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Is Management and Organizational Studies divided into (micro-)tribes?

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Abstract
Many claims have been made in the past that Management and Organization Studies (MOS) is becoming increasingly fragmented, and that this fragmentation is causing it to drift into self-reference and irrelevance. Despite the weight of this claim, it has not yet been subjected to a systematic empirical test. This paper addresses this research gap using the tribalization approach and diachronic co-citation analyses. Based on 22,430 papers published in 14 MOS journals between 1980 and 2019, we calculate local and global centrality measures and the flow of cited articles between co-citation communities over time. In addition, we use a node-removal strategy to test whether only ritualized citations ensure MOS cohesion. Rather than tribalization, our results suggest a center–periphery structure. Furthermore, more peripheral papers are integrated into the central co-citation communities, but the lion's share of the flow of cited papers occurs over time to only a small number of large clusters. An increase of fragmentation and crowding-out of smaller clusters in MOS in seen in the polycentrically organized core 2014–2019.

Keywords Tribalism · Science of science · Network analysis · Co-citation analysis · Management and Organizational Studies · Multiple center–periphery analysis

Introduction

Management and Organization Studies (MOS) is a multidisciplinary field of research which provides in-depth analyses and knowledge on organizational behavior, culture, psychology, or theory among many others (Augier et al., 2005; Maclean et al., 2016). Today, claims abound within MOS that the field suffers from all kinds of defects, including most of all the production of dissemination of research that is irrelevant, meaningless and parochial, and that members of the field show increasing lack of integrity and focus on the superficial and easily publishable (e.g. March 2005; Bartunek et al. 2006; Pfeffer 2007; Miller et al. 2009; Macdonald & Kam, 2010; Adler & Hansen 2012; Alvesson 2012; Alvesson & Sandberg 2013; Barley 2016; Huzzard et al. 2017; Tourish, 2019). Similar claims have been

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made before (e.g. Koontz 1961, 1980; Sprague & Sprague 1976; Tinker & Lowe 1982), but seem to become more common.

In addition to all these charges, one development weighs heavily on MOS, namely the development of disconnected academic tribes with their own academic language and an own territory (Becher & Trowler, 2001). Tribalism is defined as the emergence of closed-off communities within an academic discipline with own research styles and values. We suspect these closing-off dynamics are especially prevalent in divergent (regarding the potential to share knowledge) and rural disciplines such as MOS with a low people-to-problem ratio.[1] Paired with the ongoing differentiation of academic disciplines, this process should result in the emergence of small subcommunities of micro-tribes, which in turn would follow lines of "boxed-in" research "characterized by a strong and narrow focus on some issues within a well-defined, specialized intellectual terrain" (Alvesson & Sandberg, 2014). This, in turn, nudges MOS scholars to the practice of "following of fashion, adapting to a specific sub-tribe and making similar-minded colleagues happy" (Alvesson, 2013), and a loss of "flexibility with regard to problem solving, adaptation, and creative idea generation" (Dane, 2010, p. 579).

Such developments entail three problems besides a boxing-in and a potential growth of irrelevance of MOS. First, tribalism contributes to the fragmentation of MOS, meaning that its ability to integrate different views to tackle problems and research puzzles diminishes. Secondly, tribalism yields the danger of the formation of citation cartels (Tienari, 2012), which would contribute to further fragmentation of MOS, as it prohibits scholars outside the citation circles to join the MOS (sub-)discourses. Finally, this could promote the spread of authoritative citation of dominant actors in the field, which does not provide additions to the knowledge stock (Davis, 2015; Whitley, 2000). Instead, the stark orientation on the most prevalent sources could colonize promising approaches and lead to a crowding-out of solutions of research puzzles as well as practical problems.

Despite the potential dire consequences that would arise if MOS were tribalized, this assumption was not yet subjected to empirical investigation. This is even more puzzling, as there is not only the hypothesis of tribalization present in MOS, but there are also voices that claim that MOS is getting more tribalized (Alvesson & Sandberg, 2014; Macdonald & Kam, 2010). With this in mind, we take both the assumption that MOS is tribalized and the consequences stemming from the associated fragmentation of the discipline into citation circles seriously and ask…

RQ1 …how many tribes make up Management and Organization Studies, and …
RQ2 … how fragmented is its knowledge base?

To trace the potential tribalization of MOS and the fragmentation of its knowledge base due to the formation of citation circles empirically, we employ a diachronic co-citation network analysis on 22,430 papers published in 14 MOS journals between 1980 and 2019. We split the data into timeframes of 5 years each and apply canonical centrality measures (Freeman, 1978), and constraint (Burt, 2004, 2017), and global measures such as modularity and transitivity to trace changes regarding the fragmentation of MOS between these timeframes. We also employ measures that enable us to control for the presence

[1] Becher and Trowler (2001), distinguish between urban and rural disciplines. In urban disciplines, a large number of scholars organize around a relatively small number of problems (e.g. physics), whereas in rural disciplines, there are comparatively many problems, which are addressed by a low number of scholars each. In the former case, the authors speak of a high people-to-problem ratio, whereas the people-to-problem ratio is low in the latter case.

of single- or multiple center–periphery structures in the data (Everett & Borgatti, 1999; Kojaku & Masuda, 2018a, 2018b). The idea here is that tribalism should be present if we identify a multitude of relatively closed-off, densely connected regions of the network with a semi-periphery connecting a number of these regions and a number of peripheries which are adjacent to the tribal centers. We also introduce and use absolute and relative flow between the co-citation communities we have detected, with a time dimension. Thereby, we can identify potential evolving microtribes in MOS, in the shape of closing knowledge circuits. Finally, we adopt node removal strategies (Michele Bellingeri et al., 2020a, 2020b; Boldi et al., 2013; Yang et al., 2018) to check if ritualized citations of the most influential papers holds the otherwise tribalized discipline of MOS together.

To answer the research questions, the remainder of the article is structured as follows. We begin with discussing the theoretical factors driving or prohibiting the formation of tribes in MOS in "Factors driving or prohibiting the emergence of micro-tribes in Management and Organizational Science" section. In the same section, we also present which network structures we expect to observe over time. We then proceed with introducing our research strategy, data and employed methods in more detail in "Research strategy" section, before we present our results in "Results" section. The findings are then discussed in Discussion and Conclusion and linked to the theoretical assumptions outlined in "Factors driving or prohibiting the emergence of micro-tribes in Management and Organizational Science" section. We then close our paper with highlighting the limitations and potential future research avenues regarding tribalism in and beyond MOS.

Factors driving or prohibiting the emergence of micro-tribes in Management and Organizational Science

Theoretical background

In general, the emergence of academic (micro-)tribes is linked to (1) increasing specialization and internal differentiation of scientific disciplines, (2) the intersection of the paradigmatic core with the most relevant journals and subsequent formation of subcommunities and citation circles, and (3) the mono- or interdisciplinary constitution of the discipline under investigation.

(1) Despite recent analyses have argued that specialization is indeed a natural feature of science and therefore an ongoing process (Abbott, 2001; Leahey, 2007), it is linked to fragmentation when driven by a split in research communities regarding basic and applied research (Santos et al., 2022), methodological divides (Schwemmer & Wieczorek, 2020), struggles among schools of thought (e.g. Münch, 2018 on the shism in German sociology), and the absence of chances to collaborate and integrate knowledge, especially in multidisciplinary research fields (Wittek et al., 2023).

Fragmentation, conflict, and specialization are especially witnessed in disciplines characterized by low levels of collaboration, a lack of resources, and without a strong, paradigmatic core (Abbott, 2001; Turner, 2006, 2016; Wieczorek et al., 2021a, b). Every discipline and the scholars therein have a limited attention space, usually restricting the number of in-depth discourses. As academic disciplines branch and differentiate, each branch may develop a limited number of topics suitable for discourse, ultimately severing ties with to other branches, or, to stick with the metaphor, the disciplinary tree from which they grew. Following Collins (2002, p. 24), this may result in "[i]solated communities, where the

same lineup of persons are recurrently thrown together", which "tend to reify their symbols as if they were concrete objects; at the extremes of self-subsistent tribes or deliberately separated cult communities". Here, the symbols are the ideas, paradigms, outlets, publications to be cited, or the (idolized) forerunner of an academic tribe (ibid. 36). Under these circumstances, increasing differentiation with regards to theories, methods applied, thought leaders, and research questions entail a limited possibility to exchange ideas. In the following, microtribes with boxed-in research (Alvesson & Sandberg, 2014) emerge and limit the flow of ideas even further.

According to Whitley (2000), MOS is no exception. He argued as early as 1984, that MOS is characterized as "fragmented adhocracy" in which "research is rather personal, idiosyncratic, and only weakly co-ordinated across research sites". Consequently, scholars "do not have to produce specific contributions which fit in to those of others in a clear and relatively unambiguous manner". In MOS, "there is a wide variety of work techniques, approaches and audiences", and a "lack of systematic interconnection" between "highly differentiated and specialized subfields" (Whitley, 1984, pp. 798–799). Translated into the tribalistic framework of Becher and Trowler (2001), MOS is a rural, divergent discipline that might yield multiple, relatively small, siloed attention spaces that might contribute to its internal fragmentation and promote the emergence of (micro-)tribes.

However, his descriptions of the state of science and of MOS were made before the recent few decades' intensified growth in importance of journal publishing, and the stiffening competition among individuals (and, to some extent, groups) for a reputational place in the sun in the shape of articles published in high-impact ("top") journals (Butler & Spoelstra, 2020; Hallonsten, 2021; Macdonald, 2015; Tourish, 2019). Instead, a citation network analysis by Vogel (2012) indicates that MOS developed into a "polycentric oligarchy" between 1980 and 2009 and is still "characterized by a small number of dominant schools whose intellectual leaders exert strong control over research agendas and resources" (Whitley 1984b, p. 810).

(2) Simultaneously, a number of central outlets relevant for MOS emerged, which nowadays represent its paradigmatic core (see Kuhn, 1962 on the depiction of paradigms, paradigmatic cores and paradigmatic shifts). Due to the increasing publication pressure and the need of MOS scholars to increase their visibility to remain in academia, authors seek to publish in these outlets (Macdonald & Kam, 2007, 2010), and adopt "questionable research practices" (Butler et al., 2017), including inadequate, inaccurate, or authoritative citations. Under the disguise of a grandiose appeal to all authors to make "innovative theoretical contributions", top MOS journals force researchers into focusing on "narrow issues, frequently of only marginal relevance to the plentiful problems afflicting the world, and, all too often, are inaccessible and unreadable"—the desire of journals to reach the crowned positions of "such elite US outlets as the Academy of Management Review", makes them co-perpetrators in the "narrowing of academic inquiry", and urge authors to engage in "alienating displays of metatheorizing, about issues of less and less importance" and in increasingly "higher states of specialization" that could be called "micro-theorizing" (Tourish 2011, pp. 369, 374). Therefore, the co-emergence of a paradigmatic core and central journals should play a significant role in the emergence of microtribes, whose members are then able to lift their likes into the elite US outlets.

A phenomenon directly linked to the need to publish efficiently is the forming of subcommunities. In this regard, Alvesson (2012) claims that the habit of researchers to remain faithful to a subcommunity throughout one's career in order to avoid serious intellectual challenges is a serious problem not just in MOS but in social sciences generally. Furthermore, Alvesson and Gabriel (2013, p. 251) claim that authors frequently engage in strategic

"location of a text in a sympathetic subcommunity" in order to neutralize critique and protecting both paper and author from any serious questioning. This, in turn, gives rise to the coordinated agglomeration of mutual citation among a few high-impact journals and papers (Davis, 2015, p. 182), or, as Whitley (2000, p. 28) noted, "citations are a way of ritualistically affirming group goals and norms, of demonstrating group membership and identity".

(3) If we now consider the interdisciplinary nature of MOS, we could assume to witness an even larger degree of fragmentation compared other disciplines with a long tradition such as economics. Interdisciplinarity complicates the establishment of a coherent body of knowledge insofar, as the intellectual distance between potential collaborators increases the difficulty to find a common theoretical and methodological ground (Boix Mansilla et al., 2016; Cummings & Kiesler, 2007; Haeussler & Sauermann, 2020). Therefore, MOS had to (1) coordinate multiple knowledge domains at once, while (2) establish an own publication system, and (3) cushioning the negative effects related to interdisciplinary research such as reduced research productivity (Leahey et al., 2017), and potential losses in terms of citation numbers (Unger et al., 2022).

For the reasons discussed above, one would expect to find small pockets of knowledge within MOS subcommunities which roughly follow the boundaries of each discipline from which MOS stems. Yet interdisciplinary fields like MOS can possibly prevent fragmentation, if they manage to do the following. First, a narrow scope of problems and social facts (e.g. organizations as strategic actors) are defined as worthy of investigation. Second, the theories and assumptions previously associated with each discipline are discarded, are used punctual, or in a rather eclectic manner. Third, a common mode of exchange is established with a shared canon of methods. In other words, it is easier to argue about whether a regression coefficient is significant or not than to argue about theoretical vocabulary and epistemological assumptions. Fourth, the combination of the first three assumptions may help a school of thought with the ability to superimpose its paradigm on other schools of thought to emerge. Fifth, the emergence of its own journals and monograph series, which serve as beacons for MOS scholars to rally around. All factors taken together should put the fragmentation of a discipline and the formation of (micro-)tribes to a hold and should help to form a common, citable knowledge base. Following the statements outlined by Collins (2002, p. 24) on the dispersed intellectual communities, this should also be more easy in a multidisciplinary community, as the flux of intellectuals and their stance towards self-reflexivity turns them into critical observers of their own discipline and creates a mixture of organic solidarity (=dependence on the knowledge and expertise of scholars originating in different disciplines and their critical stance) and mechanical solidarity (=based on the belief to be part of MOS as a discipline with shared assumptions, beliefs, and problems to be addressed) among scholars. Table 1 summarizes the factors which drive or prohibit fragmentation of the knowledge base, or the emergence of micro-tribes. However, what can we expect to witness empirically when investigating MOS when we investigate the link between academic micro-tribes and co-citations diachronically?

Empirically observable patterns of tribalization

If tribalization is present in MOS and micro-tribes emerge, we expect to see a small number of communities in the first observation period t_0. These communities consist of a limited number of co-cited articles and are relatively closed. Each community is interpreted as a shared knowledge-domain within MOS, e.g. authors who follow different

Table 1 Factors driving and prohibiting the emergence of micro-tribes

Driving factors	Prohibiting factors
Sedimentation of large sets of specialized problems on a core set of research questions dealt with by different schools of thought	Limitation to a small set of problems
Amalgamation of theories, methods, and epistemologies into exclusive schools of thought	Reduction of the total numbers of available theories and methods included into the scholarly discourse
Multiplicity of middle ranged theories	Focus on a unified methodological framework and a limited set of methods
Epistemological conflicts and methodological divides	Dominance of a single school of thought
Specialization of subdiscourses with own journals, but linkage to the main discourses	Rallying around core journals dedicated to answer commonly shared research questions

organizational theories or different methods. Simultaneously, we expect to witness some connections between communities. These connections represent the possibility to link knowledge stemming from different domains in MOS. These domains may even yield different disciplinary origins (e.g. organizational sociology, behavioral economics, management science).

If tribalization exists, we would witness the appearance of subgroups within at least a few clusters at the next time frame t_1. From there onwards, these subgroups increase their internal connectivity, and sever connections to other parts of the now larger cluster. This means that despite emergent stronger co-citations in local cores, there are still co-citations between the local cores, albeit to a lesser degree. In other words, we will witness the transition from a single, densely connected core and a periphery, which element's bears connections to the center but not to others in the periphery, to multiple, disparate cores with peripheral regions each.

Furthermore, articles published in the meantime could either be (1) integrated into the developing subclusters, or (2) may serve as nuclei for novel clusters. In the first case, novel knowledge is integrated a preexisting cluster, which may displace older papers which previously served as glue between emerging subschools in MOS. In the second case, these may introduce either disruptive knowledge (Wu et al., 2019) such as behavioral economics, or indicate a turn, meaning that the same set of problems might be addressed by applying different theories, methods, but ultimately arriving at the same conclusions while using a different vocabulary (Schneider & Osrecki, 2020). If this happens, we expect to see a closure of knowledge circulation in form of citation circles, which in turn might speed up the tribalization process. Nevertheless, there might be seminal works, which might be routinely cited to demonstrate the belonging the MOS (e.g. the paper issued by Meyer & Rowan, 1977). These may serve as a backbone for the discipline and exert the ability to connect different domains of knowledge, but, in fact, do not hinder MOS to progressively fragment into micro-tribes.

At the same time, we expect the following network patterns to emerge from the data which may counteract tribalization. First, articles are added to the network that span bridges between two or more preexisting clusters. Initially, these cite only a few sources from each cluster. However, in a next step, these bridges might be the seedbed for other articles written by different authors to combine even more sources stemming from different clusters and the bridging paper itself. In this case, we should witness the closure

of structural holes (Burt, 2017), and the formation of superclusters with abundant co-citations stemming from formerly unconnected knowledge domains. In other words, we expect to see densely connected communities, whereas the local density grows stronger (1) the more paradigmatically unified MOS gets, and (2) the stronger the flow of knowledge gets.

Second, at t_{+1}, papers citing these central papers (=neighbors of the papers mentioned above) would also get a share of citations, meaning that those who read the citing papers but not the core paper tend to cite both at later points in time. Furthermore, we would expect to witness the closure of co-citations between forerunners of a tribe and an inner circle of their followers. This means that the papers issued by the disciples of the forerunners might get so tightly linked to the latter's contribution at $t_{>1}$ that they are cited together systematically. In this case, we expect a center–periphery structure to emerge in MOS with one, densely connected core which comprises most of the co-cited publications, and a periphery with little or no connectivity to the core. Yet, if MOS lacks epistemological integrity or if internal conflicts arise, novel subclusters and thus micro-tribes with own territories (=subdomains of knowledge) might emerge. These subclusters, in turn, would still cite the thought leaders as well as their disciples, but would start to criticize them and to gain a cognitive distance at the same time. Over time, this would manifest in citation circles in which ever smaller amounts of literature adjacent to the micro-tribe would be cited, and multiple, smaller local cores and many peripheries would emerge.

If, however, a unification under (1) a set of research questions, (2) a single theory, or (3) a limited set of methods occur, we expect to see the incorporation of smaller clusters into larger ones besides the emergence of a single core–periphery structure or multiple within one partition if MOS is a "polycentric oligopoly" (Vogel, 2012; Whitley, 1984). This process might lead to an overarching network-structure with a single, relatively dense core consisting of a limited number of thought leaders, and a broad (semi-)periphery with more specialized and loosely connected papers and authors. In this case, there might be a number of seminal works, or works citing those, which must then cited by scholars to highlight their belonging to the discipline, in our case MOS. Even if the circle of thought leaders might change over time, an unipolar structure with a strong, integrated core might be stable enough to prohibit micro-tribes to emerge. In other words, the cognitive core would remain intact and the knowledge flow embodied in the citation network would be still in need of the forerunners or their descendants.

Against this backdrop, we would expect four ideal typical trajectories emerge from the data (Fig. 1), two of which could be linked to tribalism. In one case, we expect multiple, sharply distinguishable local cores with little or no connection to emerge (strong Tribalism, upper left panel of Fig. 1). In another case, we expect differentiation, but with limited exchange over time which could be mainly driven by the co-citation of seminal scholars of each tribe and a certain extent of exchange (weak tribalism). This would be the case, if a strong version of the polycentric oligarchy mentioned above with strong boundaries between each center is present. In other cases, we expect a limited amount of branching of (thematically driven) communities. However, in this case they do not systematically exclude publications from scholars of other potential "tribes" from being co-cited. Rather, scholars specialize but within their areas of specialization read and cite other specialists (lower left panel, Fig. 1). This pattern would correspond most clearly to the polycentric oligarchy described by Whitley (1984) and Vogel (2012). Here, different cores emerge and yield the possibility to (a) exclude inconvenient approaches, and (b) to integrate knowledge stemming from other acknowledged centers of MOS. If, however, no tribalism and focus on a limited number of theories, problems, etc. is present in the data, we expect to see a

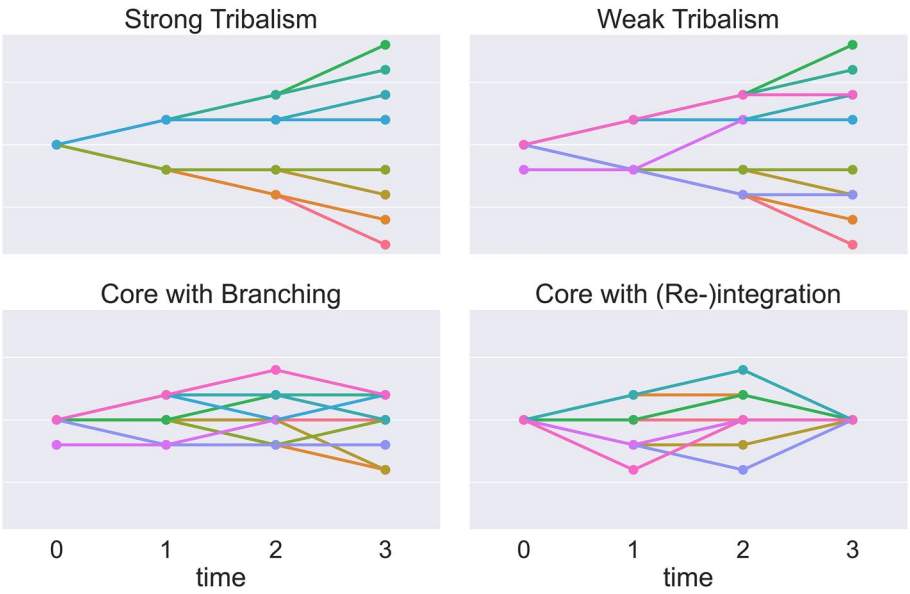

Fig. 1 Idealized trajectories of tribalization and (re-)centralization of the discourses in MOS

branching from different MOS communities due to specialization at first, followed by a reintegration into a co-citation core (lower right panel, Fig. 1). This would correspond to a single, dominating school of thought in MOS, which is paired with internal, problem-based specialization. This paradigmatic core should consist of a small number of different approaches or specializations in MOS similar to the law of small numbers in the attention space described by Collins (2002, p. 24). For this reason, the core should be able to glue the approaches and potential approaches and specializations intellectually together.

Research strategy

In the following, we begin with describing our data and the search strategy. We then continue with describing our method, namely the diachronic co-citation analysis. We then introduce the three analytical approaches we combine to identify the emergence or absence of micro-tribes in the diachronic co-citation analysis.

Data

After removing duplicate articles, our dataset comprises of 22,430 papers issued in the 14 MOS core journals listed in Web of Science (WOS) between 1980 and 2019. These include the *Academy of Management Review*, *Journal of Management*, *Administrative Science Quarterly*, *Leadership Quarterly*, *Academy of Management Journal*, *Strategic Management Journal*, *Journal of Organizational Behavior*, *Journal of Management Studies*, *Organization Studies*, *Human Relations*, *Organization*, *European Management Journal*, *Organization Science*, and *Management Science*. An overview of the number of publications per

timeframe is provided in "Appendix 1". We used the WOS interface and downloaded all full articles and review articles.

