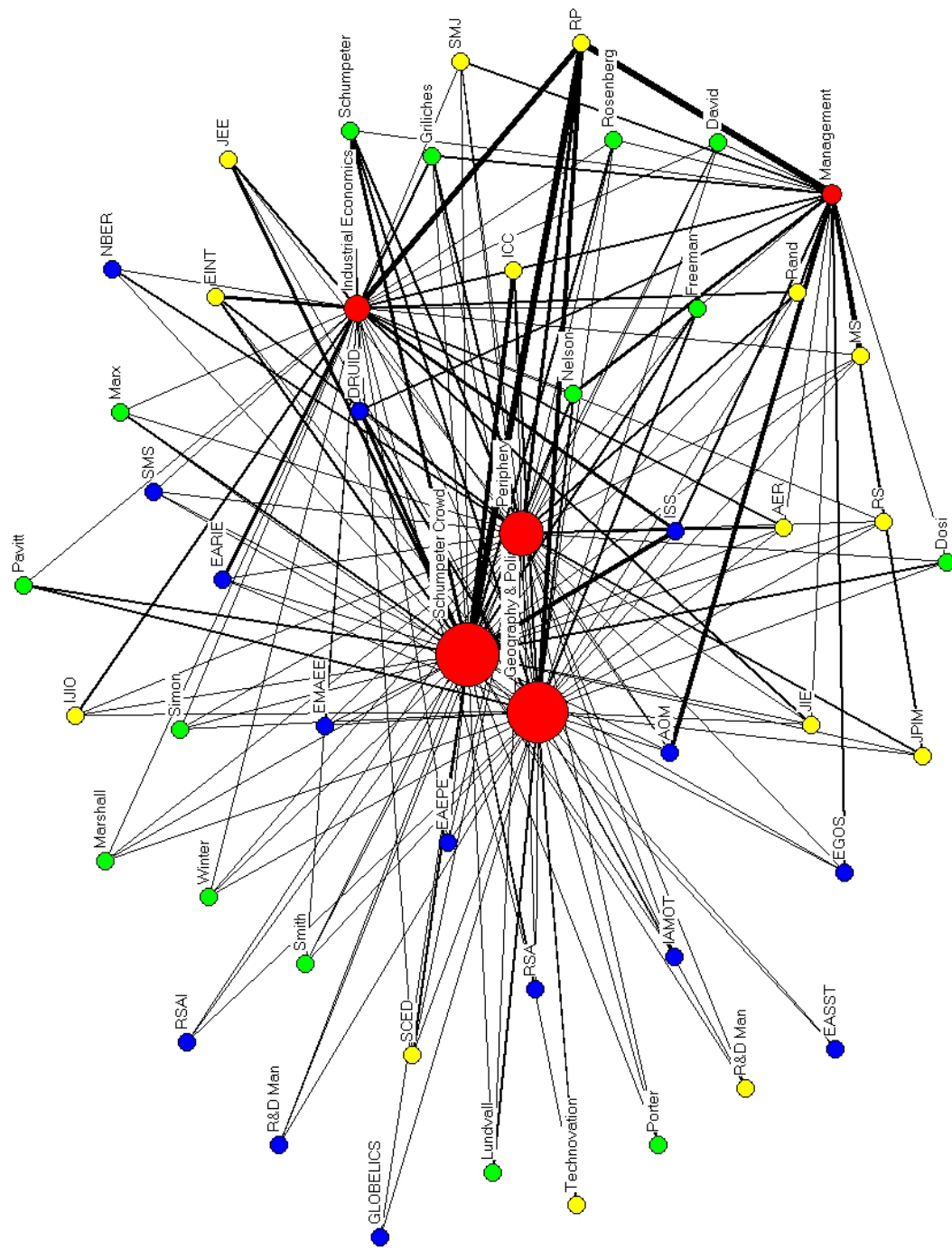
It is clear from the analysis that, consistent with expectations, “weak ties” contribute to embed the many groups bound together by “strong ties” together in a smaller number of “intellectual communities”. “Scholarly inspiration” turns out to be an important feature in delimiting these communities. Apart from Schumpeter, the “founding father” of this body of knowledge, who is highly appreciated by almost everybody (with the exception of the small “Management” cluster), most such sources tend to be highly valued by a one or a few clusters only. For instance, the “Schumpeter Crowd” is closely associated with Nelson, Freeman and Dosi, the “Geography and Policy” community with Porter and Lundvall and the “Periphery” and “Industrial Economics” communities with Griliches. This may reflect a division between “schools of thought” since Griliches is associated with neoclassical (mainstream) economics, while, say, Nelson, Freeman and Dosi represent the evolutionary strand within economics.