Diachronic co-citation analysis

We apply diachronic co-citation analysis to investigate the development of micro-tribes. Co-citation analysis is a subdomain of social network analysis (Zupic & Čater, 2015), which has previously been used in studies of the knowledge base of MOS, and how it has evolved over time (Acedo & Casillas, 2005; Ozturk, 2021; Vogel, 2012). If an article cites two or more sources (=nodes), this establishes a link (=tie) between those cited sources. These ties, and the absence of ties, together form the overall structure of the co-citation network. Since co-citations are symmetrical two-way connections among cited articles, co-citation networks are undirected, and their edges are also weighted by the number of co-appearances of papers in the reference lists. As we rely on the reference lists to establish co-citations, we might overestimate the paradigmatic coherence of MOS. However, even if tribes exist, the fact that proponents of those cite other tribes indicates that (1) tribes are still in contact and do not ignore each other, and (2) they still know to a certain extent what their competitors in MOS do and, by doing so, still uphold the potential for knowledge evolution.

If co-citations appear systematically in a period of observation, that is 3 times or more, a tie between two papers is established and included in the analysis.[2] Systematic co-citation of articles hint at the emergence of a specific knowledge domain, and if this domain establishes firm boundaries, this may indicate the emergence of an academic (micro-)tribe.

A diachronic co-citation analysis is a form of longitudinal analysis, in which discrete time windows are defined and the evolution of the co-citation network is depicted between these windows. We decided on 5-year timeframes (1980–1984, 1985–1989 and so forth), as shorter timeframes yield the danger to witness random fluctuations in co-citation patterns, whereas longer timeframes would gloss over the potential development of micro-tribes. Furthermore, articles in the social sciences need approximately 4–5 years to get integrated into the scholarly discourse (Gou et al., 2022). Afterwards, their citation number and thus their potential for being a nucleus for one or more academic tribes starts to decline as their academic age increases (Zhang & Glänzel, 2017). Therefore, focusing on a 5-year timeframe to establish co-citations enables us to witness the formation of (micro-)tribes in MOS, especially if many timeframes are analyzed in succession.

We use articles published in the 14 journals under investigation to establish the diachronic co-citation network, as an assumption regarding the emergence and stability of these micro-tribes relies on the closure of their knowledge base and the necessity to signal the belonging of MOS scholars to these tribes. As these 14 journals represent the core of MOS and define the topics, methods, and theories legit in these fields, the emergence of micro-tribes should be most clearly visible within the lines of research acknowledged in these journals. To provide an overview on the data analyzed, Table 2 lists the number

[2] We are aware that the co-citation of two articles appear to be arbitrary. However, a threshold of two over a time period of 5 years increased the network size by at least a factor of four per timeframe, making it less likely to find tribelike structures. A threshold of five or even ten proved to remove too many nodes, leaving us only with the remnants of a densely connected core of co-cited articles. This could be interpreted as the knowledge core of MOS, which may in fact only consist of sources which must be cited routinely to demonstrate the belonging of scholars to MOS. The results of the sensitivity analyses with different thresholds of 5, 10, 15, and 20 for the construction of co-citation edges are reported in "Appendix 6".

of papers issued per timeframe, the total number of cited items issued in the current and previous observation period, the number of total co-citations, as well as the number of co-citations after removing articles which cited fewer than three times.

Analytical approach I: analysis of local and global network measures over time

To analyze the changes in the co-citation structure over time and thus the potential emergence of micro-tribes in MOS, we focus first on local and global network measures. The former enable us to identify specificities in regards to the co-cited documents and their neighbors, whereas the latter enables us to identify structures of the overall network, e.g. the degree of fragmentation into different micro-tribes. As a network is a graph object and changes in the local structure impact the global structure and vice versa (Kossinets & Watts, 2006), we must analyze both simultaneously to answer our research question.[3]

Local structures comprise the (more or less) direct neighborhood of a given node (=cited publication) or a set of nodes and indicate the embeddedness of actors within a given network. To capture different aspects of the local structure of our co-citation network, we employ degree centrality, eigenvector centrality, closeness centrality, and betweenness centrality as described by Freeman (1978), and network constraint as described by Burt (2017).[4]

Degree centrality measures the number of ties assigned to each node. In our case, we use the weighed degree centrality measure, which measures the strength of co-citations among a paper and its neighbors (e.g. paper a and b are co-cited ten times together, so this link will have an initial weight of 10) divided by the sum of the edge weights for edges incident to the node under observation. According to Freeman (1978, p. 219f.), degree centrality is associated with the visibility of a node within a network, and thus its potential to be a focus of activity. In our case, MOS papers with high degree centrality yield the potential to become a seed for tribes or are relevant sources of knowledge within different tribes.

Eigenvector centrality measures the relative influence of a node in a network. It transcends degree centrality insofar, as it takes the connectivity (e.g. weighted number of edges) of the neighbors of a given node into account. For example, a night might yield connections to a few other nodes, which, in turn, might be very well connected to multiple other nodes. An example is the collaboration network between eminent scholars described by Abramo et al. (2019), who tend to collaborate with other eminent scholars. However, if a less eminent scholar collaborates with at least one of the more eminent, he or she gains in access to more network resources and thus is potentially able to exert more impact on the network. Translated to our case, papers with high eigenvector centrality are either seminal papers, or adjacent papers that may become the seedbed of novel specialties or knowledge domains in MOS. As stated in "Factors driving or prohibiting the emergence of micro-tribes in Management and Organizational Science" section, these domains might be linked to the emergence of micro tribes. However, if a large number of co-cited papers yield high levels of eigenvector centrality, this might indicate an overall better embeddedness in the MOS discourse and higher levels of co-citedness of the articles.

Betweenness centrality measures the weighted share of shortest paths between two nodes, which passes through a node under observation (ibid. pp. 222–224). In other words,

[3] We use the networkx-package (Hagberg et al., 2008) for the calculation of local and global network measures, the matplotlib (Hunter 2007) and seaborn-packages (Waskom 2021) for network visualization.

[4] We employed the weighted versions of the centrality measures provided by the python networkx-package.

Table 2 Overview on the papers and co-citations per time frame included in the analysis

	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
# Papers included in the analysis (nodes)	1295	1731	2087	2423	2866	3198	4115	4715
# Cited papers issued in the included journals	376	1420	2837	4005	5589	7678	10,704	13,803
# Co-citations of papers issued in the included journals	1903	24,689	103,897	176,615	270,224	454,496	899,189	1,392,882
# Co-citations (edges) (threshold = 3)	203	5010	31,369	60,824	76,747	129,212	256,297	388,121

betweenness centrality measures the probability of a node to control the flow of information in a given network. In our case, high betweenness values indicate the possibility of a paper to be co-cited across different tribes or domains. This, in turn, means that a paper might either serve as bridge, or as a seedbed for the emergence of a novel tribe over time.

Next, *closeness centrality* follows the idea of independence of nodes from intermediaries in a network (Freeman, p. 224f.). It also indicates the possibility of a node to easily spread information to even distant outskirts (=periphery/peripheries) of the network. In our case, the notion of independence may be interpreted literally, as nodes who are close to every region of the co-citation network are not bound to a single paradigm. Therefore, if closeness centrality increases over time, this might indicate dissolving boundaries between tribes in MOS (if they exist in the first place) as knowledge incorporated in the co-cited papers is increasingly easy to co-cite and circulate.

Finally, *constraint* is a measure of brokerage, or the lack thereof. It is calculated as the share of nonredundant ties of a node and its neighbors (Burt, 2017). As such, it is assumed that a node with low constraint values may be able to span multiple knowledge domains. In our case, high constraint values indicate the local closure of co-citations and are thus an indicator of the emergence of (micro-)tribes.

In turn, the term *global structure* means that also measures of the overall properties of a network are included. The properties are number of nodes (=cited articles), the share of realized connections on the total number of possible connections, the appearance of fragmentation into isolated subgroups (Newman, 2006), and also relations among clusters, meaning systematically co-cited articles, including their closure, size, and stability over time.

There are several measures of global structure. One is *transitivity* (Newman, 2006), which means the share of triplets on all possible triplets. A triplet consists of three nodes (triad), which are connected among each other (paper A is co-cited with paper B, B with paper C, and A with C). Transitivity can be seen as a global counterpart to network constraint, as it measures how densely connected the co-citation network is overall. If, for example, regions of the MOS–co-citation network are fully connected and little to no connections are present to other regions, then we would witness high levels of transitivity. This, in turn, would indicate either a tribal structure or a (unipolar or multipolar) center–periphery structure. However, transitivity alone is not sufficient to distinguish between these two cases, which is why we also use the *number of detected components* as the second measure, and the *number of nodes of the largest component* as third measure. A detected component is an isolated area of the network, which in our case means a group of (densely or loosely) co-cited papers that are otherwise unconnected with other cited papers in the sample. At the same time, the more nodes the largest component comprises, the more cohesive the network is. Ideal typically, we would expect a multitude of (roughly) equal sized components to emerge if MOS is truly organized in (micro-)tribes, as these tribes would only co-cite papers belonging to the same tribe and ignore papers stemming from different tribes. But if we witness the emergence of a stable, large component which comprises the lion's share of co-cited papers, then the probability to witness tribalization decreases.

Nonetheless we must check for the presence of densely connected regions or co-cited papers in our network, to make sure we do not under- or overestimate the degree of tribalization or centralization. This is why, at last, *modularity* measures that a graph

is fragmented into different densely connected subgroups. The clearer cut the boundaries between these groups, the higher the *modularity*.[5] This is the case, if papers are co-cited systematically, thus establish a community, while links to other communities of co-cited papers are sparse. According to Newman (2006, p. 8578), "modularity is, up to a multiplicative constant, the number of edges falling within groups minus the expected number in an equivalent network with edges placed at random". In our case, higher values indicate more clearly delineated structures within the MOS co-citation network and thus the potential for tribes to emerge.

The last piece of the puzzle to control whether the MOS co-citation network yields a tribelike structure is to employ *center–periphery detection algorithms*. As outlined above, if tribes are present, we will find multiple, densely connected cores, a semi-periphery which links a number of cores, and multiple peripheries. This is more likely, if the components are of equal size.

To test for center–periphery (CP) structures, we employ the algorithm developed by Kojaku and Masuda (2018a, 2018b). It is designed to detect a multitude of core–periphery structures. We also controlled if a single CP-structure is present in our data using the algorithm developed by Everett and Borgatti (1999). However, the calculations did not converge, meaning that there is no clean, single CP-structure present in our data for each timeframe. We then employed q–s test for multiple cores developed by Kojaku and Masuda (2018a, 2018b) to check for spurious core–periphery structures. The q-s test assumes that (especially smaller) cores may be artifacts and only weakly distinguished from other parts of the network.

Analytical approach II: community detection and flow of publications between communities at t_n and t_{n+1}

The analysis of the local and global structure of the network may hint at the emergence of micro-tribes in MOS. However, these hints alone are not sufficient, as they do not give us details about the potential splitting of knowledge stocks and their embedding into new subgroups, or—in terms of network analysis—communities. A community is defined as a region of the network, in which nodes are densely connected, whereas connections to different parts are low (Girvan & Newman, 2002). In our case, a community is detected if articles are systematically co-cited.[6]

The intention is, that emergent micro-tribes entail a focus on certain papers, which become essential over time for MOS scholars to back their line of reasoning within the micro-tribes. At the same time, scholars belonging to a (micro-)tribe, will progressively refrain from citing sources related to other (micro-)tribes over time. Instead, they will cite

[5] For modularity detection, we employed the python-Louvain algorithm described by Blondel et al. (2008). As suggested by an anonymous reviewer, we also employed the Girvan–Newman algorithm (2002), and added the label proportion algorithm (Cordasco and Gargano 2010). However, due to the huge computational burden and the lack of random-access memory (32 GB RAM are at disposal for calculations), the Girvan–Newman algorithm could only be calculated for timeframes up to 2000–2004. The inspection of all timeframes calculated revealed that, in comparison, the modularity algorithm detected smaller, more fine-grained clusters. The other two algorithms in turn found larger community structures, which would provide another argument in favor of our center–periphery interpretation. Instead, we decided to stick with the smaller clusters detected by the modularity algorithm in order to access the fragmentation of MOS in the most self-critical way as possible.

[6] We employ the modularity algorithm implemented in the python-Louvain package for community detection.

focal papers of the forerunners of the tribe and other members, which may be closely linked to the former. This should increase transitivity and decrease betweenness- and closeness values. If this applies, we may witness a schism between (micro-)tribes. In other words, if these sources are assigned to a cluster C_1 or CP-structure CP_1 at time t_n, we will witness a split of this cluster into two or more distinct clusters or CP-structures at t_{n+1}. If we check the intersection between co-cited papers of C_1 or CP-structure CP_1 at t_n and clusters C_2 to C_m or CP-structures CP_2 to CP_n at t_{n+1}, we are able to calculate their flow over time. This pattern indicates the formation of micro-tribes if it reoccurs in the forthcoming timeframes.

As the number of nodes per cluster varies greatly within and between timeframes, we calculate two flow measures: *total flow* and *relative flow*. While the former measures the absolute number of nodes which appear at a cluster C_m or CP-structure CP_m at t_n and C_k or CP_k at t_{n+1}, the latter calculates the share of nodes assigned to C_m or CP_m at t_n which is also assigned to C_k or CP_k at t_{n+1}. Total flow is therefore able to depict flows between clusters with large number of nodes, while relative flow is more sensitive to the flow of cited papers assigned to smaller clusters.

Analytical approach III: removal of central nodes

A final building block concerns the argument that the whole diachronic co-citation network is only held together by a few seminal papers which must be cited ritually to demonstrate the affiliation with the MOS research community. In this case, these few seminal papers yield the ability to connect different parts of the network. Consequently, they would gloss over the emergence and establishment of micro-tribes. Therefore, we follow previous studies and employ a node removal strategy to demonstrate the fragility of networks (Michele Bellingeri et al., 2020a, 2020b) and the potential of central nodes to fragment into different communities (Yang et al., 2018).

According to Boldi et al. (2013), and Bellingeri et al., (2020a, 2020b), removing links or nodes with the highest betweenness centrality is most effective in fragmenting the network, if there are few central nodes which yield the ability to bridge different areas of the network. In our case, these nodes equate with seminal papers which must be cited to demonstrate the affiliation with the MOS community. We follow this approach and remove the 5, 10, and 25 most central cited papers regarding their betweenness centrality from the diachronic co-citation analysis. This approach should suffice to increase the number of components, reduce the number of nodes associated with the largest component, and increase the modularity considerably—even if the co-citation network is larger, namely consists of many cited papers and abundant combinations of co-citations, i.e. at later timeframes. In combination with the change in the local and global structure over time, as well as the flow of cited papers between detected communities over time, this strategy should help us to discover potential micro-tribes in MOS.

Results

Local and global measures

Beginning with the local network measures, we witness a decrease in mean and median values of normalized degree centrality, betweenness centrality and eigenvector centrality

over time.[7] To a certain extent, this is unsurprising, as these values are associated with the number of nodes (=cited references) and edges (=co-citations) in the network under scrutiny. Regarding the local structure, these measures indicate (a) that MOS papers are co-cited in increasingly limited circumstances, and (b) that their ability to get embedded prominently in the MOS discourse diminishes over time. At the same time, we witness an increase in mean and median closeness centrality and a decrease of the constraint value between the time-frames. The change over time in the last two measures suggests that the observed co-citation network is becoming more cohesive. On first glance, the findings contradict each other. Nonetheless, these findings might hint at increasing specialization and a broadening knowledge base at the same time; even if MOS gets more local, yet more cohesive at the same time. The change in these measures, excluding outliers, is depicted in the boxplots in Fig. 2, and listed comprehensively in "Appendix 2". Further sensitivity analyses with different edge thresholds are provided in "Appendix 6".[8]

Turning to the global measures depicted in Fig. 3, we witness an increase in the number of nodes and edges over time, which is especially prevalent from the 2005 onwards (upper echelon). At the same time, the number of components rise between 1980 and 1999, reaches a plateau between 2000 and 2009, declines slightly in 2010–2014, before increasing again in the timeframe between 2015 and 2019. Simultaneously, the largest component comprises nearly all nodes present in the network at all points in time. At the same time, modularity declines over the whole period, with the exception of a small increase between 1995 and 1999, which means that during this short period, the initially very closed subgroups in the co-citation network began opening up and enabled idea exchange. We see this also in the transitivity measure, which shows that in the period 1980–1984, almost 40% of all triads were completely connected (e.g. citations A and B, B and C, and A and C are connected). Thereafter, transitivity continuously declined until it plateaued in 1995–1999, with 31.53% triads completely connected, and then declined again, this time steeply to 0.2032 in 2010–2014, before slightly rising again.[9]

[7] We also calculated the association among the network measures using spearman's rho due to their skewed distributions. As expected, there are extremely high correlations regarding the eigenvector centrality and degree centrality ($\rho = 0.91$), and high correlations regarding betweenness centrality and degree—as well as eigenvector centrality. However, closeness centrality is weakly associated with betweenness centrality ($\rho = 1.12$), and with medium strength with degree centrality ($\rho = 0.35$). Brokerage, on the other hand, is weakly and negatively associated with betweenness centrality (-0.1) and medium to strongly negative with degree centrality, eigenvector centrality, and closeness centrality ($\rho = -0.35, -0.32$, and -0.65 respectively). This indicates that the most central nodes which are removed are not exactly those who are able to bridge between the clusters. The correlation-heatmap is included in "Appendix 3".

[8] These indicate, in general, that centrality measures are sensitive to different network sizes and edge thresholds. Firstly, networks including only a few nodes (papers cited) and edges (co-citations) are more sensitive towards increasing edge thresholds. This is especially true for timeframe 1980–1984, as the network disintegrates with a threshold of 10. Furthermore, all local measures whose values dependent on (1) information spanning the neighboring nodes and (2) network topology are most sensitive to changes in the threshold. Especially brokerage, betweenness, and closeness centrality are affected. Yet, in most cases, the network is stable for thresholds of 10, meaning that an edge is constructed if papers are co-cited at least ten times per timeframe. Additionally, they tend to follow the main distribution found in the main article to a large extent. This indicates that, despite its sensitivity, our findings are not entirely random and that an underlying structure is present in MOS which follows its diversification into a polycentric oligarchy as argued in Sects. 4.2, 4.3, and 5.

[9] Sensitivity analyses with different edge thresholds are also reported for the global measures in "Appendix 6", Table 9 and Fig. 18. Again, we witness the dissolution of the co-citation network for timeframe 1980–1984 for edge-thresholds ≥ 10. The strongest decrease is witnessed in the number of connected nodes,

Next, Fig. 4 depicts the point measures regarding the size of the detected clusters. The orange line depicts the number of nodes assigned to the largest community. It tells us that the largest cluster constantly grows in size and is, with the exception of 2000–2004, at least double the size of the 90% percentile. Furthermore, we witness the steepest rise in the number of cited papers assigned to the largest cluster in the between 2005 and 2014. The 90th percentile grows nearly as strong from 1980–1984 to 2000–2005, but loses ground against the largest component from this timeframe onwards. Especially between 2015 and 2019, less nodes are assigned to the 90th percentile cluster compared to the timeframe 2010–2014. The same, albeit to a much less extend, is seen for the median and mean cluster sizes.

If there were tribalization, we would expect a nearly exponential increase in number of detected components over time, a stagnant number of nodes assigned to the largest component, constantly high levels of modularity, and stable levels of triadic closure. Yet none of these is detected. Furthermore, these findings on the global measure complement the local measures insofar, as the increasing levels of brokerage and closeness indicate the increasing ability of knowledge to flow between different areas of the network and are mirrored in the global structure. Finally, the distribution of nodes regarding the detected communities in the co-citation network does not support the assumption regarding the tribalization of MOS.

Finally, let us turn our attention to the CP-structures extracted by the KM-algorithm. The main findings are depicted in Fig. 5, and a full account is listed in "Appendix 2", Table 4.[10] In the upper echelon, we ee the total number of nodes present in our data (upper left) and the share of nodes assigned to core–periphery structures deemed significant by our qs-statistics. This means that, after testing, we can be sure at $p < 0.05$, that we detected a core–periphery structure within our data. Regarding the latter, we see that in 1980–1984, only a tiny fracture of co-cited papers ($\approx$11.4%) are assigned to CP-structures. Albeit the share rises considerable over the next timeframes, it takes until 2010–2014 until we may speak of a co-citation network in MOS, which is generally ordered into CP-structures (94% of all nodes in 2010–2014 are assigned to significant CP-structures, and 97.3% in 2015–2019).

Turning to the left panel in the middle echelon in Fig. 5, we see that approximately half of the nodes present in each timeframe are assigned to a center. The only exception is 1980–1984, where 4 out of 5 nodes assigned to the CP-structure are denoted as central nodes (see "Appendix 2", Table 5). The number of significant CP-structures (right, middle echelon) detected rises over time; moderately at first (nine in 1985–1989 up to 14 in 1995–1999), then jumping to 24 in 2000–2004. In the following two timeframes, the number stagnates before rising sharply to 68 in 2015–2019. So far, the findings of the CP analysis indicate either an ongoing process of internal differentiation of MOS, or a tribalization over time, which increases its pace over the last two decades and, maybe, lead to the emergence of micro tribes in 2015–2019.

Footnote 9 (continued)

which drops considerable even when the threshold is increased from 3 to 5. Despite this drop, the number of components, transitivity, and modularity remains relatively stable, especially for timeframes from 1990 to 1994 onwards. This finding hints at a cohesive, relatively stable but small core of co-cited papers in MOS. Only 2015–2019 is the exception. Here, the number of components rise sharply, even if a threshold of 3 is considered. Nonetheless, these tests indicate that later timeframes, and thus larger co-citation networks, are more robust compared to smaller ones.

[10] Sensitivity analyses are provided in "Appendix 6", Tables 10, 11 and Figs. 15, 16, 17. They follow, in general, the same pattern as the global network measures.

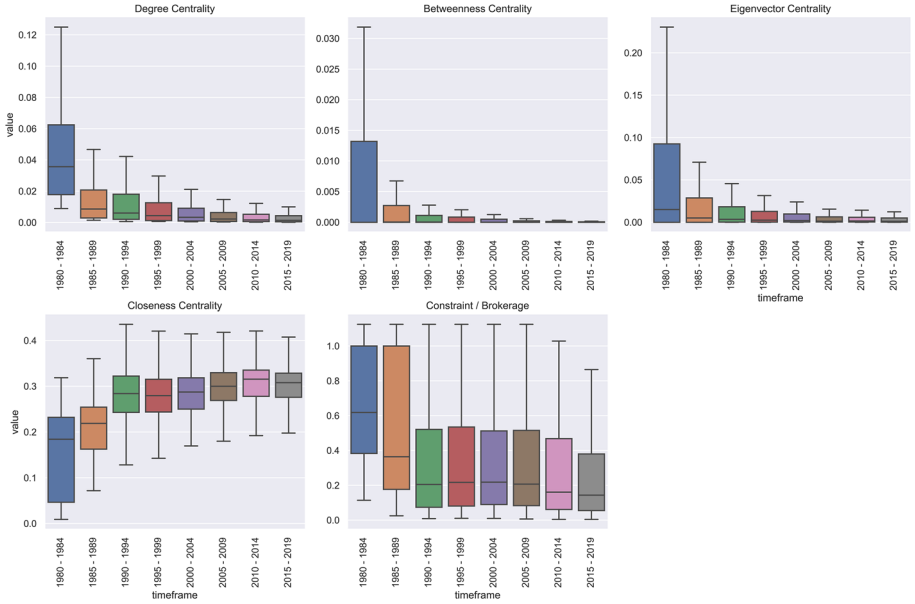

Fig. 2 Boxplots of local network measures by timeframe

We must now focus on the two panels at the bottom echelon of Fig. 5 to see, which one of the two interpretations is more likely. On the left, we see that in the first timeframes, namely from 1980–1984 to 1995–1999, the CP-structures were only detected in a single network component. Between 2000–2004 and 2010–2014, the number increased to two. This indicates a possible bifurcation of MOS into a dominant core and a subaltern center, which coincides with the establishment of the journals Leadership Quarterly, Organization, and European Journal of Management. A fragmentation into components with a size large enough to house CP-structures on their own occurs only recently in 2015–2019. In this timeframe, 12 components house significant CP-structures.

This impression is covered by the sizes of the CP-structures as depicted in the bottom right panel in Fig. 5. Eyeballing the graph and reflecting the values in Table 5 in "Appendix 2", this might hint at two simultaneous developments. First, tribalization might occur, which is pronounced in the last timeframe. Secondly, the decreasing size of CP-structures and comparatively small CP-structures extracted from the data might also hint at the emergence of small, maybe short-lived co-citation pockets within the MOS discourse, or the crowding-out of marginalized scholars and their papers. Such closed-off pockets of knowledge yield little changes to develop paradigms on their own and might incorporate either disciplinary pariahs, or scholars who only occasionally publish in MOS journals and get cited by MOS scholars.

Flow of cited papers between clusters over time

Nevertheless, the objection could be raised that we are not mapping the process of tribalization and that the clusters detected at different timeframes are mutually independent of each other. For this reason, let us now turn to the flow of nodes between the detected

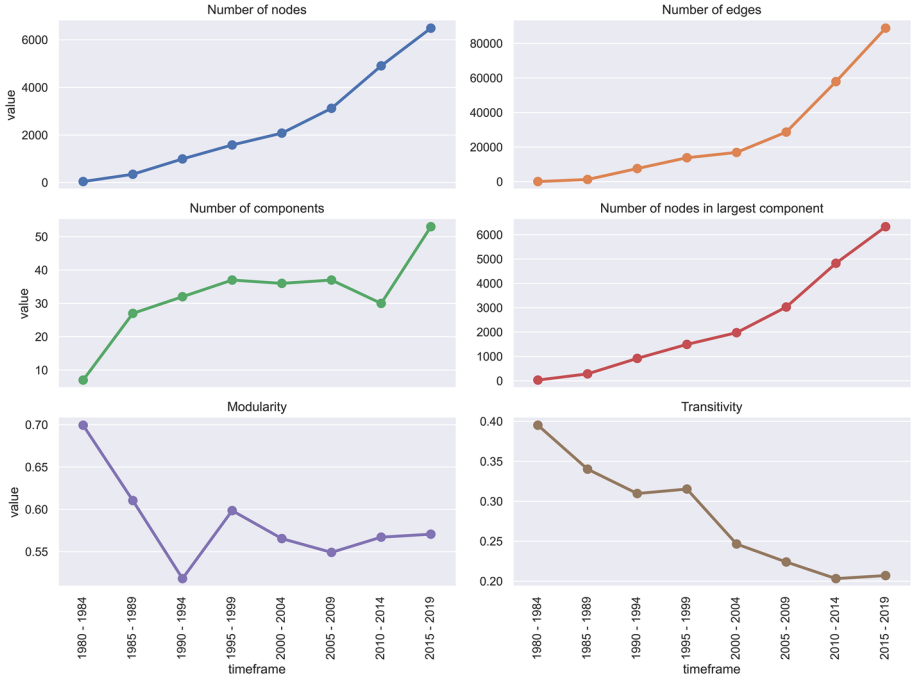

Fig. 3 Global network measures over time

communities over time depicted in Figs. 6 and 7, and between the CP-structures in Figs. 8 and 9. Tables of the full account of flow between the clusters and CP-structures detected per timeframe is provided in "Appendix 5". In these figures, communities are arranged per timeframe on the *y*-axis from the smallest to the largest clusters and are divided by timeframe under observation on the *x*-axis. In case of absolute flow, we colored the flow from red (low absolute numbers of citation transfer) to blue (high absolute numbers of citation transfer between communities and timeframes). Regarding relative flow, we colored the clusters and the flow between them from green (smallest clusters and CP-structures) over red (medium sized communities and CP-structures) to blue (largest communities and CP-structures) and used the same color to denote the percentage of nodes transferred between these communities from t_n to t_{n+1}.

Regarding the absolute flow in Figs. 6 and 8, we witness a certain degree of exchange between clusters and CP-structures, which intensifies over time, but is restricted to seven or eight detected clusters and CP-structures per timeframe. Over time, the flow between the largest detected communities at the bottom of Fig. 4 even intensifies. Meanwhile, the flow from larger to smaller communities is almost negligible, and the flow between them even smaller. To this shall be added that if small and novel communities emerge at a time t_n, we can see that they usually are incorporated into larger communities at t_{n+1}. Furthermore, there are few or no connections between these communities and communities of articles in earlier timeframes.

In Fig. 6, we see three patterns of relative flow. The first is that nodes that belong to smaller clusters (top of both figures) at t_n usually get incorporated in larger clusters and CP-structures at t_{n+1}. Second, our graph indicates that a small share of the nodes present in large clusters and CP-structures at t_n flow towards other larger clusters at t_{n+1}. Meanwhile,

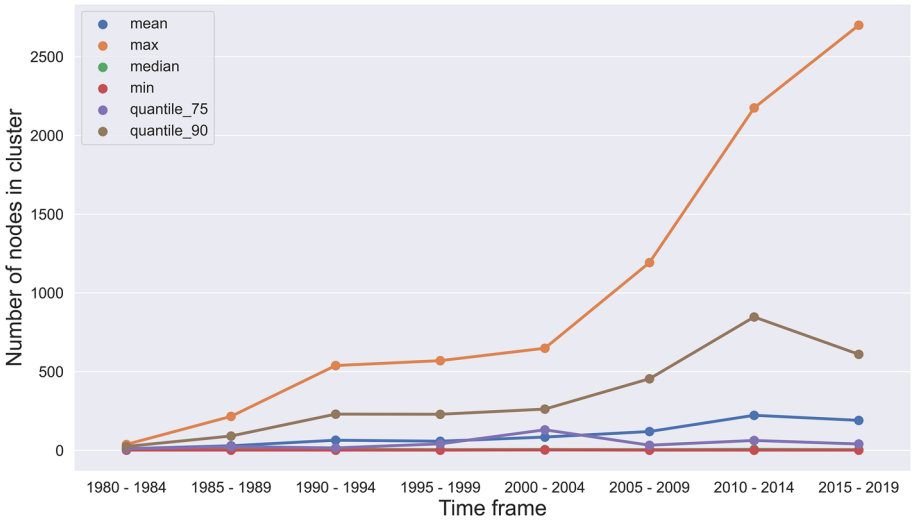

Fig. 4 Descriptive statistics regarding the number of nodes assigned to the largest cluster over time

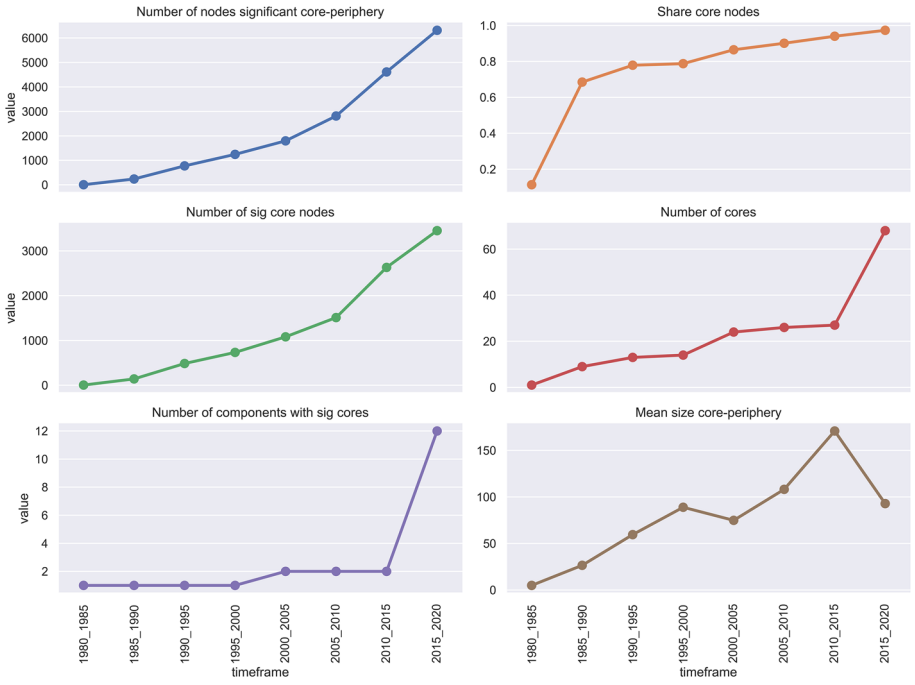

Fig. 5 Descriptive statistics of the core–periphery structure over time

there is not much flow from large clusters to small and peripheral clusters. Third, we witness a higher fluctuation in the node assignment between CP-structures over time compared to the clusters, which are either caused by the overall larger number of CP-structures

present in our data, or from the recombination of knowledge within MOS and research trends therein.

If MOS were dominated by tribalism, we would see a larger flow of cited papers from the large clusters and CP-structures to small clusters and CP-structures among the timeframes, while the flow between the large clusters and CP-structures would become increasingly smaller and eventually fade away. Instead, our findings suggest a polycentric center–periphery structure present in the MOS co-citation network. The center consists of a few large clusters and CP-structures consisting of many co-cited articles published in the ten major MOS journals. Articles belonging the periphery tend to be absorbed into the denser center. Here, a kind of annexation and possible recombination of knowledge takes place, while, at the same time, new co-citation clusters and CP-structures are added. The opposite movement can hardly be observed. This may indicate either that many articles and the knowledge stocks bound to them are not (or no longer) cited, or that certain knowledge stocks are systematically pushed out of the discourse.

Node removal

The next component in testing whether MOS is characterized by a tribalistic structure is in removing the 5, 10, and 25 most centrally cited papers according to betweenness centrality. If MOS is truly tribalistic, we would expect the number of unique components, modularity as well as transitivity to increase, but the number of nodes that make up the largest component in the co-citation network to decrease very sharply, especially if the fragmentation into multiple CP-structures is considered. Figure 10 lists the four above values for the networks in the respective time periods. At first glance, there is mixed evidence in favor and against tribalization.

Evidence in favor of tribalization is indicated by the increase in the number of components (top left panel of Fig. 10). This is even true if the number of reduced nodes is small, and becomes more pronounced over time, especially in 2005–2009 and on. This result is in itself a testimony that the central nodes indeed are seminal papers that are cited as a rite of passage into the MOS community. Another indication of tribalization is the increase in modularity (bottom left of the graph). But when removing the 25 most central nodes in the first period observed (1980–1984), the increase in modularity is not seen, since this already meant a removal of a large portion of the nodes that are present in the network. An increase in modularity means that we find increasingly closed network structures when removing the most central nodes.

Evidence against tribalization is conveyed by the values for the number of nodes of the largest component. They indicate the presence of a large, contiguous co-citation area despite the removal of the most central nodes within the network (in the upper right graph). Again, the largest component dominates the co-citation network entirely and includes almost all nodes in each timeframe. Looking at components and modularity, the surge in components is likely driven by small co-citation pockets which participate in the ritual citation of central articles in order to connect to the mainstream of the field. This is also indicated by the transitivity values (bottom right in the graph), which would increase to a larger extent if there were tribal, self-contained structures. This is true just because the central nodes with the highest betweenness centrality are removed, i.e. those that have a large number of connections to all areas of the co-citation network. However, this also that these central nodes are not the nodes with the highest brokerage.

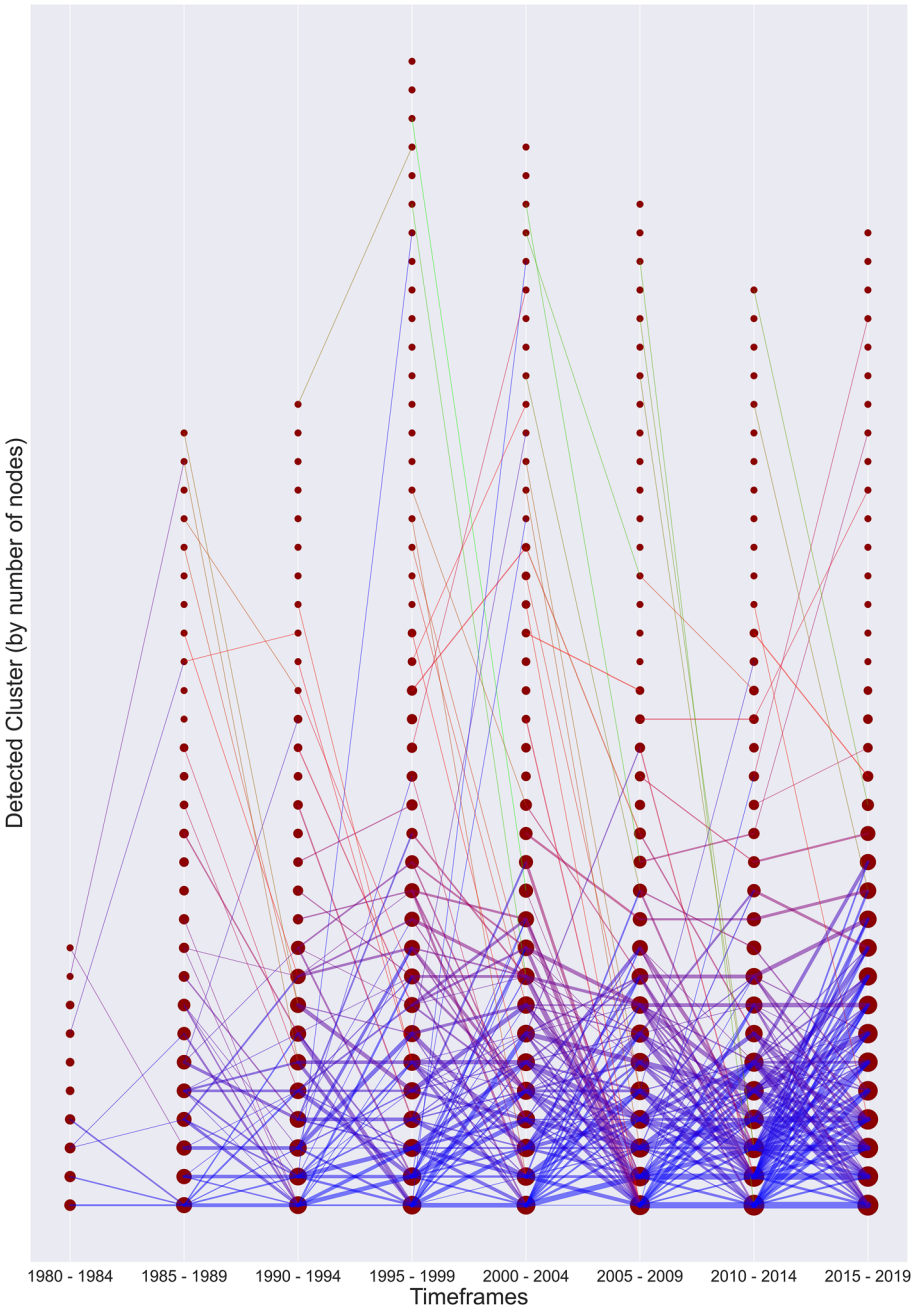

Fig. 6 Absolute flow of nodes between the detected network communities over time

If the findings are combined, the conjecture is strengthened that structure consisting of multiple centers and peripheries is present in the MOS co-citation network, which, with the exception of 2015–2019, clearly concentrates on the largest component. We can

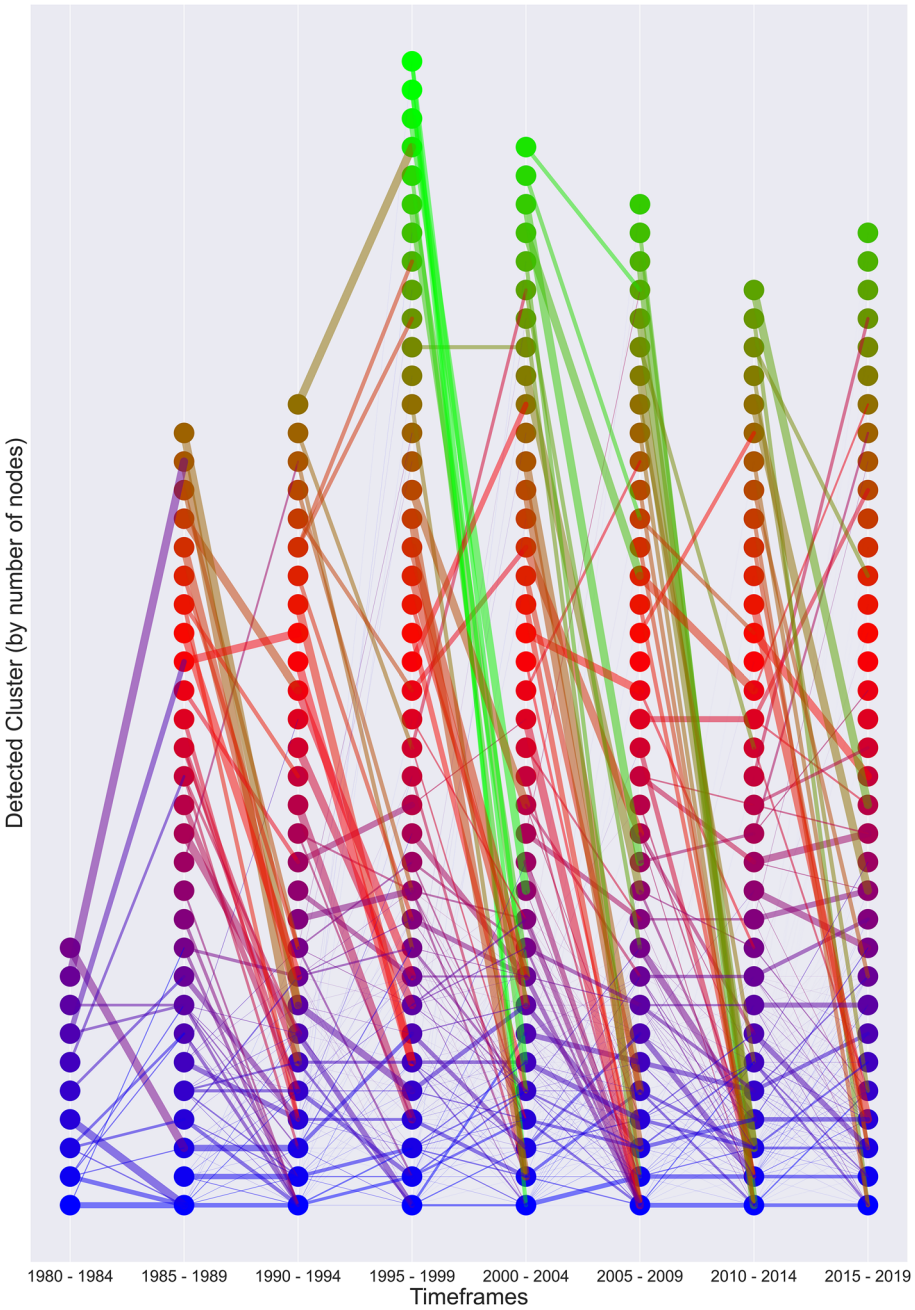

Fig. 7 Relative flow of nodes between the detected network communities over time

once again see this structure in the removed most central nodes listed in "Appendix 4". Among them are articles published in the *Academy of Management Review*, *Administrative Science Quarterly*, and the *Academy of Management Journal*—the journals in the field

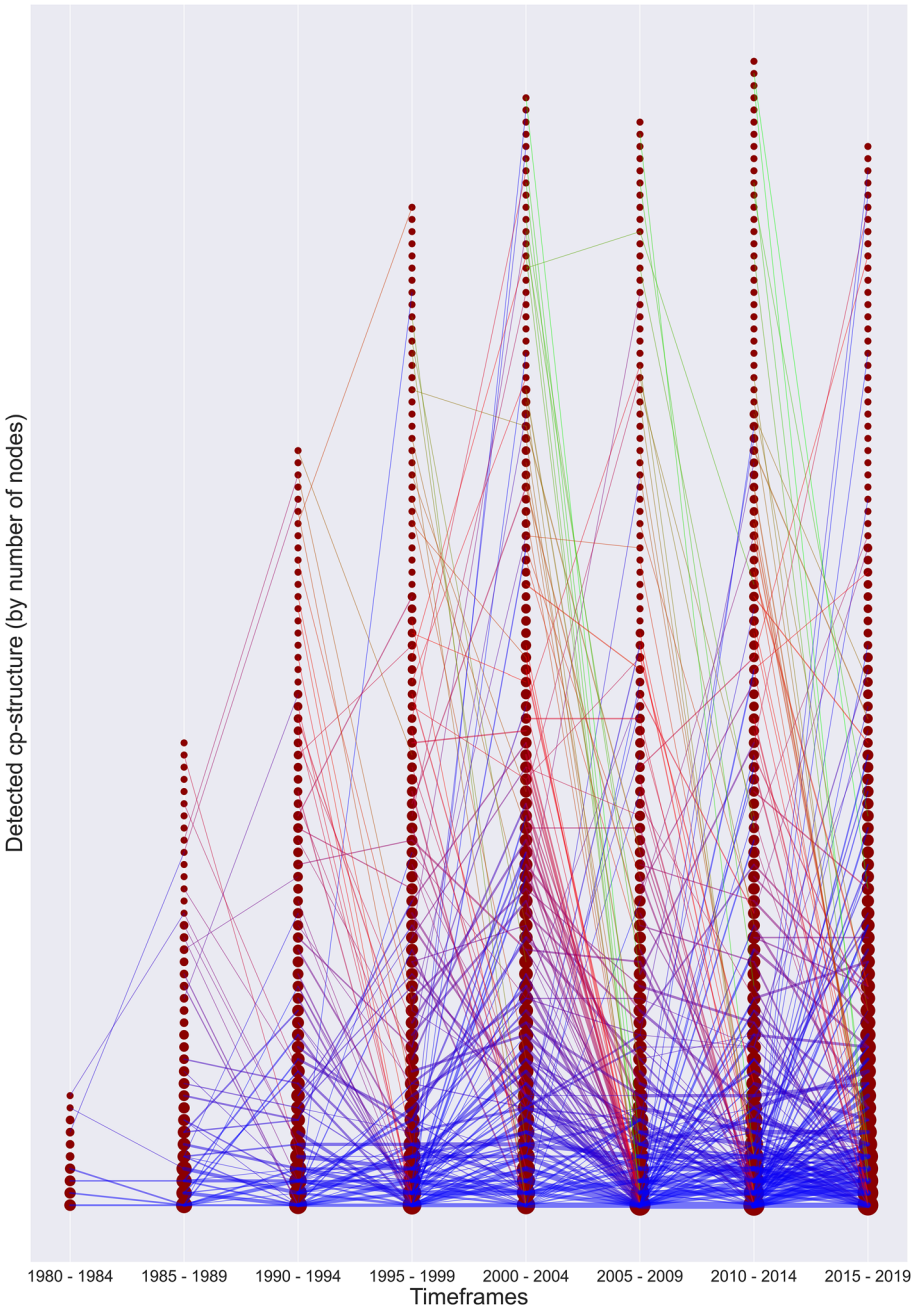

Fig. 8 Absolute flow of nodes between the detected core–periphery structures over time

of MOS that have the highest impact and therefore can be said to represent the (Anglo-American) center. This means that the results of the edge-removal strategy are complementary to the results of the flow of cited articles between clusters and CP-structures over