However, it might be argued that a thriving intellectual field may learn to live with – and even gain momentum from – such differences in perspective. Common meeting places, e.g., associations and conferences, may play an important role in mediating such differences, by providing a framework for interaction between people with similar interests but different theoretical and disciplinary backgrounds. For instance, the Schumpeter Society (ISS) meetings are very popular both with the evolutionary “Schumpeter crowd” and the neoclassical “Industrial Economics” cluster, while the DRUID conference similarly bridges the “Schumpeter crowd”, “Geography and Policy” and “Management”. Finally, the Academy of Management (AOM) brings together the Management” and “Periphery” clusters. It should be noted, though, that there is no common “meeting place” for innovation studies as a whole. This is different when it comes to publication outlets, since the journal Research Policy spans the entire field. This is a clear exception though. Most journals were found to be of much more specific interest, such as for instance Management Science for the “Management” cluster, ICC and SCED for the “Schumpeter crowd”, Regional Studies and Technovation for the “Geography and Policy” cluster and mainstream economics journals for the “Periphery” and “Industrial Economics” clusters.

Figures 6.1-3 further illustrate the different roles that weak ties may play in (a) defining clusters of likeminded innovation scholars and (b) linking these clusters together.¹² The figures treat the five clusters and the “weak ties” that characterize them (e.g., sources of scholarly inspiration, meeting places and journals) as a network. The lines in the figures are links between a cluster and a particular “weak tie”, and the thickness of a line reflects how

¹² The graphs, included here as illustrations only, are based on a spring-embedding algorithm (using Ucinet / Netdraw). The lines in the graphs reflect how the members of a cluster on average assess a certain weak tie. These assessments are measured on a scale of 5 – 9 with 7 as the middle point. Hence, the 0.9 cut-off corresponds one in every 7.78 members scoring a 7 (and none of the other members scoring anything). Similarly, the 1.6 cut-off means that one in every 4.38 members scores a 7 (and none of the other members scoring anything).

important (“busy”) a particular link is. In Figure 6.1, we include all positive links, no matter how important they are. What results is a densely populated network in which the five clusters of scholars are linked by many “weak ties”. However, when the least important links are removed (Figure 6.2), a clearer structure emerges. Most of the retained “weak ties” now contribute to differentiate clusters from each other rather than unite them. In fact, the “Periphery” cluster, which used to be connected to the other clusters through a number of ties, only has one tie left to the other clusters, through the common appreciation for Research Policy (RP), confirming the peripheral role of the scholars in this cluster. Apart from Research Policy, what keeps the network integrated at this level of intensity is a number of “bridges” (consisting of combinations of “weak ties”) between the main clusters. At an even higher threshold level for which links to retain (Figure 6.3), there are only eleven weak ties lefts, nine of which contribute to differentiate the clusters from each other and two (Research Policy and the Schumpeter Society) that continue to keep the network integrated. Hence, the Schumpeter Society and, in particular, the journal Research Policy evidently play a very important role in keeping the network together.