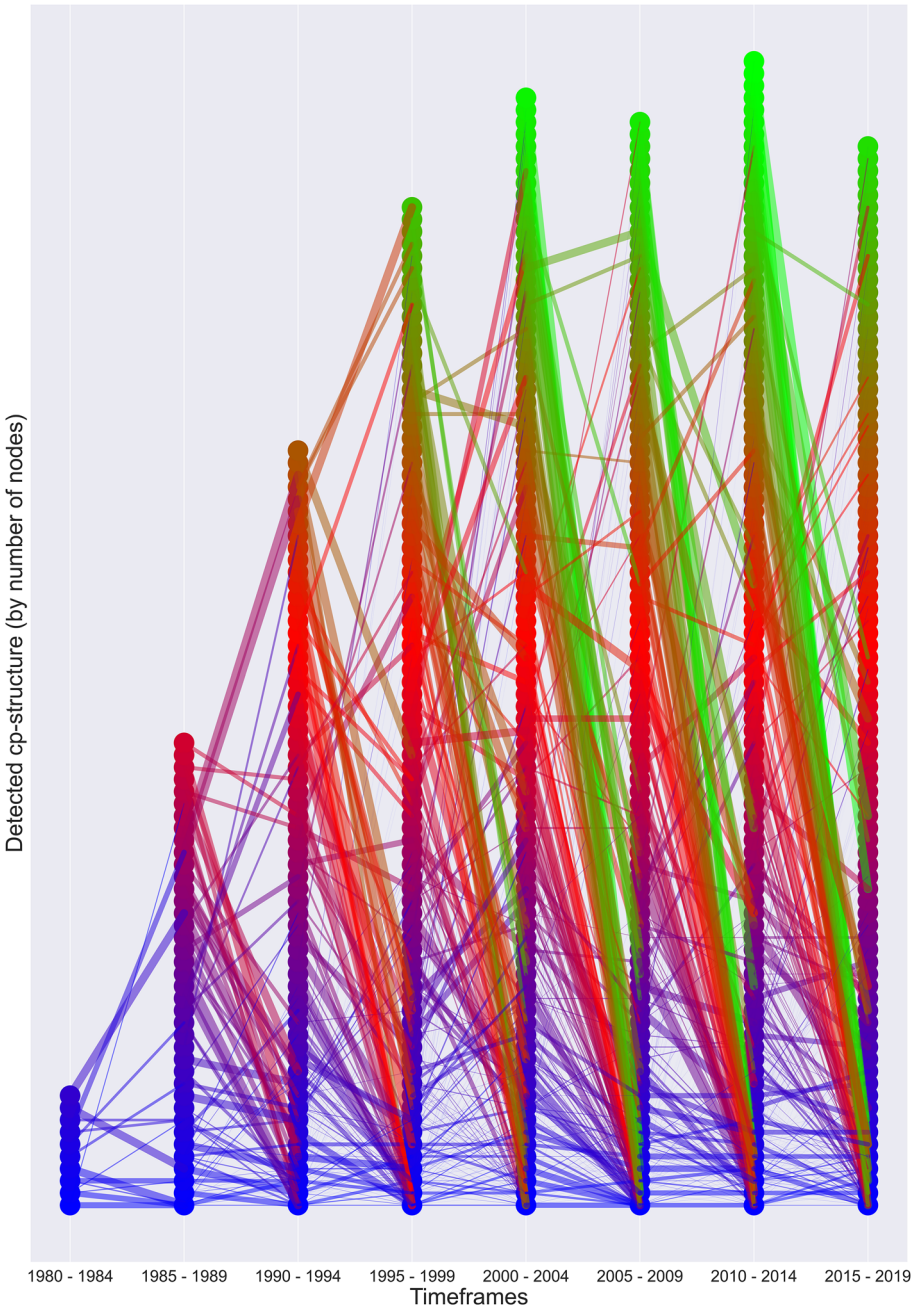

Fig. 9 Relative flow of nodes between the detected core–periphery structures over time

time. Consequently, the largest component persists in spite of removal of the most central nodes, while transitivity does not increase significantly. Instead, components that are seemingly small, self-contained, and therefore more edge-removed disappear from the largest

component when the most central nodes are removed. This means, in the context of our study, that they represent what we can call the semi-periphery of MOS.

Discussion and conclusions

The paper at hand sought to answer the questions of how many tribes make up Management and Organization Studies (RQ1), and how fragmented is its knowledge base is (RQ2). To do so, a diachronic co-citation analysis was conducted. Besides the canonical local and global network measures as well as CP-structures, a measure of flow among of the cited papers between the communities over time was established. Additionally, the most central nodes according to betweenness centrality were removed to investigate whether or not the coherence of MOS is due a limited number of potentially authoritatively cited papers.

If we interrelate all the evidence, a dichotomy between a more interconnected center and a periphery of bodies of knowledge emerges, which becomes more and more pronounced over time. This picture runs counter to the assumption that MOS is breaking up into ever smaller micro-tribes (Alvesson 2012; Alvesson & Sandberg, 2014; Barley 2016; Huzzard et al. 2017; Tourish, 2019). Instead of a weak paradigmatic core, which is seen as one of the main drivers of fragmentation and thus tribalization (Abbott, 2001; Schwemmer & Wieczorek, 2020; Turner, 2006, 2016; Wieczorek et al., 2021a, b), our findings indicate an oligopolist, paradigmatic core which captures nearly all of the co-cited papers in our dataset and might hint at a crowding-out of subalterns or pockets of knowledge in 2015–2019. In this sense, MOS is a convergent discipline in terms of the tribalism approach (Becher & Trowler, 2001), albeit our findings suggest a mixture of the weak tribalism, and core with (Re-)integration scenario depicted in Fig. 1 in "Empirically observable patterns of tribalization" section. If there were no strong paradigmatic core, then, at the very least, our findings indicate a center of power to which peripheral authors orient themselves. This center is structured around a limited number if CP-structures, which are aligned to the limited attention space described by Collins (2002, p. 24), but with a tendency to fractalize into smaller, probably more specialized branches of MOS in line with Abbot's (2001) argumentation. These interpretations are backed by the absolute and relative flow of citations among detected communities over time. They signal the strong interrelation between a small number of detected communities within the very center of MOS, the negligible outflow of cited papers, and the ability to incorporate peripheral communities of co-cited papers by the detected central co-citation communities.

As indicated by the number of detected communities, CP-structures, and modularity values, we suspect specialization and crowding-out effects in MOS to be present in our data, but it is overshadowed by the integration of knowledge into the largest component in the co-citation network. Also, the increasing number of components detected if the most central nodes are removed might be a hint at this underlying differentiation, but again, potential differentiation is also adherent to the alignment to dominant sources and the need to follow narrow, connective paths of research, as criticized by Alvesson and Sandberg (2014). Furthermore, the oligopolistic center–periphery structure present in the data and the fact that a large number of the most central papers are situated in the reputational place of the sun (Butler & Spoelstra, 2020; Hallonsten, 2021; Macdonald, 2015), namely in the Academy of Management Review, Administrative Science Quarterly, and Academy of Management Journal adds to the impression that MOS is not as prone to form tribes as

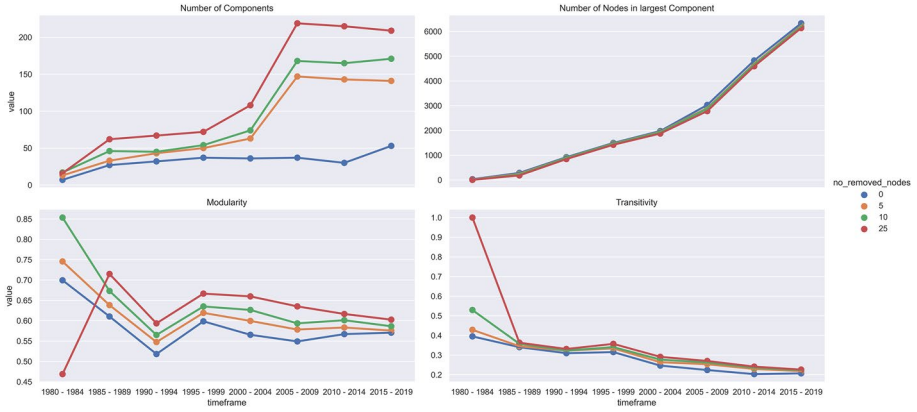

Fig. 10 Changes in the global measures after applying the node-removal strategy

expected (Alvesson, 2013). Rather, a subaltern (possibly European) core emerges, which is accompanied by small CP-structures in 2014–2019.

These findings also resonate with Alvesson and Gabriel (2013) and Davis (2015) insofar, as the structure of the co-citation network reveals the strategic location of thought products in a sympathetic community, and the practice of ritualized citations in high-impact MOS journals. In turn, the practice of ritualized citation contributes to the detected, stark center–periphery dynamic. In other words: Researchers may become part of the densely connected center embodied in the largest component, otherwise, researchers will have to look for a (possible more fragmented) discipline with a higher tolerance for deviating opinions and research styles.

Taken together, our approach reveals that MOS does not consist of micro-tribes, but an oligopolistic center–periphery structure (RQ1), and yields a low degree of fragmentation of its knowledge base with an only recent increase (RQ2). Due to the limited number of CP-structures in line with Collins' (2002) line of argumentation, this oligopolistic center of MOS yields the ability to incorporate the influx of novel, yet not fully integrated ideas. In this sense, not only the tribalism approach (Becher & Trowler, 2001) provides us with important mechanisms to study and map the fragmentation of academic disciplines. Also, the multiple CP-algorithm as well as the qs-algorithm developed by Kojaku and Masuda (2018a, 2018b), our employed strategy to remove central nodes (Bellingeri et al., 2020a, 2020b Boldi et al., 2013; Yang et al., 2018), and the introduced approach to investigate the absolute and relative flow of nodes among different detected communities over time proved to be useful tools which for studying the fragmentation and internal differentiation of research communities or academic disciplines.

As usual, our approach yields a number of limitations. The first limitation is linked to the usage of Web of Science as data base. Despite its relevance, Web of Science is biased against publications in the social sciences and the humanities, thus the coverage is not as good as in other databases, e.g. SCOPUS (Aksnes & Sivertsen, 2019). Secondly, network structures are especially sensitive. This is inherent to their relational structure inscribed into the nodes, the connections between those, and the topology of the network itself. If we change one of these, it will immediately have an impact on the others, especially when measures are employed who rely on the topology of the network and the edges between the nodes, in our case the co-citations between published MOS papers (see "Appendix 6").

These two limitations might lead to an overestimation of tribalism, as missing data would translate in both missing nodes and missing edges in our co-citation network (Smith et al., 2017). In this sense, our approach would even overestimate the presence of academic tribes in MOS. Thirdly, some journals were founded in the 1990s. To a certain extent, this explains the growth of the network and the emergence of a second component with CP-structures from the 2000s onwards. Nonetheless, one would expect to find accelerated fragmentation and thus tribalization of the co-citation network from this time onwards, which only occurred in 2015–2019 and could also be accountable to a crowding out effect of peripheral MOS papers. Yet micro-tribes did not only emerge from our data, leading us to the conclusion that MOS is not a fragmented adhocracy anymore (Whitley, 1984), but rather the "polycentric oligarchy" described by Vogel (2012).

Besides the limitations stemming from the choice of the bibliometric database, there are three further limitations linked to the methodology employed in this article. First, we could not adequately capture the displacement of bodies of knowledge despite the hints provided by the CP-analysis. However, the way papers are citated in MOS leaves open the possibility that bodies of knowledge from other disciplines and fields are briefly absorbed, only to become bogged down or transferred back to other disciplines. However, it is also possible that knowledge assets that are published in MOS journals, but are not central, are exported to other disciplines through a crowding-out effect.

Second, we only considered one network layer. However, tribalization could also be reflected in cooperative relationships. Given that these are also unequally distributed according to the prestige of the researchers (collaborations between star scientists) (Abramo et al., 2019; Choi, 2012), the fact that male researchers are generally better networked nationally as well as internationally (Kwiek, 2020), and the U.S. presents itself as a center of management research (Wieczorek et al., 2021a, b), it might possibly be possible to discover more (micro-)tribes. However, their appearance in multiple network-layers would rather reflect (a) the monetary opportunity for international cooperation, or (b) hierarchies within MOS that contribute to the emergence of subcommunities. Nevertheless, it is to be expected that these subcommunities relate to a shared knowledge base, which is why future analyses discussing the MOS from the perspective of cooperation networks should always include co-citation analyses.

Third, we could not include the content of the articles from which we established the co-citation analyses in the present study. This could be realized in the future based on topic modeling approaches such as Structural topic modeling (Roberts et al., 2014) or Word-embedding algorithms (Kozlowski et al., 2019). These could then be used to contrast the present findings, or more precisely: to find out in which topic references the articles were and partly still are cited and which topic mix the clusters we extracted show.

Related to this, we were fourthly unable to discern the type of (co-)citations of the articles. Admittedly, some of the citations could be the result of adverse citations, e.g. which are used by scholars for reasons of distinction against different paradigms or mock competitors in MOS. Unfortunately, we could not take this into account, as we based our co-citation analysis on the articles' reference lists. For this reason, we might still underestimate the true level of fragmentation between paradigms in MOS. Nonetheless, even if papers assigned to different tribes are cited as strawmen, this could also mean that the different tribes are still in touch and discuss the theoretical approaches, methodological stances, or empirical findings. To account for this shortcoming, future studies should include textual content related to the citation to discern whether is an adverse citation or not. However, this could be achieved if scholars have full-text access to all of the 22,430 articles analyzed in this paper.

Despite these limitations, our study largely debunks the myth, repeated in several recent high-profile publications, that MOS is experiencing increasing (micro)tribalization. The main takeaway of this comprehensive analysis of the claims of microtribalization is therefore that we hereby hopefully have opened up for a host of research into the potential power dynamics of MOS in itself and in comparison with other disciplines. Against this backdrop, a first novel line of inquiry could be linked either to a qualitative content analysis of the central nodes extracted from each cluster or CP-structure, or a topic modeling approach linking extracted topic features to the components, clusters, and cores. The composition of topics assigned to each core etc. might then, firstly, depict the changes in the combination of problems, methods, and theories employed in MOS, and, secondly, what topics dominate the MOS discourse and whether these stem from the disciplinary center or the periphery. Furthermore, we encourage other scholars to replicate our study with different databases (e.g. SCOPUS), and with comparative approaches that include disciplines that display varying degrees of internal struggles and differences in their paradigmatic cores (e.g. Psychology, Sociology as examples of disciplines with high fragmentation and weak paradigmatic core, or physics as example of relatively low levels of fragmentation and a strong paradigmatic core). Finally, we advise scholars to analyze the re-embedding of sources within the sections of the articles to find more evidence of whether citations are ritual or have a real potential of re-integrating knowledge stemming from different branches of MOS. Inquiries of this and other related matters are the only true means by which we can obtain a more comprehensive view of MOS and of mechanisms that can drive tribalization and unification of disciplines, which can then be used in similar studies of other disciplines.

Appendix 1: Papers issued in the journals under investigation in the given periods of time

Journal	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	Σ
Academy of Management Review	99	173	115	153	107	122	130	141	1040
Journal of Management	37	168	168	169	193	205	288	440	1668
Administrative Science Quarterly	114	92	100	108	84	85	82	109	774
Leadership Quarterly				91	128	198	315	237	969
Academy of Management Journal	265	228	250	258	304	141	317	404	2167
Strategic Management Journal	98	178	240	244	321	320	410	615	2426
Journal of Organizational Behavior		44	195	184	227	243	295	331	1519
Journal of Management Studies	62	118	140	145	243	283	279	202	1472
Organization Studies	39	82	100	148	197	285	277	284	1412
Human Relations	181	189	230	200	240	268	284	303	1895

Journal	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	Σ
Organization				88	129	149	173	161	700
European Management Journal						23	166	181	370
Organization Science			114	161	209	261	444	350	1539
Management Science	400	459	435	474	484	615	655	957	4479
Σ	1295	1731	2087	2423	2866	3198	4115	4715	22,430

Appendix 2: Descriptive statistics of network measures over time

See Tables 3, 4, and 5.

Table 3 Global network measures

	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
# Papers issued	1295	1731	2087	2422	2866	3197	4115	4175
# Cited papers issued in the included journals	376	1420	2837	4005	5589	7678	10,704	13,803
# Cited papers issued in the included journals/# papers issued	0.2903	0.4693	0.5549	0.5315	0.5374	0.5646	0.6043	0.6306
# Co-citations of papers issued in the included journals	1903	24,689	103,897	176,615	270,224	454,496	899,189	1,392,882
# Co-citations (threshold = 3)	203	5010	31,369	60,824	76,747	129,212	256,297	388,121
# Unique co-citations (threshold = 3)	57	1247	7574	13,834	16,918	28,699	57,899	88,853
# Unique co-citations (threshold = 3)/# co-citations of papers included in the journals	0.030	0.051	0.073	0.078	0.063	0.063	0,064	0.064
# Components	7	27	32	37	36	37	30	53
# Nodes largest component	29	284	919	1491	1976	3029	4826	6328
Modularity	0.6994	0.6104	0.5181	0.5985	0.5654	0.5491	0.5671	0.5706
Triadic closure	0.3952	0.3402	0.3097	0.3153	0.2465	0.2240	0.2032	0.2070

Timeframe	Variable	Min	Median	Mean	75% Quantile	90% Quantile	Maximum	Skewness
1980–1984	Degree	0.0233	0.0465	0.0603	0.0756	0.1326	0.186	1.4584
1985–1989	Degree	0.0029	0.0115	0.0205	0.023	0.0575	0.1954	2.4996
1990–1994	Degree	0.001	0.006	0.0153	0.0181	0.041	0.2397	3.3458
1995–1999	Degree	0.0006	0.0044	0.0111	0.0127	0.031	0.2063	3.5609
2000–2004	Degree	0.0005	0.0034	0.0078	0.0091	0.0193	0.1887	5.2239
2005–2009	Degree	0.0003	0.0022	0.0059	0.0064	0.0151	0.1971	6.6852
2010–2014	Degree	0.0002	0.0016	0.0048	0.0053	0.0122	0.1814	6.9599
2015–2019	Degree	0.0002	0.0014	0.0042	0.0043	0.0109	0.1294	5.4736
1980–1984	Betweenness	0	0	0.0261	0.0279	0.0816	0.257	2.7719
1985–1989	Betweenness	0	0	0.0056	0.0033	0.0139	0.2504	8.3354
1990–1994	Betweenness	0	0	0.0021	0.0015	0.0051	0.1252	8.9936
1995–1999	Betweenness	0	0	0.0014	0.0008	0.0035	0.127	12.1264
2000–2004	Betweenness	0	0	0.001	0.0005	0.0021	0.0979	13.0558

Table 3 (continued)

Timeframe	Variable	Min	Median	Mean	75% Quantile	90% Quantile	Maximum	Skewness
2005–2009	Betweenness	0	0	0.0007	0.0002	0.0012	0.1705	22.4041
2010–2014	Betweenness	0	0	0.0004	0.0001	0.0008	0.1906	34.2421
2015–2019	Betweenness	0	0	0.0003	0.0001	0.0005	0.1261	30.4283
1980–1984	Eigenvector	0	0.0162	0.0834	0.1268	0.287	0.4347	1.5954
1985–1989	Eigenvector	0	0.0084	0.0289	0.0389	0.0932	0.2657	2.1899
1990–1994	Eigenvector	0	0.0045	0.0167	0.0211	0.051	0.2172	2.6036
1995–1999	Eigenvector	0	0.0026	0.012	0.0128	0.0355	0.205	3.1479
2000–2004	Eigenvector	0	0.0021	0.0098	0.0098	0.0285	0.2127	4.0915
2005–2009	Eigenvector	0	0.0013	0.0074	0.0064	0.0211	0.1917	4.4891
2010–2014	Eigenvector	0	0.0016	0.0062	0.0059	0.0171	0.1881	4.8981
2015–2019	Eigenvector	0	0.0012	0.0053	0.0051	0.0143	0.1365	4.4953
Timeframe	Variable	Min	Median	Mean	75% Quantile	90% Quantile	Maximum	Skewness
1980–1984	Closeness	0.0233	0.1614	0.1387	0.2037	0.2381	0.2989	-0.1743
1985–1989	Closeness	0.0029	0.2143	0.1807	0.2472	0.276	0.3579	-0.9363
1990–1994	Closeness	0.001	0.2771	0.2585	0.3155	0.3411	0.4354	-1.6191
1995–1999	Closeness	0.0006	0.2796	0.266	0.3153	0.341	0.4519	-1.8465
2000–2004	Closeness	0.0005	0.2875	0.2741	0.3184	0.3426	0.451	-2.0851
2005–2009	Closeness	0.0003	0.3	0.2909	0.3296	0.3528	0.4754	-2.3217
2010–2014	Closeness	0.0002	0.3156	0.3037	0.3353	0.3583	0.4797	-2.3539
2015–2019	Closeness	0.0002	0.308	0.2961	0.3286	0.3507	0.4604	-2.5929
1980–1984	brokerage	0.2581	0.7309	0.7385	1	1.0049	1.125	-0.2309
1985–1989	brokerage	0.0391	0.4075	0.5173	1	1	1.0069	0.3445
1990–1994	brokerage	0.0139	0.2374	0.3825	0.5448	1	1.125	0.8478
1995–1999	brokerage	0.0107	0.217	0.3629	0.5347	1	1.125	0.9248
2000–2004	brokerage	0.01	0.2178	0.3597	0.5123	1	1.125	1.0033

Table 3 (continued)

Timeframe	Variable	Min	Median	Mean	75% Quantile	90% Quantile	Maximum	Skewness
2005–2009	brokerage	0.0063	0.2066	0.3566	0.5157	1	1.125	0.9771
2010–2014	brokerage	0.0038	0.1608	0.3042	0.468	1	1.125	1.2494
2015–2019	brokerage	0.004	0.1436	0.2918	0.3798	1	1.125	1.3224

Table 4 Descriptive Statistics of the core–periphery structure detected using the KM-algorithm and the qs-score

Timeframe	Threshold	Nodes	Nodes in significant CP-structures	Share of nodes present in CP-structures	Number of nodes belonging to the significant cores	Cores	Number of components with significant CP-structures
1980–1984	3	44	5	0.113636	4	1	1
1985–1989	3	349	239	0.684814	141	9	1
1990–1994	3	994	774	0.778672	485	13	1
1995–1999	3	1581	1245	0.787476	733	14	1
2000–2004	3	2078	1797	0.864774	1081	24	2
2005–2009	3	3122	2813	0.901025	1511	26	2
2010–2014	3	4907	4613	0.940086	2631	27	2
2015–2019	3	6490	6315	0.973035	3452	68	12

Table 5 Descriptive statistics of core–periphery structures by threshold—descriptives of core–periphery size (KM-Algorithm)

Timeframe	Threshold	Nodes	Minimum size of CP-structures	Median size of CP-structures	Mean size of CP-structures	Maximum size of CP-structures	Skewness of CP-structures	Kurtosis of CP-structures
1980–1985	3	44	5	5	5	5		
1985–1990	3	349	6	15	26.56	63	0.55	− 1.07
1990–1995	3	994	15	32	59.54	187	1.15	− 0.12
1995–2000	3	1581	11	39	88.93	286	1.03	− 0.42
2000–2005	3	2078	13	25	74.88	369	2.13	3.64
2005–2010	3	3122	9	37	108.19	573	1.82	2.09
2010–2015	3	4907	9	32	170.85	1175	2.14	3.79
2015–2020	3	6490	2	11	92.87	1089	3.19	10.12

Appendix 3: Correlation Matrices of network measures

See Figs. 11 and 12.

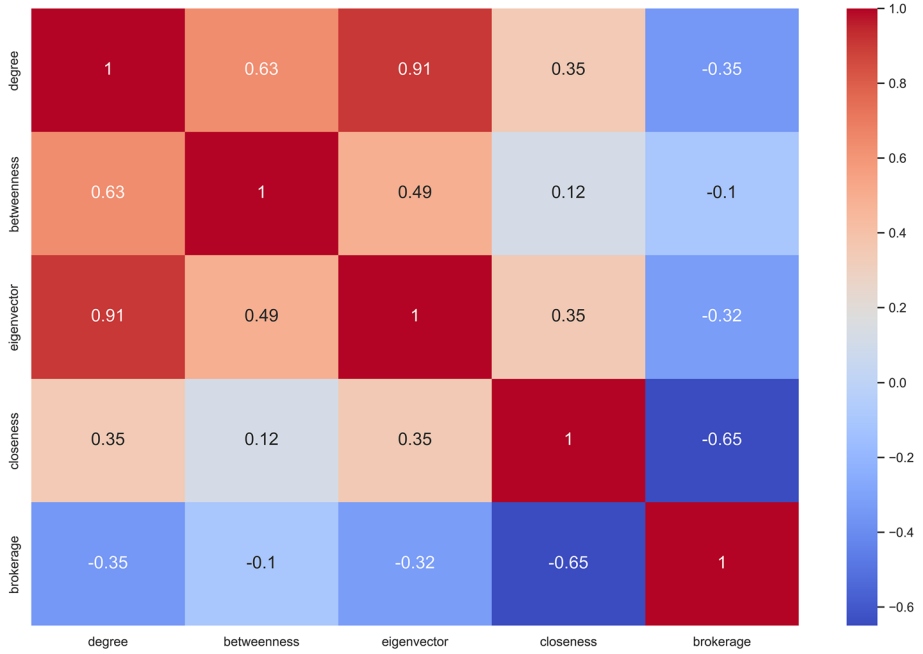

Fig. 11 Heatmap of correlations between local measures present in the data

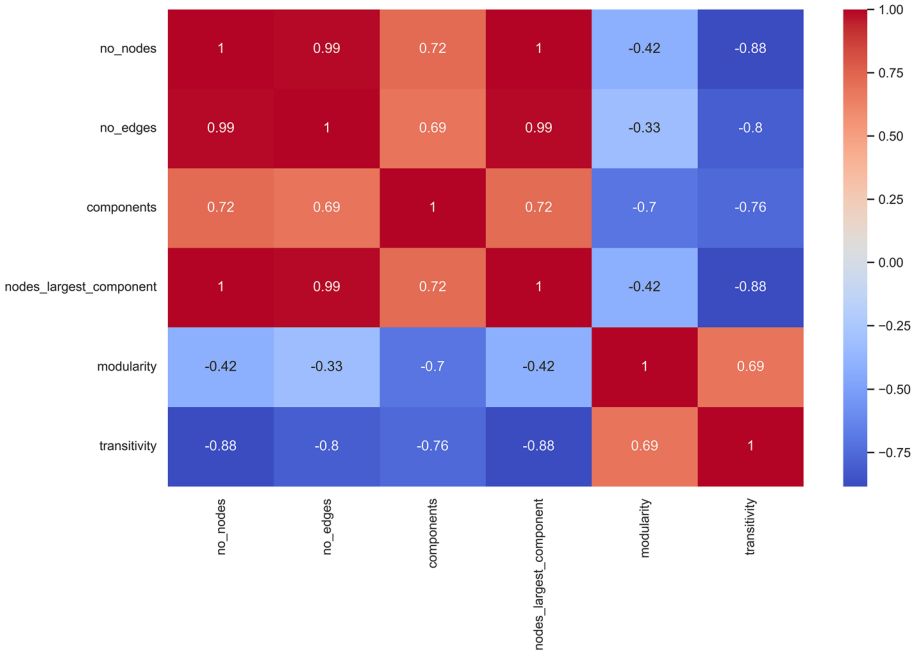

Fig. 12 Heatmap of correlations between global measures present in the data

Appendix 4: Properties of the 25 most central nodes removed from the network per timeframe

Timeframe	DI	PY	Betweenness	TI	AU	SO
1980–1984	https://doi.org/10.2307/256077	1982	0.257014	STRATEGIC ATTRIBUTES AND PERFORMANCE IN THE BCG MATRIX: A PIMS-BASED ANALYSIS OF INDUSTRIAL-PRODUCT BUSINESSES	HAMBRICK, DC; MACMILLAN, IC; DAY, DL	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.1002/smj.4250010105	1980	0.204319	STRATEGIC MANAGEMENT ARCHETYPES	WISSEMA, JG; VANDERPOL, HW; MESSER, HM	STRATEGIC MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/2392472	1981	0.130399	ENVIRONMENT, STRATEGY, AND POWER WITHIN TOP MANAGEMENT TEAMS	HAMBRICK, DC	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.2307/2392512	1981	0.109635	PROBLEMS WITH CONTINGENCY THEORY: TESTING ASSUMPTIONS HIDDEN WITHIN THE LANGUAGE OF CONTINGENCY THEORY	SCHOONHOVEN, CB	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.1002/smj.4250010304	1980	0.083056	PERFORMANCE AND CONSENSUS	BOURGEOIS, LJ	STRATEGIC MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.1111/j.1467-6486.1981.tb00088.x	1981	0.07835	TOWARD A NEW CONTINGENCY APPROACH: THE SEARCH FOR ORGANIZATIONAL GESTALTS	MILLER, D	JOURNAL OF MANAGEMENT STUDIES

Timeframe	DI	PY	Betweenness	TI	AU	SO
1980–1984	https://doi.org/10.2307/2392455	1980	0.061646	ARCHETYPES OF ORGANIZATIONAL TRANSITION	MILLER, D; FRIESEN, P	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.1002/smj.4250010107	1980	0.057586	PLANNING PERCEPTIONS AND PLANNING RESULTS	LEONTIADES, M; TEZEL, A	STRATEGIC MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/256078	1982	0.057586	TECHNOLOGY-STRUCTURE RESEARCH: 3 CRITICAL ISSUES	FRY, LW	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/255551	1980	0.031654	MOMENTUM AND REVOLUTION IN ORGANIZATIONAL ADAPTATION	MILLER, D; FRIESEN, PH	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/255507	1980	0.0299	IMPACT OF THE ORGANIZATION ENVIRONMENT ON THE LONG-RANGE PLANNING PROCESS: A CONTINGENCY VIEW	LINDSAY, WM; RUE, LW	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/2392457	1980	0.027224	STRATEGY, DISTINCTIVE COMPETENCE, AND ORGANIZATIONAL PERFORMANCE	SNOW, CC; HREBINIAK, LG	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.2307/256132	1983	0.009321	SOME TESTS OF THE EFFECTIVENESS AND FUNCTIONAL ATTRIBUTES OF MILES AND SNOWS STRATEGIC TYPES	HAMBRICK, DC	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1980–1984	https://doi.org/10.2307/255990	1982	0.006091	INDUSTRIAL FIRMS GRAND STRATEGY AND FUNCTIONAL IMPORTANCE: MODERATING EFFECTS OF TECHNOLOGY AND UNCERTAINTY	HITT, MA; IRELAND, RD; PALIA, KA	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/256096	1982	0.003507	THE PRODUCT PORTFOLIO AND PROFITABILITY: A PIMS-BASED ANALYSIS OF INDUSTRIAL-PRODUCT BUSINESSES	MACMILLAN, IC; HAMBRICK, DC; DAY, DL	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/2392259	1980	0.001107	AVERAGE TENURE OF ACADEMIC DEPARTMENT HEADS: THE EFFECTS OF PARADIGM, SIZE, AND DEPARTMENTAL DEMOGRAPHY	PFEFFER, J; MOORE, WL	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.2307/2392283	1980	0.001107	PARADIGMS, METAPHORS, AND PUZZLE SOLVING IN ORGANIZATION THEORY	MORGAN, G	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.1002/smj.4250020104	1981	0	MODELING CHANGES IN MARKET SHARE: A CROSS-SECTIONAL ANALYSIS	BUZZELL, RD; WIERSEMA, FD	STRATEGIC MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.1111/j.1467-6486.1982.tb00057.x	1982	0	CONGEALING OIL: INVENTING IDEOLOGIES TO JUSTIFY ACTING IDEOLOGIES OUT	STARBUCK, WH	JOURNAL OF MANAGEMENT STUDIES

Timeframe	DI	PY	Betweenness	TI	AU	SO
1980–1984	https://doi.org/10.1177/001872678003300304	1980	0	A TYPOLOGY FOR INTEGRATING TECHNOLOGY, ORGANIZATION, AND JOB DESIGN	SLOCUM, JW; SIMS, HP	HUMAN RELATIONS
1980–1984	https://doi.org/10.1287/mnsc.28.9.1013	1982	0	THE LONGITUDINAL ANALYSIS OF ORGANIZATIONS: A METHODOLOGICAL PERSPECTIVE	MILLER, D; FRIESEN, PH	MANAGEMENT SCIENCE
1980–1984	https://doi.org/10.2307/2392469	1981	0	A TENTATIVE EXPLORATION INTO THE AMOUNT AND EQUIVOCALITY OF INFORMATION-PROCESSING IN ORGANIZATIONAL WORK UNITS	DAFT, RL; MACINTOSH, NB	ADMINISTRATIVE SCIENCE QUARTERLY
1980–1984	https://doi.org/10.2307/255427	1980	0	STRATEGY, STRUCTURE, THE ENVIRONMENT, AND FINANCIAL PERFORMANCE IN 48 UNITED-KINGDOM COMPANIES	GRINYER, PH; YASAIARDEKANI, M; ALBAZZAZ, S	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/255496	1980	0	ORGANIZATION STRUCTURE AND TECHNOLOGY IN MANUFACTURING: SYSTEM VERSUS WORK FLOW LEVEL PERSPECTIVES	REIMANN, BC	ACADEMY OF MANAGEMENT JOURNAL
1980–1984	https://doi.org/10.2307/255508	1980	0	DIMENSIONS OF ORGANIZATIONAL-STRUCTURE: A CRITICAL REPLICATION	GRINYER, PH; YASAIARDEKANI, M	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1985–1989	https://doi.org/10.2307/258434	1984	0.250438	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
1985–1989	https://doi.org/10.2307/2393081	1984	0.130956	ORGANIZATIONAL DEMOGRAPHY AND TURNOVER IN TOP-MANAGEMENT GROUPS	WAGNER, WG; PFEFFER, J; OREILLY, CA	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/256029	1982	0.118744	THE ROLE OF PERFORMANCE IN THE TURNOVER PROCESS	DREHER, GF	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/255927	1984	0.084638	INDIVIDUAL EXPLORATION TO ORGANIZATIONAL COMMITMENT OR WITHDRAWAL	STUMPF, SA; HARTMAN, K	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/256040	1984	0.054347	PORTER (1980) GENERIC STRATEGIES AS DETERMINANTS OF STRATEGIC GROUP MEMBERSHIP AND ORGANIZATIONAL PERFORMANCE	DESS, GG; DAVIS, PS	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/258441	1984	0.048165	TOWARD A MODEL OF ORGANIZATIONS AS INTERPRETATION SYSTEMS	DAFT, RL; WEICK, KE	ACADEMY OF MANAGEMENT REVIEW
1985–1989	https://doi.org/10.2307/2392337	1981	0.046795	THREAT-RIGIDITY EFFECTS IN ORGANIZATIONAL-BEHAVIOR: A MULTILEVEL ANALYSIS	STAW, BM; SANDELANDS, LE; DUTTON, JE	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
1985–1989	https://doi.org/10.2307/255551	1980	0.046673	MOMENTUM AND REVOLUTION IN ORGANIZATIONAL ADAPTATION	MILLER, D; FRIESEN, PH	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/2392457	1980	0.046052	STRATEGY, DISTINCTIVE COMPETENCE, AND ORGANIZATIONAL PERFORMANCE	SNOW, CC; HREBINIAK, LG	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.1002/smj.4250010304	1980	0.041344	PERFORMANCE AND CONSENSUS	BOURGEOIS, LJ	STRATEGIC MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/2392342	1981	0.036686	THE COMMITMENT AND JOB TENURE OF NEW EMPLOYEES: SOME EVIDENCE OF POST-DECISIONAL JUSTIFICATION	OREILLY, CA; CALDWELL, DF	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/2392512	1981	0.036307	PROBLEMS WITH CONTINGENCY THEORY: TESTING ASSUMPTIONS HIDDEN WITHIN THE LANGUAGE OF CONTINGENCY THEORY	SCHOONHOVEN, CB	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.1002/smj.4250020402	1981	0.035689	CORPORATE ECONOMIC-PERFORMANCE: DIVERSIFICATION STRATEGY VERSUS MARKET-STRUCTURE	CHRISTENSEN, HK; MONTGOMERY, CA	STRATEGIC MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/255572	1981	0.035515	GENERALIZABILITY OF AN ORGANIZATIONAL COMMITMENT MODEL	MORRIS, JH; SHERMAN, JD	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1985–1989	https://doi.org/10.2307/2392223	1980	0.033428	STRUCTURING OF ORGANIZATIONAL STRUCTURES	RANSON, S; HININGS, B; GREENWOOD, R	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/256075	1982	0.031791	TRACKING STRATEGY IN AN ENTREPRENEURIAL FIRM	MINTZBERG, H; WATERS, JA	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/255955	1984	0.029317	BUSINESS UNIT STRATEGY, MANAGERIAL CHARACTERISTICS, AND BUSINESS UNIT EFFECTIVENESS AT STRATEGY IMPLEMENTATION	GUPTA, AK; GOVINDARAJAN, V	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.1002/smj.4250030303	1982	0.02585	THE VALUE OF FORMAL PLANNING FOR STRATEGIC DECISIONS: REVIEW OF EMPIRICAL-RESEARCH	ARMSTRONG, JS	STRATEGIC MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/2392620	1983	0.024435	CENTRAL PERSPECTIVES AND DEBATES IN ORGANIZATION THEORY	ASTLEY, WG; VANDEVEN, AH	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/255568	1981	0.024138	A MODEL OF CORPORATE PERFORMANCE AS A FUNCTION OF ENVIRONMENTAL, ORGANIZATIONAL, AND LEADERSHIP INFLUENCES	WEINER, N; MAHONEY, TA	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1985–1989	https://doi.org/10.2307/2392320	1982	0.023737	INPUT UNCERTAINTY AND ORGANIZATIONAL COORDINATION IN HOSPITAL EMERGENCY UNITS	ARGOTE, L	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/2392666	1985	0.023519	ORGANIZATIONAL ADAPTATION: STRATEGIC CHOICE AND ENVIRONMENTAL DETERMINISM	HREBINIAK, LG; JOYCE, WF	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/2392246	1983	0.023129	CONCEPTS OF CULTURE AND ORGANIZATIONAL ANALYSIS	SMIRCICH, L	ADMINISTRATIVE SCIENCE QUARTERLY
1985–1989	https://doi.org/10.2307/255990	1982	0.022523	INDUSTRIAL FIRMS GRAND STRATEGY AND FUNCTIONAL IMPORTANCE: MODERATING EFFECTS OF TECHNOLOGY AND UNCERTAINTY	HITT, MA; IRELAND, RD; PALIA, KA	ACADEMY OF MANAGEMENT JOURNAL
1985–1989	https://doi.org/10.2307/255971	1983	0.022075	AN EMPIRICAL TYPOLOGY OF MATURE INDUSTRIAL-PRODUCT ENVIRONMENTS	HAMBRICK, DC	ACADEMY OF MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/258434	1984	0.125244	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
1990–1994	https://doi.org/10.2307/258441	1984	0.084863	TOWARD A MODEL OF ORGANIZATIONS AS INTERPRETATION SYSTEMS	DAFT, RL; WEICK, KE	ACADEMY OF MANAGEMENT REVIEW

Timeframe	DI	PY	Betweenness	TI	AU	SO
1990–1994	https://doi.org/10.2307/2392337	1981	0.066316	THREAT-RIGIDITY EFFECTS IN ORGANIZATIONAL-BEHAVIOR: A MULTILEVEL ANALYSIS	STAW, BM; SANDELANDS, LE; DUTTON, JE	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/2392453	1980	0.05882	SURPRISE AND SENSE MAKING: WHAT NEWCOMERS EXPERIENCE IN ENTERING UNFAMILIAR ORGANIZATIONAL SETTINGS	LOUIS, MR	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/256368	1989	0.053649	BEYOND SIMPLE DEMOGRAPHIC EFFECTS: THE IMPORTANCE OF RELATIONAL DEMOGRAPHY IN SUPERIOR-SUBORDINATE DYADS	TSUI, AS; OREILLY, CA	ACADEMY OF MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/2392832	1986	0.047049	TECHNOLOGICAL DISCONTINUITIES AND ORGANIZATIONAL ENVIRONMENTS	TUSHMAN, ML; ANDERSON, P	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/2392984	1989	0.044812	WORK GROUP DEMOGRAPHY, SOCIAL INTEGRATION, AND TURNOVER	OREILLY, CA; CALDWELL, DF; BARNETT, WP	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/2392246	1983	0.04381	CONCEPTS OF CULTURE AND ORGANIZATIONAL ANALYSIS	SMIRCICH, L	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
1990–1994	https://doi.org/10.2307/256460	1988	0.040112	A CAUSAL MODEL OF LINKAGES AMONG ENVIRONMENTAL DIMENSIONS, MACRO ORGANIZATIONAL CHARACTERISTICS, AND PERFORMANCE	KEATS, BW; HITT, MA	ACADEMY OF MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.1002/smj.4250070602	1986	0.037522	THE DOMINANT LOGIC: A NEW LINKAGE BETWEEN DIVERSITY AND PERFORMANCE	PRAHALAD, CK; BETTIS, RA	STRATEGIC MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/2392666	1985	0.027282	ORGANIZATIONAL ADAPTATION: STRATEGIC CHOICE AND ENVIRONMENTAL DETERMINISM	HREBINIAK, LG; JOYCE, WF	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/2392937	1984	0.027175	BEING IN THE RIGHT PLACE: A STRUCTURAL-ANALYSIS OF INDIVIDUAL INFLUENCE IN AN ORGANIZATION	BRASS, DJ	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.1002/smj.4250050207	1984	0.026208	A RESOURCE-BASED VIEW OF THE FIRM	WERNERFELT, B	STRATEGIC MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/255955	1984	0.024264	BUSINESS UNIT STRATEGY, MANAGERIAL CHARACTERISTICS, AND BUSINESS UNIT EFFECTIVENESS AT STRATEGY IMPLEMENTATION	GUPTA, AK; GOVINDARAJAN, V	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1990–1994	https://doi.org/10.1177/014920638601200408	1986	0.023835	SELF-REPORTS IN ORGANIZATIONAL RESEARCH: PROBLEMS AND PROSPECTS	PODSAKOFF, PM; ORGAN, DW	JOURNAL OF MANAGEMENT
1990–1994	https://doi.org/10.2307/257995	1987	0.023804	CATEGORIZING STRATEGIC ISSUES: LINKS TO ORGANIZATIONAL ACTION	DUTTON, JE; JACKSON, SE	ACADEMY OF MANAGEMENT REVIEW
1990–1994	https://doi.org/10.2307/258331	1986	0.023557	EMPLOYEE TURNOVER: A META ANALYSIS AND REVIEW WITH IMPLICATIONS FOR RESEARCH	COTTON, JL; TUTTLE, JM	ACADEMY OF MANAGEMENT REVIEW
1990–1994	https://doi.org/10.2307/2393081	1984	0.022396	ORGANIZATIONAL DEMOGRAPHY AND TURNOVER IN TOP-MANAGEMENT GROUPS	WAGNER, WG; PFEFFER, J; OREILLY, CA	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.2307/256040	1984	0.021014	PORTER (1980) GENERIC STRATEGIES AS DETERMINANTS OF STRATEGIC GROUP MEMBERSHIP AND ORGANIZATIONAL PERFORMANCE	DESS, GG; DAVIS, PS	ACADEMY OF MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/258191	1989	0.019084	AGENCY THEORY: AN ASSESSMENT AND REVIEW	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
1990–1994	https://doi.org/10.2307/2393080	1984	0.018793	DIMENSIONS OF ORGANIZATIONAL TASK ENVIRONMENTS	DESS, GG; BEARD, DW	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
1990–1994	https://doi.org/10.2307/256337	1988	0.018602	POLITICS OF STRATEGIC DECISION-MAKING IN HIGH-VELOCITY ENVIRONMENTS: TOWARD A MIDRANGE THEORY	EISENHARDT, KM; BOURGEOIS, LJ	ACADEMY OF MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/2392528	1982	0.017517	ADAPTING TO ENVIRONMENTAL JOLTS	MEYER, AD	ADMINISTRATIVE SCIENCE QUARTERLY
1990–1994	https://doi.org/10.1002/smj.4250090206	1988	0.017443	TRANSACTION COST-ANALYSIS OF STRATEGY-STRUCTURE CHOICE	JONES, GR; HILL, CWL	STRATEGIC MANAGEMENT JOURNAL
1990–1994	https://doi.org/10.2307/258128	1985	0.01625	A REVIEW AND RECONCEPTUALIZATION OF ORGANIZATIONAL COMMITMENT	REICHERS, AE	ACADEMY OF MANAGEMENT REVIEW
1995–1999	https://doi.org/10.2307/258434	1984	0.127014	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
1995–1999	https://doi.org/10.1002/smj.4250050207	1984	0.077582	A RESOURCE-BASED VIEW OF THE FIRM	WERNERFELT, B	STRATEGIC MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/258441	1984	0.050737	TOWARD A MODEL OF ORGANIZATIONS AS INTERPRETATION SYSTEMS	DAFT, RL; WEICK, KE	ACADEMY OF MANAGEMENT REVIEW
1995–1999	https://doi.org/10.2307/2392337	1981	0.045848	THREAT-RIGIDITY EFFECTS IN ORGANIZATIONAL-BEHAVIOR: A MULTILEVEL ANALYSIS	STAW, BM; SANDELANDS, LE; DUTTON, JE	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
1995–1999	https://doi.org/10.1177/014920638601200408	1986	0.044665	SELF-REPORTS IN ORGANIZATIONAL RESEARCH: PROBLEMS AND PROSPECTS	PODSAKOFF, PM; ORGAN, DW	JOURNAL OF MANAGEMENT
1995–1999	https://doi.org/10.2307/256434	1989	0.041084	MAKING FAST STRATEGIC DECISIONS IN HIGH-VELOCITY ENVIRONMENTS	EISENHARDT, KM	ACADEMY OF MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/258191	1989	0.03608	AGENCY THEORY: AN ASSESSMENT AND REVIEW	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
1995–1999	https://doi.org/10.2307/2392620	1983	0.034837	CENTRAL PERSPECTIVES AND DEBATES IN ORGANIZATION THEORY	ASTLEY, WG; VANDEVEN, AH	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.2307/2393553	1990	0.029751	ABSORPTIVE-CAPACITY: A NEW PERSPECTIVE ON LEARNING AND INNOVATION	COHEN, WM; LEVINTHAL, DA	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.2307/256474	1992	0.028154	TOP MANAGEMENT TEAM DEMOGRAPHY AND CORPORATE STRATEGIC CHANGE	WIERSEMA, MF; BANTEL, KA	ACADEMY OF MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.1002/smj.4250130702	1992	0.028092	STRUCTURING COOPERATIVE RELATIONSHIPS BETWEEN ORGANIZATIONS	RING, PS; VANDEVEN, AH	STRATEGIC MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/256368	1989	0.027602	BEYOND SIMPLE DEMOGRAPHIC EFFECTS: THE IMPORTANCE OF RELATIONAL DEMOGRAPHY IN SUPERIOR-SUBORDINATE DYADS	TSUI, AS; OREILLY, CA	ACADEMY OF MANAGEMENT JOURNAL