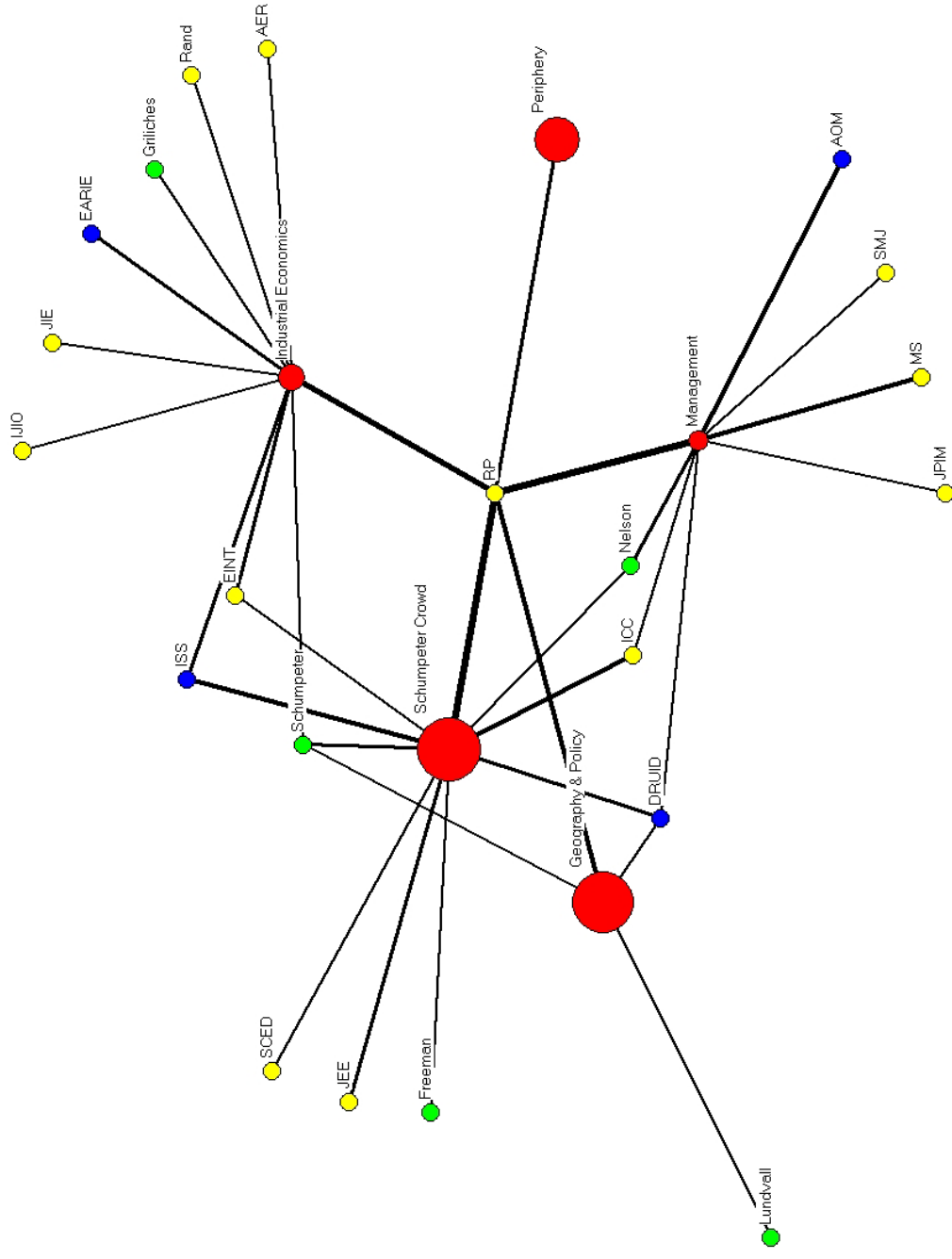


Figure 6.2. Weak links between clusters, cut-off value = 0.9



Conclusion

Scholarly work on innovation has increased very rapidly in recent years. In parallel with this we have seen the emergence of a number of new journals and meeting places. This raises the question of how these developments are to be understood. Is there a new body of knowledge and teaching developing that backed by the emergence of new institutions and organisations eventually may develop into a new discipline within the social sciences? Or is it more a loose associations of scholars from different disciplines and settings with little more in common than a (vaguely) related thematic focus?

This is a difficult question to research, so we felt a compelling need to collect our own data on the subject (in the form of a web-based survey). In one sense the answer is clear. 80 % of the more than 1100 respondents identified themselves with “innovation studies”. Surely this is something new. Who talked about “innovation studies” ten or twenty years ago? But this does of course not imply that we necessarily are talking about something is developing into a new discipline. It could equally well be a sub-field within an existing discipline or something that crosses existing disciplines without challenging them in their basic foundations.

But what is a discipline after all? The term has different connotations. First of all it is a body of knowledge. Second it has to do with teaching (that body of knowledge) to others. And thirdly it also has to do “discipline” in the more traditional sense of the word, e.g. the need for any body of knowledge (and teaching) to have norms, institutions and organisations that allow the knowledge worker to distinguish between what is true and untrue, substantiated by the evidence or purely speculative, useful and not so useful etc. All of this involves social organisation in one form or another, and this is what we have tried to explore through our survey and the ensuing analysis.

What we have found is that there is solid evidence backing the proposition that a commonly recognized body of knowledge has developed (related to the work of Schumpeter and others) and that new institutions and organisations have developed in the form of journals, associations and meetings to facilitate the continuing growth and spread of this knowledge. But our research also indicates that there is something “half-baked” about these institutions and organisations. Although there is a substantial part of the network, the “Schumpeter crowd” in particular, that is very closely associated with the central organisations and activities in this area, others – while continuing to see themselves as part of “innovation studies” – have a much more distant relationship. In fact, as we have shown, the strongest integrating feature of the area is not a set of leading academics or a professional society but a journal. Hence, there is a possibility that the existing social organisation of the field will not be strong enough to allow for a common base of knowledge to continue to develop, and that the field instead will fragment into several different intellectual communities with little common interaction (not to say insights). Arguably, for this field to prosper, and for a common body of knowledge to continue to develop and spread, stronger organisations, particularly in the form of common “meeting places”, may be needed.