Timeframe	DI	PY	Betweenness	TI	AU	SO
1995–1999	https://doi.org/10.2307/2392832	1986	0.025856	TECHNOLOGICAL DISCONTINUITIES AND ORGANIZATIONAL ENVIRONMENTS	TUSHMAN, ML; ANDERSON, P	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.1287/mnsc.35.12.1504	1989	0.023655	ASSET STOCK ACCUMULATION AND SUSTAINABILITY OF COMPETITIVE ADVANTAGE	DIERICKX, I; COOL, K	MANAGEMENT SCIENCE
1995–1999	https://doi.org/10.1002/smj.4250070602	1986	0.023386	THE DOMINANT LOGIC: A NEW LINKAGE BETWEEN DIVERSITY AND PERFORMANCE	PRAHALAD, CK; BETTIS, RA	STRATEGIC MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/2393080	1984	0.022135	DIMENSIONS OF ORGANIZATIONAL TASK ENVIRONMENTS	DESS, GG; BEARD, DW	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.2307/2392231	1980	0.021782	MARKETS, BUREAUCRACIES, AND CLANS	OUCHI, WG	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.2307/256405	1991	0.021336	KEEPING AN EYE ON THE MIRROR: IMAGE AND IDENTITY IN ORGANIZATIONAL ADAPTATION	DUTTON, JE; DUKERICH, JM	ACADEMY OF MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/258610	1991	0.019517	STRATEGIC RESPONSES TO INSTITUTIONAL PROCESSES	OLIVER, C	ACADEMY OF MANAGEMENT REVIEW
1995–1999	https://doi.org/10.1002/smj.4250140203	1993	0.019008	STRATEGIC GROUPS: A COGNITIVE PERSPECTIVE	REGER, RK; HUFF, AS	STRATEGIC MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/258703	1994	0.018343	LEVELS ISSUES IN THEORY DEVELOPMENT, DATA-COLLECTION, AND ANALYSIS	KLEIN, KJ; DANSEREAU, F; HALL, RJ	ACADEMY OF MANAGEMENT REVIEW

Timeframe	DI	PY	Betweenness	TI	AU	SO
1995–1999	https://doi.org/10.2307/256337	1988	0.017936	POLITICS OF STRATEGIC DECISION-MAKING IN HIGH-VELOCITY ENVIRONMENTS: TOWARD A MIDRANGE THEORY	EISENHARDT, KM; BOURGEOIS, LJ	ACADEMY OF MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.2307/2393275	1991	0.017888	AGENTS WITHOUT PRINCIPLES: THE SPREAD OF THE POISON PILL THROUGH THE INTERCORPORATE NETWORK	DAVIS, GF	ADMINISTRATIVE SCIENCE QUARTERLY
1995–1999	https://doi.org/10.2307/256485	1992	0.017136	POWER IN TOP MANAGEMENT TEAMS: DIMENSIONS, MEASUREMENT, AND VALIDATION	FINKELSTEIN, S	ACADEMY OF MANAGEMENT JOURNAL
1995–1999	https://doi.org/10.1002/smj.4250100709	1989	0.016948	TOP MANAGEMENT AND INNOVATIONS IN BANKING: DOES THE COMPOSITION OF THE TOP TEAM MAKE A DIFFERENCE	BANTEL, KA; JACKSON, SE	STRATEGIC MANAGEMENT JOURNAL
2000–2004	https://doi.org/10.2307/258434	1984	0.097947	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.1177/014920638601200408	1986	0.088066	SELF-REPORTS IN ORGANIZATIONAL RESEARCH: PROBLEMS AND PROSPECTS	PODSAKOFF, PM; ORGAN, DW	JOURNAL OF MANAGEMENT
2000–2004	https://doi.org/10.2307/2393553	1990	0.081037	ABSORPTIVE-CAPACITY: A NEW PERSPECTIVE ON LEARNING AND INNOVATION	COHEN, WM; LEVINTHAL, DA	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2000–2004	https://doi.org/10.2307/258557	1989	0.070548	BUILDING THEORIES FROM CASE-STUDY RESEARCH	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.1002/smj.4250050207	1984	0.069727	A RESOURCE-BASED VIEW OF THE FIRM	WERNERFELT, B	STRATEGIC MANAGEMENT JOURNAL
2000–2004	https://doi.org/10.1287/orsc.2.1.71	1991	0.049238	EXPLORATION AND EXPLOITATION IN ORGANIZATIONAL LEARNING	March, JG	ORGANIZATION SCIENCE
2000–2004	https://doi.org/10.1287/mnsc.35.12.1504	1989	0.035926	ASSET STOCK ACCUMULATION AND SUSTAINABILITY OF COMPETITIVE ADVANTAGE	DIERICKX, I; COOL, K	MANAGEMENT SCIENCE
2000–2004	https://doi.org/10.2307/256434	1989	0.033833	MAKING FAST STRATEGIC DECISIONS IN HIGH-VELOCITY ENVIRONMENTS	EISENHARDT, KM	ACADEMY OF MANAGEMENT JOURNAL
2000–2004	https://doi.org/10.1287/orsc.3.3.383	1992	0.030663	KNOWLEDGE OF THE FIRM, COMBINATIVE CAPABILITIES, AND THE REPLICATION OF TECHNOLOGY	KOGUT, B; ZANDER, U	ORGANIZATION SCIENCE
2000–2004	https://doi.org/10.2307/258189	1989	0.022931	SOCIAL IDENTITY THEORY AND THE ORGANIZATION	ASHFORTH, BE; MAEL, F	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.2307/2393638	1995	0.022688	A MULTIMETHOD EXAMINATION OF THE BENEFITS AND DETRIMENTS OF INTRAGROUP CONFLICT	JEHN, KA	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2000–2004	https://doi.org/10.2307/258792	1995	0.020603	AN INTEGRATIVE MODEL OF ORGANIZATIONAL TRUST	MAYER, RC; DAVIS, JH; SCHOORMAN, FD	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.2307/258610	1991	0.020036	STRATEGIC RESPONSES TO INSTITUTIONAL PROCESSES	OLIVER, C	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.2307/2393807	1997	0.019251	THE ART OF CONTINUOUS CHANGE: LINKING COMPLEXITY THEORY AND TIME-PACED EVOLUTION IN RELENTLESSLY SHIFTING ORGANIZATIONS	BROWN, SL; EISENHARDT, KM	ADMINISTRATIVE SCIENCE QUARTERLY
2000–2004	https://doi.org/10.1002/smj.4250141009	1993	0.018872	THE MYOPIA OF LEARNING	LEVINTHAL, DA; MARCH, JG	STRATEGIC MANAGEMENT JOURNAL
2000–2004	https://doi.org/10.2307/2667032	1999	0.01748	THE SEARCH-TRANSFER PROBLEM: THE ROLE OF WEAK TIES IN SHARING KNOWLEDGE ACROSS ORGANIZATION SUBUNITS	HANSEN, MT	ADMINISTRATIVE SCIENCE QUARTERLY
2000–2004	https://doi.org/10.2307/258191	1989	0.016812	AGENCY THEORY: AN ASSESSMENT AND REVIEW	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.2307/2393549	1990	0.016522	ARCHITECTURAL INNOVATION: THE RECONFIGURATION OF EXISTING PRODUCT TECHNOLOGIES AND THE FAILURE OF ESTABLISHED FIRMS	HENDERSON, RM; CLARK, KB	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2000–2004	https://doi.org/10.2307/259329	1997	0.016066	STRATEGY RETOLD: TOWARD A NARRATIVE VIEW OF STRATEGIC DISCOURSE	BARRY, D; ELMES, M	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.1177/014920639702300602	1998	0.015771	CENTERING DECISIONS IN HIERARCHICAL LINEAR MODELS: IMPLICATIONS FOR RESEARCH IN ORGANIZATIONS	HOFMANN, DA; GAVIN, MB	JOURNAL OF MANAGEMENT
2000–2004	https://doi.org/10.2307/258441	1984	0.015658	TOWARD A MODEL OF ORGANIZATIONS AS INTERPRETATION SYSTEMS	DAFT, RL; WEICK, KE	ACADEMY OF MANAGEMENT REVIEW
2000–2004	https://doi.org/10.1002/smj.4250171105	1996	0.014981	EXPLORING INTERNAL STICKINESS: IMPEDIMENTS TO THE TRANSFER OF BEST PRACTICE WITHIN THE FIRM	SZULANSKI, G	STRATEGIC MANAGEMENT JOURNAL
2000–2004	https://doi.org/10.1287/orsc.6.3.280	1995	0.014279	MANAGERIAL AND ORGANIZATIONAL COGNITION: NOTES FROM A TRIP DOWN MEMORY LANE	WALSH, JP	ORGANIZATION SCIENCE
2000–2004	https://doi.org/10.2307/2392832	1986	0.013487	TECHNOLOGICAL DISCONTINUITIES AND ORGANIZATIONAL ENVIRONMENTS	TUSHMAN, ML; ANDERSON, P	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2000–2004	https://doi.org/10.2307/256405	1991	0.013445	KEEPING AN EYE ON THE MIRROR: IMAGE AND IDENTITY IN ORGANIZATIONAL ADAPTATION	DUTTON, JE; DUKERICH, JM	ACADEMY OF MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.1002/job.403	2007	0.170524	ONE MORE TIME: WHAT IS A REALISTIC THEORY OF CORPORATE GOVERNANCE	LUBATKIN, M	JOURNAL OF ORGANIZATIONAL BEHAVIOR
2005–2009	https://doi.org/10.1287/orsc.2.1.71	1991	0.111914	EXPLORATION AND EXPLOITATION IN ORGANIZATIONAL LEARNING	MARCH, JG	ORGANIZATION SCIENCE
2005–2009	https://doi.org/10.2307/2393553	1990	0.095097	ABSORPTIVE-CAPACITY: A NEW PERSPECTIVE ON LEARNING AND INNOVATION	COHEN, WM; LEVINTHAL, DA	ADMINISTRATIVE SCIENCE QUARTERLY
2005–2009	https://doi.org/10.2307/258434	1984	0.088412	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
2005–2009	https://doi.org/10.2307/258557	1989	0.063372	BUILDING THEORIES FROM CASE-STUDY RESEARCH	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2005–2009	https://doi.org/10.1287/orsc.3.3.383	1992	0.047966	KNOWLEDGE OF THE FIRM, COMBINATIVE CAPABILITIES, AND THE REPLICATION OF TECHNOLOGY	KOGUT, B; ZANDER, U	ORGANIZATION SCIENCE

Timeframe	DI	PY	Betweenness	TI	AU	SO
2005–2009	https://doi.org/10.1287/mnsc.35.12.1504	1989	0.030685	ASSET STOCK ACCUMULATION AND SUSTAINABILITY OF COMPETITIVE ADVANTAGE	DIERICKX, I; COOL, K	MANAGEMENT SCIENCE
2005–2009	https://doi.org/10.2307/258191	1989	0.029198	AGENCY THEORY: AN ASSESSMENT AND REVIEW	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2005–2009	https://doi.org/10.2307/258189	1989	0.028722	SOCIAL IDENTITY THEORY AND THE ORGANIZATION	ASHFORTH, BE; MAEL, F	ACADEMY OF MANAGEMENT REVIEW
2005–2009	https://doi.org/10.2307/2393372	1993	0.027828	COLLECTIVE MIND IN ORGANIZATIONS: HEEDFUL INTERRELATING ON FLIGHT DECKS	WEICK, KE; ROBERTS, KH	ADMINISTRATIVE SCIENCE QUARTERLY
2005–2009	https://doi.org/10.1287/orsc.4.4.577	1993	0.022712	THE MOTIVATIONAL EFFECTS OF CHARISMATIC LEADERSHIP: A SELF-CONCEPT BASED THEORY	SHAMIR, B; HOUSE, RJ; ARTHUR, MB	ORGANIZATION SCIENCE
2005–2009	https://doi.org/10.1002/smj.4250050207	1984	0.021858	A RESOURCE-BASED VIEW OF THE FIRM	WERNERFELT, B	STRATEGIC MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.1177/014920639702300602	1998	0.020256	CENTERING DECISIONS IN HIERARCHICAL LINEAR MODELS: IMPLICATIONS FOR RESEARCH IN ORGANIZATIONS	HOFMANN, DA; GAVIN, MB	JOURNAL OF MANAGEMENT

Timeframe	DI	PY	Betweenness	TI	AU	SO
2005–2009	https://doi.org/10.2307/256405	1991	0.01832	KEEPING AN EYE ON THE MIRROR: IMAGE AND IDENTITY IN ORGANIZATIONAL ADAPTATION	DUTTON, JE; DUKERICH, JM	ACADEMY OF MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.1177/014920638601200408	1986	0.018207	SELF-REPORTS IN ORGANIZATIONAL RESEARCH: PROBLEMS AND PROSPECTS	PODSAKOFF, PM; ORGAN, DW	JOURNAL OF MANAGEMENT
2005–2009	https://doi.org/10.2307/259373	1998	0.01768	SOCIAL CAPITAL, INTELLECTUAL CAPITAL, AND THE ORGANIZATIONAL ADVANTAGE	NAHAPIET, J; GHOSHAL, S	ACADEMY OF MANAGEMENT REVIEW
2005–2009	https://doi.org/10.2307/2393988	1996	0.016706	INTERORGANIZATIONAL COLLABORATION AND THE LOCUS OF INNOVATION: NETWORKS OF LEARNING IN BIOTECHNOLOGY	POWELL, WW; KOPUT, KW; SMITHDOERR, L	ADMINISTRATIVE SCIENCE QUARTERLY
2005–2009	https://doi.org/10.1002/smj.4250141009	1993	0.016071	THE MYOPIA OF LEARNING	LEVINTHAL, DA; MARCH, JG	STRATEGIC MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.2307/255551	1980	0.016034	MOMENTUM AND REVOLUTION IN ORGANIZATIONAL ADAPTATION	MILLER, D; FRIESEN, PH	ACADEMY OF MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.2307/2667032	1999	0.015988	THE SEARCH-TRANSFER PROBLEM: THE ROLE OF WEAK TIES IN SHARING KNOWLEDGE ACROSS ORGANIZATION SUBUNITS	HANSEN, MT	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2005–2009	https://doi.org/10.2307/256434	1989	0.015504	MAKING FAST STRATEGIC DECISIONS IN HIGH-VELOCITY ENVIRONMENTS	EISENHARDT, KM	ACADEMY OF MANAGEMENT JOURNAL
2005–2009	https://doi.org/10.2307/2393808	1997	0.015043	SOCIAL STRUCTURE AND COMPETITION IN INTERFIRM NETWORKS: THE PARADOX OF EMBEDDEDNESS	UZZI, B	ADMINISTRATIVE SCIENCE QUARTERLY
2005–2009	https://doi.org/10.1287/mnsc.47.5.629.10486	2001	0.014229	CONTRACTING TO ASSURE SUPPLY: HOW TO SHARE DEMAND FORECASTS IN A SUPPLY CHAIN	CACHON, GP; LARIVIERE, MA	MANAGEMENT SCIENCE
2005–2009	https://doi.org/10.2307/2392832	1986	0.013098	TECHNOLOGICAL DISCONTINUITIES AND ORGANIZATIONAL ENVIRONMENTS	TUSHMAN, ML; ANDERSON, P	ADMINISTRATIVE SCIENCE QUARTERLY
2005–2009	https://doi.org/10.1111/1467-6486.00305	2002	0.012831	IDENTITY REGULATION AS ORGANIZATIONAL CONTROL: PRODUCING THE APPROPRIATE INDIVIDUAL	ALVESSON, M; WILLMOTT, H	JOURNAL OF MANAGEMENT STUDIES
2010–2014	https://doi.org/10.1002/job.403	2007	0.190586	ONE MORE TIME: WHAT IS A REALISTIC THEORY OF CORPORATE GOVERNANCE	LUBATKIN, M	JOURNAL OF ORGANIZATIONAL BEHAVIOR
2010–2014	https://doi.org/10.2307/2393553	1990	0.096368	ABSORPTIVE-CAPACITY: A NEW PERSPECTIVE ON LEARNING AND INNOVATION	COHEN, WM; LEVINTHAL, DA	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2010–2014	https://doi.org/10.1287/orsc.2.1.71	1991	0.081785	EXPLORATION AND EXPLOITATION IN ORGANIZATIONAL LEARNING	MARCH, JG	ORGANIZATION SCIENCE
2010–2014	https://doi.org/10.2307/258434	1984	0.076306	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.2307/258557	1989	0.04825	BUILDING THEORIES FROM CASE-STUDY RESEARCH	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.2307/258189	1989	0.032032	SOCIAL IDENTITY THEORY AND THE ORGANIZATION	ASHFORTH, BE; MAEL, F	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.1287/orsc.3.3.383	1992	0.025937	KNOWLEDGE OF THE FIRM, COMBINATIVE CAPABILITIES, AND THE REPLICATION OF TECHNOLOGY	KOGUT, B; ZANDER, U	ORGANIZATION SCIENCE
2010–2014	https://doi.org/10.1177/014920639702300602	1998	0.02176	CENTERING DECISIONS IN HIERARCHICAL LINEAR MODELS: IMPLICATIONS FOR RESEARCH IN ORGANIZATIONS	HOFMANN, DA; GAVIN, MB	JOURNAL OF MANAGEMENT
2010–2014	https://doi.org/10.1002/smj.4250171110	1996	0.021124	TOWARD A KNOWLEDGE-BASED THEORY OF THE FIRM	GRANT, RM	STRATEGIC MANAGEMENT JOURNAL
2010–2014	https://doi.org/10.1287/mnsc.35.12.1504	1989	0.020621	ASSET STOCK ACCUMULATION AND SUSTAINABILITY OF COMPETITIVE ADVANTAGE	DIERICKX, I; COOL, K	MANAGEMENT SCIENCE

Timeframe	DI	PY	Betweenness	TI	AU	SO
2010–2014	https://doi.org/10.2307/2393808	1997	0.0181	SOCIAL STRUCTURE AND COMPETITION IN INTERFIRM NETWORKS: THE PARADOX OF EMBEDDEDNESS	UZZI, B	ADMINISTRATIVE SCIENCE QUARTERLY
2010–2014	https://doi.org/10.1002/smj.4250141009	1993	0.017237	THE MYOPIA OF LEARNING	LEVINTHAL, DA; MARCH, JG	STRATEGIC MANAGEMENT JOURNAL
2010–2014	https://doi.org/10.2307/258610	1991	0.015974	STRATEGIC RESPONSES TO INSTITUTIONAL PROCESSES	OLIVER, C	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.1002/smj.4250120604	1991	0.015007	SENSEMAKING AND SENSEGIVING IN STRATEGIC CHANGE INITIATION	GIOIA, DA; CHITTIPEDDI, K	STRATEGIC MANAGEMENT JOURNAL
2010–2014	https://doi.org/10.2307/259349	1999	0.014773	STRATEGIES FOR THEORIZING FROM PROCESS DATA	LANGLEY, A	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.1111/1467-6486.00305	2002	0.014593	IDENTITY REGULATION AS ORGANIZATIONAL CONTROL: PRODUCING THE APPROPRIATE INDIVIDUAL	ALVESSON, M; WILLMOTT, H	JOURNAL OF MANAGEMENT STUDIES
2010–2014	https://doi.org/10.1287/orsc.1050.0133	2005	0.014245	ORGANIZING AND THE PROCESS OF SENSEMAKING	WEICK, KE; SUTCLIFFE, KM; OBSTFELD, D	ORGANIZATION SCIENCE
2010–2014	https://doi.org/10.1287/orsc.4.4.577	1993	0.01411	THE MOTIVATIONAL EFFECTS OF CHARISMATIC LEADERSHIP: A SELF-CONCEPT BASED THEORY	SHAMIR, B; HOUSE, RJ; ARTHUR, MB	ORGANIZATION SCIENCE

Timeframe	DI	PY	Betweenness	TI	AU	SO
2010–2014	https://doi.org/10.5465/AMR.2001.4845785	2001	0.013526	A TEMPORALLY BASED FRAMEWORK AND TAXONOMY OF TEAM PROCESSES	MARKS, MA; MATHIEU, JE; ZACCARO, SJ	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.2307/259056	1998	0.013134	THE RELATIONAL VIEW: COOPERATIVE STRATEGY AND SOURCES OF INTERORGANIZATIONAL COMPETITIVE ADVANTAGE	DYER, JH; SINGH, H	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.2307/259373	1998	0.012324	SOCIAL CAPITAL, INTELLECTUAL CAPITAL, AND THE ORGANIZATIONAL ADVANTAGE	NAHAPIET, J; GHOSHAL, S	ACADEMY OF MANAGEMENT REVIEW
2010–2014	https://doi.org/10.1002/smj.425005020 7	1984	0.012311	A RESOURCE-BASED VIEW OF THE FIRM	WERNERFELT, B	STRATEGIC MANAGEMENT JOURNAL
2010–2014	https://doi.org/10.2189/asqu.2005.50.1.35	2005	0.01201	RHETORICAL STRATEGIES OF LEGITIMACY	SUDDABY, R; GREENWOOD, R	ADMINISTRATIVE SCIENCE QUARTERLY
2010–2014	https://doi.org/10.2307/3556659	2003	0.011886	MISERY LOVES COMPANIES: RETHINKING SOCIAL INITIATIVES BY BUSINESS	MARGOLIS, JD; WALSH, JP	ADMINISTRATIVE SCIENCE QUARTERLY
2010–2014	https://doi.org/10.1177/001872679504800703	1995	0.011825	ORGANIZATIONAL CULTURE IN HIGH-RELIABILITY ORGANIZATIONS: AN EXTENSION	KLEIN, RL; BIGLEY, GA; ROBERTS, KH	HUMAN RELATIONS
2015–2019	https://doi.org/10.1002/job.403	2007	0.126072	ONE MORE TIME: WHAT IS A REALISTIC THEORY OF CORPORATE GOVERNANCE	LUBATKIN, M	JOURNAL OF ORGANIZATIONAL BEHAVIOR

Timeframe	DI	PY	Betweenness	TI	AU	SO
2015–2019	https://doi.org/10.2307/258557	1989	0.057612	BUILDING THEORIES FROM CASE-STUDY RESEARCH	EISENHARDT, KM	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.1287/orsc.2.1.71	1991	0.055111	EXPLORATION AND EXPLOITATION IN ORGANIZATIONAL LEARNING	March, JG	ORGANIZATION SCIENCE
2015–2019	https://doi.org/10.2307/258434	1984	0.054824	UPPER ECHELONS: THE ORGANIZATION AS A REFLECTION OF ITS TOP MANAGERS	HAMBRICK, DC; MASON, PA	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.1177/014920639702300602	1998	0.035807	CENTERING DECISIONS IN HIERARCHICAL LINEAR MODELS: IMPLICATIONS FOR RESEARCH IN ORGANIZATIONS	HOFMANN, DA; GAVIN, MB	JOURNAL OF MANAGEMENT
2015–2019	https://doi.org/10.2307/2393553	1990	0.032991	ABSORPTIVE-CAPACITY: A NEW PERSPECTIVE ON LEARNING AND INNOVATION	COHEN, WM; LEVINTHAL, DA	ADMINISTRATIVE SCIENCE QUARTERLY
2015–2019	https://doi.org/10.2307/258189	1989	0.026045	SOCIAL IDENTITY THEORY AND THE ORGANIZATION	ASHFORTH, BE; MAEL, F	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.2307/259349	1999	0.025148	STRATEGIES FOR THEORIZING FROM PROCESS DATA	LANGLEY, A	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.2307/2393808	1997	0.024577	SOCIAL STRUCTURE AND COMPETITION IN INTERFIRM NETWORKS: THE PARADOX OF EMBEDDEDNESS	UZZI, B	ADMINISTRATIVE SCIENCE QUARTERLY

Timeframe	DI	PY	Betweenness	TI	AU	SO
2015–2019	https://doi.org/10.1002/smj.197	2001	0.021739	DOES MARKET ORIENTATION MATTER?: A TEST OF THE RELATIONSHIP BETWEEN POSITIONAL ADVANTAGE AND PERFORMANCE	HULT, GTM; KETCHEN, DJ	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1002/smj.4250141009	1993	0.01941	THE MYOPIA OF LEARNING	LEVINTHAL, DA; MARCH, JG	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1111/1467-6486.00305	2002	0.016954	IDENTITY REGULATION AS ORGANIZATIONAL CONTROL: PRODUCING THE APPROPRIATE INDIVIDUAL	ALVESSON, M; WILLMOTT, H	JOURNAL OF MANAGEMENT STUDIES
2015–2019	https://doi.org/10.5465/AMR.2010.53503267	2010	0.015792	WHO WILL LEAD AND WHO WILL FOLLOW? A SOCIAL PROCESS OF LEADERSHIP IDENTITY CONSTRUCTION IN ORGANIZATIONS	DERUE, DS; ASHFORD, SJ	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.1177/001872679504800703	1995	0.015363	ORGANIZATIONAL CULTURE IN HIGH-RELIABILITY ORGANIZATIONS: AN EXTENSION	KLEIN, RL; BIGLEY, GA; ROBERTS, KH	HUMAN RELATIONS
2015–2019	https://doi.org/10.1287/orsc.1050.0133	2005	0.014515	ORGANIZING AND THE PROCESS OF SENSEMAKING	WEICK, KE; SUTCLIFFE, KM; OBSTFELD, D	ORGANIZATION SCIENCE
2015–2019	https://doi.org/10.2307/258792	1995	0.014069	AN INTEGRATIVE MODEL OF ORGANIZATIONAL TRUST	MAYER, RC; DAVIS, JH; SCHOORMAN, FD	ACADEMY OF MANAGEMENT REVIEW

Timeframe	DI	PY	Betweenness	TI	AU	SO
2015–2019	https://doi.org/10.1002/smj.227	2002	0.013075	VARIATIONS IN OWNERSHIP BEHAVIOR AND PROPENSITY TO DIVERSIFY: A STUDY OF THE INDIAN CORPORATE CONTEXT	RAMASWAMY, K; LI, MF; VELIYATH, R	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1002/smj.218	2002	0.012677	ACQUISITIONS VERSUS GREENFIELD INVESTMENTS: INTERNATIONAL STRATEGY AND MANAGEMENT OF ENTRY MODES	HARZING, AW	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.2307/259056	1998	0.012112	THE RELATIONAL VIEW: COOPERATIVE STRATEGY AND SOURCES OF INTERORGANIZATIONAL COMPETITIVE ADVANTAGE	DYER, JH; SINGH, H	ACADEMY OF MANAGEMENT REVIEW
2015–2019	https://doi.org/10.1002/smj.224	2002	0.01199	HOW MUCH DOES THE BUSINESS GROUP MATTER IN KOREA?	CHANG, SJ; HONG, J	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1002/smj.195	2001	0.011686	COMPOSITIONAL GAPS AND DOWNWARD SPIRALS IN INTERNATIONAL JOINT VENTURE MANAGEMENT GROUPS	HAMBRICK, DC; LI, JT; XIN, K; TSUI, AS	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1287/orsc.3.3.383	1992	0.011525	KNOWLEDGE OF THE FIRM, COMBINATIVE CAPABILITIES, AND THE REPLICATION OF TECHNOLOGY	KOGUT, B; ZANDER, U	ORGANIZATION SCIENCE

Timeframe	DI	PY	Betweenness	TI	AU	SO
2015–2019	https://doi.org/10.1002/smj.208	2002	0.011454	THE STRUCTURE OF OWNERSHIP AND CORPORATE ACQUISITION STRATEGIES	WRIGHT, P; KROLL, M; LADO, A; VAN NESS, B	STRATEGIC MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.5465/AMJ.2010.57318391	2010	0.010727	BUILDING SUSTAINABLE HYBRID ORGANIZATIONS: THE CASE OF COMMERCIAL MICROFINANCE ORGANIZATIONS	BATTILANA, J; DORADO, S	ACADEMY OF MANAGEMENT JOURNAL
2015–2019	https://doi.org/10.1002/smj.202	2001	0.010636	WHEN WILL BOARDS INFLUENCE STRATEGY? INCLINATION X POWER = STRATEGIC CHANGE	GOLDEN, BR; ZAJAC, EJ	STRATEGIC MANAGEMENT JOURNAL

Appendix 5: Flow between timeframes

See Tables 6 and 7.

Table 6 Flow between timeframes by cluster

t_1	t_2	Edges
1980–1984_0	1985–1989_1	5
1980–1984_1	1985–1989_1	6
1980–1984_1	1985–1989_1	1
1980–1984_2	1985–1989_6	1
1980–1984_3	1985–1989_2	2
1980–1984_4	1985–1989_0	2
1980–1984_5	1985–1989_3	1
1980–1984_6	1985–1989_2	4
1980–1984_6	1985–1989_1	1
1980–1984_7	1985–1989_1	4
1980–1984_7	1985–1989_0	1
1980–1984_7	1985–1989_2	1
1980–1984_7	1985–1989_8	1
1980–1984_8	1985–1989_3	2
1980–1984_8	1985–1989_8	1
1980–1984_9	1985–1989_8	1
1985–1989_0	1990–1994_5	33
1985–1989_0	1990–1994_2	3
1985–1989_0	1990–1994_6	1
1985–1989_1	1990–1994_3	34
1985–1989_1	1990–1994_2	8
1985–1989_1	1990–1994_0	5
1985–1989_1	1990–1994_6	4
1985–1989_1	1990–1994_5	3
1985–1989_1	1990–1994_3	2
1985–1989_1	1990–1994_3	2
1985–1989_1	1990–1994_4	2
1985–1989_1	1990–1994_6	2
1985–1989_1	1990–1994_1	1
1985–1989_1	1990–1994_1	1
1985–1989_1	1990–1994_2	1
1985–1989_1	1990–1994_3	1
1985–1989_1	1990–1994_4	1
1985–1989_1	1990–1994_4	1
1985–1989_1	1990–1994_6	1
1985–1989_1	1990–1994_8	1
t_1	t_2	Edges
1985–1989_2	1990–1994_3	22
1985–1989_2	1990–1994_0	3
1985–1989_2	1990–1994_2	2
1985–1989_2	1990–1994_4	2
1985–1989_2	1990–1994_6	2
1985–1989_2	1990–1994_1	1
1985–1989_2	1990–1994_1	1
1985–1989_2	1990–1994_1	1
1985–1989_2	1990–1994_2	1

Table 6 (continued)

t_1	t_2	Edges
1985–1989_2	1990–1994_2	1
1985–1989_2	1990–1994_6	1
1985–1989_3	1990–1994_0	30
1985–1989_3	1990–1994_4	7
1985–1989_3	1990–1994_3	5
1985–1989_3	1990–1994_2	2
1985–1989_3	1990–1994_2	2
1985–1989_3	1990–1994_2	2
1985–1989_3	1990–1994_4	2
1985–1989_3	1990–1994_2	1
1985–1989_3	1990–1994_4	1
1985–1989_3	1990–1994_5	1
1985–1989_3	1990–1994_6	1
1985–1989_3	1990–1994_6	1
1985–1989_4	1990–1994_2	18
1985–1989_4	1990–1994_1	2
1985–1989_4	1990–1994_1	2
1985–1989_4	1990–1994_2	1
1985–1989_4	1990–1994_8	1
1985–1989_5	1990–1994_2	11
1985–1989_5	1990–1994_6	10
1985–1989_5	1990–1994_4	5
1985–1989_5	1990–1994_0	3
1985–1989_5	1990–1994_3	2
1985–1989_6	1990–1994_2	4
1985–1989_7	1990–1994_1	1
1985–1989_8	1990–1994_3	4
1985–1989_8	1990–1994_0	2
1985–1989_8	1990–1994_5	2
1985–1989_8	1990–1994_1	1
1985–1989_8	1990–1994_2	1
1985–1989_9	1990–1994_2	1
t_1	t_2	Edges
1990–1994_0	1995–1999_4	63
1990–1994_0	1995–1999_1	23
1990–1994_0	1995–1999_0	9
1990–1994_0	1995–1999_1	6
1990–1994_0	1995–1999_8	5
1990–1994_0	1995–1999_3	2
1990–1994_0	1995–1999_9	1
1990–1994_1	1995–1999_0	28
1990–1994_1	1995–1999_1	6
1990–1994_1	1995–1999_1	5
1990–1994_1	1995–1999_8	4
1990–1994_1	1995–1999_1	3

Table 6 (continued)

t_1	t_2	Edges
1990–1994_1	1995–1999_2	3
1990–1994_1	1995–1999_5	3
1990–1994_1	1995–1999_5	2
1990–1994_1	1995–1999_7	2
1990–1994_1	1995–1999_1	1
1990–1994_1	1995–1999_4	1
1990–1994_2	1995–1999_1	46
1990–1994_2	1995–1999_8	26
1990–1994_2	1995–1999_1	5
1990–1994_2	1995–1999_1	5
1990–1994_2	1995–1999_4	5
1990–1994_2	1995–1999_4	4
1990–1994_2	1995–1999_5	4
1990–1994_2	1995–1999_2	3
1990–1994_2	1995–1999_1	2
1990–1994_2	1995–1999_1	2
1990–1994_2	1995–1999_1	2
1990–1994_2	1995–1999_1	2
1990–1994_2	1995–1999_2	2
1990–1994_2	1995–1999_7	2
1990–1994_2	1995–1999_7	2
1990–1994_2	1995–1999_1	1
1990–1994_2	1995–1999_1	1
1990–1994_2	1995–1999_2	1
1990–1994_2	1995–1999_2	1
1990–1994_2	1995–1999_3	1
1990–1994_2	1995–1999_3	1
1990–1994_2	1995–1999_3	1
1990–1994_2	1995–1999_3	1
1990–1994_2	1995–1999_4	1
1990–1994_2	1995–1999_5	1
1990–1994_2	1995–1999_8	1
t_1	t_2	Edges
1990–1994_3	1995–1999_1	62
1990–1994_3	1995–1999_4	42
1990–1994_3	1995–1999_0	5
1990–1994_3	1995–1999_1	3
1990–1994_3	1995–1999_7	3
1990–1994_3	1995–1999_2	2
1990–1994_3	1995–1999_6	2
1990–1994_3	1995–1999_1	1
1990–1994_3	1995–1999_1	1
1990–1994_3	1995–1999_1	1
1990–1994_3	1995–1999_2	1
1990–1994_3	1995–1999_4	1

Table 6 (continued)

t_1	t_2	Edges
1990–1994_3	1995–1999_9	1
1990–1994_4	1995–1999_2	58
1990–1994_4	1995–1999_9	12
1990–1994_4	1995–1999_4	8
1990–1994_4	1995–1999_6	3
1990–1994_4	1995–1999_1	2
1990–1994_4	1995–1999_1	2
1990–1994_4	1995–1999_5	2
1990–1994_4	1995–1999_0	1
1990–1994_4	1995–1999_1	1
1990–1994_4	1995–1999_2	1
1990–1994_4	1995–1999_7	1
1990–1994_5	1995–1999_6	64
1990–1994_5	1995–1999_9	16
1990–1994_5	1995–1999_0	9
1990–1994_5	1995–1999_2	4
1990–1994_5	1995–1999_1	2
1990–1994_5	1995–1999_4	2
1990–1994_5	1995–1999_1	1
1990–1994_5	1995–1999_1	1
1990–1994_5	1995–1999_1	1
1990–1994_5	1995–1999_1	1
1990–1994_6	1995–1999_0	45
1990–1994_6	1995–1999_1	28
1990–1994_6	1995–1999_1	3
1990–1994_6	1995–1999_2	1
1990–1994_7	1995–1999_1	4
1990–1994_8	1995–1999_2	6
1990–1994_8	1995–1999_1	2
1990–1994_8	1995–1999_1	1
1990–1994_8	1995–1999_4	1
1990–1994_8	1995–1999_5	1
1990–1994_8	1995–1999_9	1
t_1	t_2	Edges
1995–1999_0	2000–2004_2	88
1995–1999_0	2000–2004_0	79
1995–1999_0	2000–2004_1	45
1995–1999_0	2000–2004_8	5
1995–1999_0	2000–2004_6	3
1995–1999_0	2000–2004_1	2
1995–1999_0	2000–2004_3	2
1995–1999_0	2000–2004_7	2
1995–1999_0	2000–2004_1	1
1995–1999_0	2000–2004_1	1
1995–1999_0	2000–2004_3	1

Table 6 (continued)

t_1	t_2	Edges
1995–1999_0	2000–2004_4	1
1995–1999_0	2000–2004_5	1
1995–1999_1	2000–2004_4	84
1995–1999_1	2000–2004_7	51
1995–1999_1	2000–2004_8	37
1995–1999_1	2000–2004_0	25
1995–1999_1	2000–2004_5	14
1995–1999_1	2000–2004_1	13
1995–1999_1	2000–2004_3	11
1995–1999_1	2000–2004_3	11
1995–1999_1	2000–2004_5	9
1995–1999_1	2000–2004_5	8
1995–1999_1	2000–2004_1	7
1995–1999_1	2000–2004_4	6
1995–1999_1	2000–2004_0	5
1995–1999_1	2000–2004_0	5
1995–1999_1	2000–2004_1	5
1995–1999_1	2000–2004_9	5
1995–1999_1	2000–2004_1	4
1995–1999_1	2000–2004_4	4
1995–1999_1	2000–2004_2	3
1995–1999_1	2000–2004_3	3
1995–1999_1	2000–2004_4	3
1995–1999_1	2000–2004_7	3
1995–1999_1	2000–2004_9	3
1995–1999_1	2000–2004_1	2
1995–1999_1	2000–2004_1	2
1995–1999_1	2000–2004_2	2
1995–1999_1	2000–2004_3	2
1995–1999_1	2000–2004_3	2
1995–1999_1	2000–2004_8	2
1995–1999_1	2000–2004_1	1
1995–1999_1	2000–2004_1	1
1995–1999_1	2000–2004_2	1
1995–1999_1	2000–2004_4	1
1995–1999_1	2000–2004_9	1
t_1	t_2	Edges
1995–1999_2	2000–2004_1	66
1995–1999_2	2000–2004_9	24
1995–1999_2	2000–2004_4	18
1995–1999_2	2000–2004_1	3
1995–1999_2	2000–2004_7	3
1995–1999_2	2000–2004_0	2
1995–1999_2	2000–2004_1	2
1995–1999_2	2000–2004_2	2

Table 6 (continued)

t_1	t_2	Edges
1995–1999_2	2000–2004_2	2
1995–1999_2	2000–2004_4	2
1995–1999_2	2000–2004_7	2
1995–1999_2	2000–2004_2	1
1995–1999_2	2000–2004_3	1
1995–1999_2	2000–2004_4	1
1995–1999_2	2000–2004_4	1
1995–1999_3	2000–2004_0	2
1995–1999_3	2000–2004_9	2
1995–1999_3	2000–2004_8	1
1995–1999_3	2000–2004_9	1
1995–1999_4	2000–2004_4	37
1995–1999_4	2000–2004_7	35
1995–1999_4	2000–2004_3	24
1995–1999_4	2000–2004_0	21
1995–1999_4	2000–2004_8	21
1995–1999_4	2000–2004_1	8
1995–1999_4	2000–2004_1	2
1995–1999_4	2000–2004_1	2
1995–1999_4	2000–2004_3	2
1995–1999_4	2000–2004_1	1
1995–1999_4	2000–2004_5	1
1995–1999_5	2000–2004_1	14
1995–1999_5	2000–2004_5	11
1995–1999_5	2000–2004_1	2
1995–1999_5	2000–2004_9	2
1995–1999_5	2000–2004_9	2
1995–1999_5	2000–2004_0	1
1995–1999_5	2000–2004_1	1
1995–1999_5	2000–2004_1	1
1995–1999_5	2000–2004_3	1
1995–1999_5	2000–2004_4	1
1995–1999_5	2000–2004_6	1
1995–1999_5	2000–2004_7	1
t_1	t_2	Edges
1995–1999_6	2000–2004_1	59
1995–1999_6	2000–2004_1	16
1995–1999_6	2000–2004_1	2
1995–1999_6	2000–2004_0	1
1995–1999_6	2000–2004_4	1
1995–1999_6	2000–2004_8	1
1995–1999_7	2000–2004_9	15
1995–1999_7	2000–2004_1	7
1995–1999_7	2000–2004_0	1
1995–1999_8	2000–2004_3	56

Table 6 (continued)

t_1	t_2	Edges
1995–1999_8	2000–2004_1	8
1995–1999_8	2000–2004_5	2
1995–1999_8	2000–2004_1	1
1995–1999_8	2000–2004_2	1
1995–1999_8	2000–2004_4	1
1995–1999_8	2000–2004_7	1
1995–1999_9	2000–2004_1	16
1995–1999_9	2000–2004_4	6
1995–1999_9	2000–2004_9	5
1995–1999_9	2000–2004_0	1
1995–1999_9	2000–2004_1	1
2000–2004_0	2005–2009_0	185
2000–2004_0	2005–2009_4	15
2000–2004_0	2005–2009_7	15
2000–2004_0	2005–2009_2	14
2000–2004_0	2005–2009_1	11
2000–2004_0	2005–2009_6	10
2000–2004_0	2005–2009_8	9
2000–2004_0	2005–2009_3	4
2000–2004_0	2005–2009_1	1
2000–2004_0	2005–2009_1	1
2000–2004_0	2005–2009_2	1
t_1	t_2	Edges
2000–2004_1	2005–2009_8	79
2000–2004_1	2005–2009_0	74
2000–2004_1	2005–2009_7	36
2000–2004_1	2005–2009_1	31
2000–2004_1	2005–2009_6	25
2000–2004_1	2005–2009_8	17
2000–2004_1	2005–2009_6	14
2000–2004_1	2005–2009_1	11
2000–2004_1	2005–2009_3	10
2000–2004_1	2005–2009_1	9
2000–2004_1	2005–2009_8	9
2000–2004_1	2005–2009_0	6
2000–2004_1	2005–2009_2	6
2000–2004_1	2005–2009_2	5
2000–2004_1	2005–2009_1	4
2000–2004_1	2005–2009_4	4
2000–2004_1	2005–2009_0	3
2000–2004_1	2005–2009_6	3
2000–2004_1	2005–2009_7	3
2000–2004_1	2005–2009_1	2
2000–2004_1	2005–2009_3	2
2000–2004_1	2005–2009_0	1

Table 6 (continued)

t_1	t_2	Edges
2000–2004_1	2005–2009_0	1
2000–2004_1	2005–2009_1	1
2000–2004_1	2005–2009_1	1
2000–2004_1	2005–2009_2	1
2000–2004_1	2005–2009_2	1
2000–2004_1	2005–2009_4	1
2000–2004_1	2005–2009_4	1
2000–2004_1	2005–2009_7	1
2000–2004_1	2005–2009_7	1
2000–2004_1	2005–2009_8	1
t_1	t_2	Edges
2000–2004_2	2005–2009_2	106
2000–2004_2	2005–2009_1	7
2000–2004_2	2005–2009_7	4
2000–2004_2	2005–2009_1	3
2000–2004_2	2005–2009_2	3
2000–2004_2	2005–2009_0	2
2000–2004_2	2005–2009_1	2
2000–2004_2	2005–2009_3	2
2000–2004_2	2005–2009_4	2
2000–2004_2	2005–2009_6	2
2000–2004_2	2005–2009_9	2
2000–2004_2	2005–2009_1	1
2000–2004_2	2005–2009_1	1
2000–2004_2	2005–2009_4	1
2000–2004_2	2005–2009_4	1
2000–2004_2	2005–2009_8	1
2000–2004_3	2005–2009_3	105
2000–2004_3	2005–2009_1	22
2000–2004_3	2005–2009_1	9
2000–2004_3	2005–2009_7	9
2000–2004_3	2005–2009_9	5
2000–2004_3	2005–2009_0	3
2000–2004_3	2005–2009_1	3
2000–2004_3	2005–2009_2	3
2000–2004_3	2005–2009_4	2
2000–2004_3	2005–2009_0	1
2000–2004_3	2005–2009_0	1
2000–2004_3	2005–2009_2	1
2000–2004_3	2005–2009_3	1
2000–2004_3	2005–2009_3	1
2000–2004_3	2005–2009_4	1
2000–2004_4	2005–2009_1	153
2000–2004_4	2005–2009_8	12
2000–2004_4	2005–2009_1	7

Table 6 (continued)

t_1	t_2	Edges
2000–2004_4	2005–2009_0	6
2000–2004_4	2005–2009_7	6
2000–2004_4	2005–2009_2	5
2000–2004_4	2005–2009_4	4
2000–2004_4	2005–2009_1	2
2000–2004_4	2005–2009_8	2
2000–2004_4	2005–2009_3	1
2000–2004_4	2005–2009_8	1
t_1	t_2	Edges
2000–2004_5	2005–2009_4	28
2000–2004_5	2005–2009_1	25
2000–2004_5	2005–2009_1	11
2000–2004_5	2005–2009_2	2
2000–2004_5	2005–2009_0	1
2000–2004_5	2005–2009_1	1
2000–2004_5	2005–2009_3	1
2000–2004_6	2005–2009_1	12
2000–2004_6	2005–2009_1	1
2000–2004_7	2005–2009_7	102
2000–2004_7	2005–2009_3	18
2000–2004_7	2005–2009_0	7
2000–2004_7	2005–2009_1	4
2000–2004_7	2005–2009_6	4
2000–2004_7	2005–2009_1	3
2000–2004_7	2005–2009_2	3
2000–2004_7	2005–2009_9	1
2000–2004_8	2005–2009_1	27
2000–2004_8	2005–2009_0	23
2000–2004_8	2005–2009_3	12
2000–2004_8	2005–2009_7	4
2000–2004_8	2005–2009_1	1
2000–2004_8	2005–2009_2	1
2000–2004_8	2005–2009_6	1
2000–2004_9	2005–2009_1	68
2000–2004_9	2005–2009_4	19
2000–2004_9	2005–2009_2	3
2000–2004_9	2005–2009_0	1
2000–2004_9	2005–2009_3	1
2000–2004_9	2005–2009_3	1
2000–2004_9	2005–2009_6	1
2005–2009_0	2010–2014_0	383
2005–2009_0	2010–2014_6	69
2005–2009_0	2010–2014_3	33
2005–2009_0	2010–2014_5	27
2005–2009_0	2010–2014_7	20
2005–2009_0	2010–2014_1	11
2005–2009_0	2010–2014_4	9