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Table A1. Role of geography and discipline in the partition of the network

Group	Number of scholars		Inverse Herfindahl		Share of largest Region		Inverse Herfindahl largest discipline		Share of largest discipline	
	Region		Region		Largest region		Discipline		Largest discipline	
1	11	2.7	0.55	North America	3.7	0.36	Sociology			
2	61	3.9	0.34	UK and Ireland	2.1	0.67	Economics			
3	23	1.3	0.87	North Europe	5.1	0.26	Economics/Engineering			
4	8	1.0	1.00	Other (=Turkey)	1.0	1.00	Economics			
5	17	1.7	0.76	North America	3.6	0.47	Economics			
6	17	3.0	0.41	South Europe	1.6	0.76	Economics			
7	22	2.4	0.59	Central Europe	6.4	0.23	Geography/Engineering			
8	20	2.5	0.55	Latin America	2.2	0.65	Economics			
9	8	2.5	0.50	Latin America	1.0	1.00	Economics			
10	24	2.2	0.58	North America	3.1	0.50	Economics			
11	3	1.8	0.67	UK and Ireland	1.0	1.00	Economics			
12	35	2.2	0.66	North America	2.0	0.69	Geography			
13	27	3.0	0.44	Latin America	3.4	0.44	Engineering			
14	5	1.0	1.00	South Europe	1.9	0.60	Economics			
15	22	2.5	0.50	North Europe	1.2	0.91	Economics			
16	28	3.2	0.46	Central Europe	4.2	0.36	Management			
17	45	3.7	0.44	South Europe	1.5	0.80	Economics			
18	36	3.3	0.47	UK and Ireland	2.9	0.56	Economics			
19	18	1.7	0.72	South Europe	2.1	0.67	Economics			
20	31	4.0	0.35	Latin America	5.8	0.32	Economics			
21	7	1.3	0.86	North America	2.0	0.57	Engineering			
22	13	1.2	0.92	North America	1.2	0.92	Economics			
23	18	1.7	0.72	Central Europe	1.1	0.94	Economics			
24	17	1.9	0.71	North Europe	4.7	0.29	Management			
25	36	5.8	0.25	Central Europe	3.9	0.39	Geography			
26	23	2.0	0.70	South Europe	1.3	0.87	Economics			
27	30	2.9	0.53	North Europe	2.1	0.67	Economics			

28	48	2.6	0.56 Central Europe	1.2	0.90 Economics
29	18	2.6	0.56 UK and Ireland	1.6	0.78 Economics
30	3	1.8	0.67 UK and Ireland	3.0	0.33 Sociology/Policy
31	26	1.6	0.77 Central Europe	1.5	0.81 Economics
32	36	1.2	0.92 Central Europe	1.9	0.72 Economics
33	4	1.6	0.75 South Europe	1.0	1.00 History
34	6	1.0	1.00 Latin America	2.0	0.67 Economics
35	15	3.2	0.47 Central Europe	1.1	0.93 Economics
36	11	1.2	0.91 Central Europe	2.6	0.55 Economics
37	20	2.4	0.45 North/Central Europe	4.9	0.40 Economics
38	5	1.5	0.80 Central Europe	1.0	1.00 Economics
39	13	2.3	0.54 South Europe	1.2	0.92 Economics
40	7	1.0	1.00 Asia	1.7	0.71 Economics
41	16	1.3	0.88 Central Europe	2.7	0.56 Economics
42	17	3.0	0.47 South Europe	1.1	0.94 Economics
43	4	1.0	1.00 North America	2.7	0.50 Sociology
44	19	1.5	0.79 Central Europe	4.1	0.42 Economics
45	6	3.0	0.50 Central Europe	1.0	1.00 Economics
46	12	2.2	0.58 Central Europe	2.0	0.50 Geography/Economics
			UK and Ireland/South		
47	6	2.0	0.50 Europe	1.8	0.67 Economics

Note.

The table provides information on the geographical and disciplinary composition of the forty-seven groups (identified through the application of the Newman-Girvan method) as reflected in the share of members coming from the largest region (discipline) in the group. The region (discipline) listed to the right of that number is the one with the largest share (when two are listed these are of equal size). In addition the table provides an indicator of the extent to which members are spread among many regions (disciplines) or tend to concentrate in one or a few regions (disciplines) only. This indicator - the so-called Herfindahl index - is defined as $\frac{1}{\sum_j x_j^2}$, where x_j is the share of either a region or discipline in the

total membership of the group (for example, x_j could be the share of economists among the members of the group). The smaller the index, the more homogenous a group will be in terms of regions (disciplines). The minimum value of the index is unity, which means all members of the

group belong to the same region (discipline). The index reaches its maximum value (identical to the numbers of regions (10) or disciplines (12)) when the members are spread equally among the alternatives.