Table 6 (continued)

t_1	t_2	Edges
2005–2009_0	2010–2014_8	4
2005–2009_0	2010–2014_1	2
2005–2009_0	2010–2014_9	2
2005–2009_0	2010–2014_1	1
t_1	t_2	Edges
2005–2009_1	2010–2014_1	307
2005–2009_1	2010–2014_5	184
2005–2009_1	2010–2014_1	50
2005–2009_1	2010–2014_6	37
2005–2009_1	2010–2014_6	26
2005–2009_1	2010–2014_0	17
2005–2009_1	2010–2014_8	13
2005–2009_1	2010–2014_5	9
2005–2009_1	2010–2014_1	8
2005–2009_1	2010–2014_7	8
2005–2009_1	2010–2014_3	6
2005–2009_1	2010–2014_1	5
2005–2009_1	2010–2014_1	3
2005–2009_1	2010–2014_2	3
2005–2009_1	2010–2014_0	2
2005–2009_1	2010–2014_1	2
2005–2009_1	2010–2014_3	2
2005–2009_1	2010–2014_4	2
2005–2009_1	2010–2014_4	2
2005–2009_1	2010–2014_0	1
2005–2009_1	2010–2014_0	1
2005–2009_1	2010–2014_3	1
2005–2009_1	2010–2014_4	1
2005–2009_1	2010–2014_7	1
2005–2009_1	2010–2014_8	1
2005–2009_2	2010–2014_3	165
2005–2009_2	2010–2014_0	34
2005–2009_2	2010–2014_4	6
2005–2009_2	2010–2014_0	3
2005–2009_2	2010–2014_9	3
2005–2009_2	2010–2014_5	2
2005–2009_2	2010–2014_0	1
2005–2009_2	2010–2014_2	1
2005–2009_2	2010–2014_7	1
2005–2009_2	2010–2014_8	1
2005–2009_3	2010–2014_6	192
2005–2009_3	2010–2014_4	30
2005–2009_3	2010–2014_0	14
2005–2009_3	2010–2014_1	13
2005–2009_3	2010–2014_1	3
2005–2009_3	2010–2014_1	2
2005–2009_3	2010–2014_1	2
2005–2009_3	2010–2014_5	2

Table 6 (continued)

t_1	t_2	Edges
2005–2009_3	2010–2014_6	2
2005–2009_3	2010–2014_1	1
2005–2009_3	2010–2014_1	1
t_1	t_2	Edges
2005–2009_4	2010–2014_3	56
2005–2009_4	2010–2014_8	36
2005–2009_4	2010–2014_0	8
2005–2009_4	2010–2014_1	6
2005–2009_4	2010–2014_7	5
2005–2009_4	2010–2014_6	4
2005–2009_4	2010–2014_5	3
2005–2009_4	2010–2014_2	2
2005–2009_4	2010–2014_4	2
2005–2009_4	2010–2014_0	1
2005–2009_4	2010–2014_1	1
2005–2009_4	2010–2014_2	1
2005–2009_4	2010–2014_3	1
2005–2009_4	2010–2014_4	1
2005–2009_4	2010–2014_6	1
2005–2009_6	2010–2014_0	43
2005–2009_6	2010–2014_9	38
2005–2009_6	2010–2014_4	11
2005–2009_6	2010–2014_6	2
2005–2009_6	2010–2014_7	1
2005–2009_7	2010–2014_4	193
2005–2009_7	2010–2014_6	26
2005–2009_7	2010–2014_7	22
2005–2009_7	2010–2014_5	13
2005–2009_7	2010–2014_0	12
2005–2009_7	2010–2014_3	4
2005–2009_7	2010–2014_9	4
2005–2009_7	2010–2014_1	2
2005–2009_7	2010–2014_3	1
2005–2009_8	2010–2014_5	122
2005–2009_8	2010–2014_7	46
2005–2009_8	2010–2014_0	11
2005–2009_8	2010–2014_1	9
2005–2009_8	2010–2014_3	4
2005–2009_8	2010–2014_4	3
2005–2009_8	2010–2014_6	3
2005–2009_8	2010–2014_8	1
2005–2009_8	2010–2014_9	1
2005–2009_9	2010–2014_6	7
2005–2009_9	2010–2014_2	4
t_1	t_2	Edges
2010–2014_0	2015–2019_2	415
2010–2014_0	2015–2019_7	101

Table 6 (continued)

t_1	t_2	Edges
2010–2014_0	2015–2019_3	74
2010–2014_0	2015–2019_6	45
2010–2014_0	2015–2019_1	33
2010–2014_0	2015–2019_0	12
2010–2014_0	2015–2019_1	11
2010–2014_0	2015–2019_1	9
2010–2014_0	2015–2019_8	8
2010–2014_0	2015–2019_9	4
2010–2014_0	2015–2019_1	3
2010–2014_0	2015–2019_1	3
2010–2014_0	2015–2019_2	2
2010–2014_0	2015–2019_2	2
2010–2014_0	2015–2019_5	1
2010–2014_1	2015–2019_0	549
2010–2014_1	2015–2019_7	28
2010–2014_1	2015–2019_1	17
2010–2014_1	2015–2019_2	17
2010–2014_1	2015–2019_3	17
2010–2014_1	2015–2019_1	15
2010–2014_1	2015–2019_1	15
2010–2014_1	2015–2019_8	14
2010–2014_1	2015–2019_1	11
2010–2014_1	2015–2019_1	8
2010–2014_1	2015–2019_6	7
2010–2014_1	2015–2019_2	6
2010–2014_1	2015–2019_1	4
2010–2014_1	2015–2019_4	2
2010–2014_1	2015–2019_6	2
2010–2014_1	2015–2019_7	2
2010–2014_1	2015–2019_1	1
2010–2014_1	2015–2019_1	1
2010–2014_1	2015–2019_2	1
2010–2014_1	2015–2019_3	1
2010–2014_1	2015–2019_3	1
2010–2014_1	2015–2019_3	1
2010–2014_1	2015–2019_3	1
2010–2014_1	2015–2019_5	1
2010–2014_1	2015–2019_6	1
2010–2014_1	2015–2019_6	1
t_1	t_2	Edges
2010–2014_2	2015–2019_1	5
2010–2014_2	2015–2019_1	4
2010–2014_2	2015–2019_1	3
2010–2014_2	2015–2019_6	2
2010–2014_2	2015–2019_0	1
2010–2014_2	2015–2019_1	1
2010–2014_2	2015–2019_2	1
2010–2014_2	2015–2019_5	1

Table 6 (continued)

t_1	t_2	Edges
2010–2014_2	2015–2019_6	1
2010–2014_3	2015–2019_7	210
2010–2014_3	2015–2019_1	97
2010–2014_3	2015–2019_2	45
2010–2014_3	2015–2019_1	15
2010–2014_3	2015–2019_3	13
2010–2014_3	2015–2019_0	11
2010–2014_3	2015–2019_6	5
2010–2014_3	2015–2019_1	2
2010–2014_3	2015–2019_2	2
2010–2014_3	2015–2019_3	2
2010–2014_3	2015–2019_9	2
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_6	1
2010–2014_3	2015–2019_8	1
2010–2014_4	2015–2019_1	339
2010–2014_4	2015–2019_6	38
2010–2014_4	2015–2019_3	16
2010–2014_4	2015–2019_2	15
2010–2014_4	2015–2019_1	12
2010–2014_4	2015–2019_7	9
2010–2014_4	2015–2019_1	4
2010–2014_4	2015–2019_2	4
2010–2014_4	2015–2019_8	3
2010–2014_4	2015–2019_9	3
2010–2014_4	2015–2019_0	2
2010–2014_4	2015–2019_3	2
2010–2014_4	2015–2019_0	1
2010–2014_4	2015–2019_4	1
2010–2014_4	2015–2019_4	1
t_1	t_2	Edges
2010–2014_5	2015–2019_3	312
2010–2014_5	2015–2019_0	110
2010–2014_5	2015–2019_2	27
2010–2014_5	2015–2019_1	11
2010–2014_5	2015–2019_6	11
2010–2014_5	2015–2019_8	9
2010–2014_5	2015–2019_7	8
2010–2014_5	2015–2019_1	7
2010–2014_5	2015–2019_1	3
2010–2014_5	2015–2019_1	2
2010–2014_5	2015–2019_4	1
2010–2014_5	2015–2019_9	1
2010–2014_6	2015–2019_1	201

Table 6 (continued)

t_1	t_2	Edges
2010–2014_6	2015–2019_6	201
2010–2014_6	2015–2019_2	52
2010–2014_6	2015–2019_0	38
2010–2014_6	2015–2019_1	26
2010–2014_6	2015–2019_3	9
2010–2014_6	2015–2019_1	5
2010–2014_6	2015–2019_7	3
2010–2014_6	2015–2019_1	1
2010–2014_6	2015–2019_3	1
2010–2014_6	2015–2019_4	1
2010–2014_6	2015–2019_8	1
2010–2014_7	2015–2019_8	56
2010–2014_7	2015–2019_1	26
2010–2014_7	2015–2019_2	16
2010–2014_7	2015–2019_1	7
2010–2014_7	2015–2019_3	6
2010–2014_7	2015–2019_7	4
2010–2014_7	2015–2019_6	2
2010–2014_7	2015–2019_5	1
2010–2014_8	2015–2019_0	69
2010–2014_8	2015–2019_7	7
2010–2014_8	2015–2019_3	6
2010–2014_8	2015–2019_1	1
2010–2014_8	2015–2019_1	1
2010–2014_8	2015–2019_2	1
2010–2014_8	2015–2019_6	1
2010–2014_8	2015–2019_8	1
t_1	t_2	Edges
2010–2014_9	2015–2019_9	45
2010–2014_9	2015–2019_3	11
2010–2014_9	2015–2019_6	6
2010–2014_9	2015–2019_1	3
2010–2014_9	2015–2019_2	3
2010–2014_9	2015–2019_7	3
2010–2014_9	2015–2019_1	2
2010–2014_9	2015–2019_6	1

The number at the end of the timeframe denotes the number of the detected cluster

Table 7 Flow between timeframes by assignment to center–periphery structure

From	To	Edges
1980–1984_0	1985–1989_2	5
1980–1984_1	1985–1989_2	6
1980–1984_1	1985–1989_0	2
1980–1984_1	1985–1989_2	1
1980–1984_2	1985–1989_6	1
1980–1984_3	1985–1989_2	2
1980–1984_4	1985–1989_1	4
1980–1984_4	1985–1989_2	1
1980–1984_5	1985–1989_4	1
1980–1984_6	1985–1989_2	5
1980–1984_6	1985–1989_1	1
1980–1984_6	1985–1989_4	1
1980–1984_7	1985–1989_4	2
1980–1984_7	1985–1989_4	1
1980–1984_9	1985–1989_4	1
From	To	Edges
1985–1989_0	1990–1994_2	35
1985–1989_1	1990–1994_9	18
1985–1989_1	1990–1994_0	5
1985–1989_1	1990–1994_2	5
1985–1989_1	1990–1994_3	5
1985–1989_1	1990–1994_1	4
1985–1989_1	1990–1994_4	4
1985–1989_1	1990–1994_0	3
1985–1989_1	1990–1994_3	2
1985–1989_1	1990–1994_7	2
1985–1989_1	1990–1994_1	1
1985–1989_1	1990–1994_2	1
1985–1989_1	1990–1994_3	1
1985–1989_1	1990–1994_7	1
1985–1989_1	1990–1994_9	1
1985–1989_2	1990–1994_9	32
1985–1989_2	1990–1994_0	7
1985–1989_2	1990–1994_3	6
1985–1989_2	1990–1994_8	4
1985–1989_2	1990–1994_2	2
1985–1989_2	1990–1994_6	2
1985–1989_2	1990–1994_7	2
1985–1989_2	1990–1994_9	2
1985–1989_2	1990–1994_0	1
1985–1989_2	1990–1994_1	1
1985–1989_2	1990–1994_2	1
1985–1989_2	1990–1994_6	1
1985–1989_2	1990–1994_7	1

Table 7 (continued)

From	To	Edges
1985–1989_3	1990–1994_0	30
1985–1989_3	1990–1994_7	4
1985–1989_3	1990–1994_9	3
1985–1989_3	1990–1994_2	2
1985–1989_3	1990–1994_5	2
1985–1989_3	1990–1994_1	1
1985–1989_3	1990–1994_2	1
1985–1989_3	1990–1994_3	1
1985–1989_3	1990–1994_7	1
1985–1989_4	1990–1994_9	4
1985–1989_4	1990–1994_0	2
1985–1989_4	1990–1994_3	2
1985–1989_4	1990–1994_0	1
1985–1989_4	1990–1994_1	1
1985–1989_4	1990–1994_2	1
1985–1989_4	1990–1994_3	1
1985–1989_4	1990–1994_5	1
1985–1989_4	1990–1994_7	1
1985–1989_5	1990–1994_1	6
1985–1989_6	1990–1994_1	3
1985–1989_6	1990–1994_5	1
1985–1989_7	1990–1994_3	12
1985–1989_7	1990–1994_5	1
From	To	Edges
1985–1989_8	1990–1994_6	5
1985–1989_8	1990–1994_0	4
1985–1989_8	1990–1994_4	2
1985–1989_8	1990–1994_9	2
1985–1989_8	1990–1994_1	1
1985–1989_8	1990–1994_4	1
1985–1989_9	1990–1994_0	3
1990–1994_0	1995–1999_5	72
1990–1994_0	1995–1999_1	26
1990–1994_0	1995–1999_0	21
1990–1994_0	1995–1999_3	10
1990–1994_0	1995–1999_2	3
1990–1994_0	1995–1999_4	2
1990–1994_0	1995–1999_6	2
1990–1994_0	1995–1999_1	1
1990–1994_0	1995–1999_7	1
1990–1994_0	1995–1999_8	1
1990–1994_0	1995–1999_9	1

Table 7 (continued)

From	To	Edges
1990–1994_1	1995–1999_0	27
1990–1994_1	1995–1999_1	8
1990–1994_1	1995–1999_0	5
1990–1994_1	1995–1999_5	5
1990–1994_1	1995–1999_2	4
1990–1994_1	1995–1999_1	3
1990–1994_1	1995–1999_2	3
1990–1994_1	1995–1999_4	3
1990–1994_1	1995–1999_5	3
1990–1994_1	1995–1999_0	2
1990–1994_1	1995–1999_1	2
1990–1994_1	1995–1999_4	2
1990–1994_1	1995–1999_0	1
1990–1994_1	1995–1999_1	1
1990–1994_1	1995–1999_2	1
1990–1994_1	1995–1999_3	1
1990–1994_1	1995–1999_4	1
1990–1994_1	1995–1999_5	1
1990–1994_1	1995–1999_6	1
1990–1994_1	1995–1999_7	1
1990–1994_1	1995–1999_9	1
From	To	Edges
1990–1994_2	1995–1999_1	63
1990–1994_2	1995–1999_9	17
1990–1994_2	1995–1999_0	10
1990–1994_2	1995–1999_1	9
1990–1994_2	1995–1999_4	7
1990–1994_2	1995–1999_1	3
1990–1994_2	1995–1999_2	3
1990–1994_2	1995–1999_4	3
1990–1994_2	1995–1999_0	2
1990–1994_2	1995–1999_1	2
1990–1994_2	1995–1999_3	2
1990–1994_2	1995–1999_4	2
1990–1994_2	1995–1999_5	2
1990–1994_2	1995–1999_8	2
1990–1994_2	1995–1999_1	1
1990–1994_2	1995–1999_2	1
1990–1994_2	1995–1999_3	1
1990–1994_2	1995–1999_4	1
1990–1994_2	1995–1999_5	1
1990–1994_2	1995–1999_6	1

Table 7 (continued)

From	To	Edges
1990–1994_3	1995–1999_1	43
1990–1994_3	1995–1999_4	12
1990–1994_3	1995–1999_3	5
1990–1994_3	1995–1999_0	4
1990–1994_3	1995–1999_4	3
1990–1994_3	1995–1999_5	3
1990–1994_3	1995–1999_7	3
1990–1994_3	1995–1999_1	2
1990–1994_3	1995–1999_0	1
1990–1994_3	1995–1999_1	1
1990–1994_3	1995–1999_3	1
1990–1994_3	1995–1999_7	1
1990–1994_4	1995–1999_0	9
1990–1994_4	1995–1999_0	3
1990–1994_4	1995–1999_0	2
1990–1994_4	1995–1999_2	2
1990–1994_4	1995–1999_9	2
1990–1994_4	1995–1999_0	1
1990–1994_4	1995–1999_1	1
1990–1994_4	1995–1999_2	1
1990–1994_4	1995–1999_3	1
1990–1994_4	1995–1999_4	1
1990–1994_4	1995–1999_7	1
1990–1994_5	1995–1999_4	47
1990–1994_5	1995–1999_1	2
1990–1994_5	1995–1999_2	2
1990–1994_5	1995–1999_2	1
1990–1994_5	1995–1999_6	1
1990–1994_6	1995–1999_3	21
1990–1994_6	1995–1999_0	10
1990–1994_6	1995–1999_5	2
1990–1994_6	1995–1999_1	1
1990–1994_6	1995–1999_2	1
1990–1994_6	1995–1999_4	1
1990–1994_6	1995–1999_5	1
1990–1994_6	1995–1999_9	1
1990–1994_7	1995–1999_5	9
1990–1994_7	1995–1999_3	2
1990–1994_7	1995–1999_0	1
1990–1994_7	1995–1999_1	1
1990–1994_7	1995–1999_5	1
1990–1994_7	1995–1999_7	1
1990–1994_7	1995–1999_9	1

Table 7 (continued)

From	To	Edges
1990–1994_8	1995–1999_6	12
1990–1994_8	1995–1999_0	1
1990–1994_8	1995–1999_3	1
1990–1994_8	1995–1999_5	1
1990–1994_9	1995–1999_1	53
1990–1994_9	1995–1999_6	13
1990–1994_9	1995–1999_0	6
1990–1994_9	1995–1999_5	6
1990–1994_9	1995–1999_1	2
1990–1994_9	1995–1999_3	2
1990–1994_9	1995–1999_2	1
1990–1994_9	1995–1999_4	1
1990–1994_9	1995–1999_8	1
From	To	Edges
1995–1999_0	2000–2004_3	93
1995–1999_0	2000–2004_2	50
1995–1999_0	2000–2004_0	46
1995–1999_0	2000–2004_1	37
1995–1999_0	2000–2004_1	5
1995–1999_0	2000–2004_1	3
1995–1999_0	2000–2004_7	3
1995–1999_0	2000–2004_1	2
1995–1999_0	2000–2004_5	2
1995–1999_0	2000–2004_8	2
1995–1999_0	2000–2004_2	1
1995–1999_0	2000–2004_3	1
1995–1999_1	2000–2004_5	91
1995–1999_1	2000–2004_1	33
1995–1999_1	2000–2004_1	27
1995–1999_1	2000–2004_3	22
1995–1999_1	2000–2004_4	15
1995–1999_1	2000–2004_8	14
1995–1999_1	2000–2004_1	12
1995–1999_1	2000–2004_1	9
1995–1999_1	2000–2004_3	9
1995–1999_1	2000–2004_0	7
1995–1999_1	2000–2004_9	7
1995–1999_1	2000–2004_1	6
1995–1999_1	2000–2004_3	6
1995–1999_1	2000–2004_2	5
1995–1999_1	2000–2004_9	5

Table 7 (continued)

From	To	Edges
1995–1999_1	2000–2004_1	4
1995–1999_1	2000–2004_3	4
1995–1999_1	2000–2004_5	4
1995–1999_1	2000–2004_3	3
1995–1999_1	2000–2004_6	3
1995–1999_1	2000–2004_0	2
1995–1999_1	2000–2004_1	2
1995–1999_1	2000–2004_2	2
1995–1999_1	2000–2004_5	2
1995–1999_1	2000–2004_6	2
1995–1999_1	2000–2004_9	2
1995–1999_1	2000–2004_1	1
1995–1999_1	2000–2004_2	1
1995–1999_1	2000–2004_4	1
1995–1999_1	2000–2004_5	1
1995–1999_1	2000–2004_6	1
1995–1999_1	2000–2004_7	1
1995–1999_1	2000–2004_8	1
1995–1999_1	2000–2004_9	1
From	To	Edges
1995–1999_2	2000–2004_3	9
1995–1999_2	2000–2004_2	7
1995–1999_2	2000–2004_9	7
1995–1999_2	2000–2004_0	5
1995–1999_2	2000–2004_1	4
1995–1999_2	2000–2004_1	3
1995–1999_2	2000–2004_4	3
1995–1999_2	2000–2004_5	3
1995–1999_2	2000–2004_9	3
1995–1999_2	2000–2004_2	2
1995–1999_2	2000–2004_6	2
1995–1999_2	2000–2004_0	1
1995–1999_2	2000–2004_1	1
1995–1999_2	2000–2004_2	1
1995–1999_2	2000–2004_4	1
1995–1999_2	2000–2004_5	1
1995–1999_2	2000–2004_9	1
1995–1999_3	2000–2004_1	41
1995–1999_3	2000–2004_2	34
1995–1999_3	2000–2004_0	3
1995–1999_3	2000–2004_3	3
1995–1999_3	2000–2004_2	2
1995–1999_3	2000–2004_3	2
1995–1999_3	2000–2004_4	2
1995–1999_3	2000–2004_5	2

Table 7 (continued)

From	To	Edges
1995–1999_3	2000–2004_7	2
1995–1999_3	2000–2004_1	1
1995–1999_3	2000–2004_9	1
From	To	Edges
1995–1999_4	2000–2004_4	45
1995–1999_4	2000–2004_2	20
1995–1999_4	2000–2004_5	19
1995–1999_4	2000–2004_1	6
1995–1999_4	2000–2004_0	4
1995–1999_4	2000–2004_1	4
1995–1999_4	2000–2004_2	4
1995–1999_4	2000–2004_0	2
1995–1999_4	2000–2004_1	2
1995–1999_4	2000–2004_3	2
1995–1999_4	2000–2004_5	2
1995–1999_4	2000–2004_8	2
1995–1999_4	2000–2004_0	1
1995–1999_4	2000–2004_1	1
1995–1999_4	2000–2004_3	1
1995–1999_4	2000–2004_4	1
1995–1999_4	2000–2004_5	1
1995–1999_4	2000–2004_6	1
1995–1999_4	2000–2004_7	1
1995–1999_4	2000–2004_8	1
From	To	Edges
1995–1999_5	2000–2004_5	44
1995–1999_5	2000–2004_0	18
1995–1999_5	2000–2004_1	12
1995–1999_5	2000–2004_4	10
1995–1999_5	2000–2004_2	8
1995–1999_5	2000–2004_1	7
1995–1999_5	2000–2004_2	4
1995–1999_5	2000–2004_6	3
1995–1999_5	2000–2004_9	3
1995–1999_5	2000–2004_1	2
1995–1999_5	2000–2004_3	2
1995–1999_5	2000–2004_1	1
1995–1999_5	2000–2004_2	1
1995–1999_5	2000–2004_3	1
1995–1999_5	2000–2004_5	1
1995–1999_5	2000–2004_6	1
1995–1999_5	2000–2004_9	1
1995–1999_6	2000–2004_2	12
1995–1999_6	2000–2004_3	6

Table 7 (continued)

From	To	Edges
1995–1999_6	2000–2004_5	3
1995–1999_6	2000–2004_0	2
1995–1999_6	2000–2004_1	2
1995–1999_6	2000–2004_4	2
1995–1999_6	2000–2004_1	1
1995–1999_6	2000–2004_2	1
1995–1999_6	2000–2004_9	1
From	To	Edges
1995–1999_7	2000–2004_1	11
1995–1999_7	2000–2004_4	4
1995–1999_7	2000–2004_0	2
1995–1999_7	2000–2004_0	1
1995–1999_7	2000–2004_1	1
1995–1999_7	2000–2004_2	1
1995–1999_7	2000–2004_5	1
1995–1999_7	2000–2004_8	1
1995–1999_8	2000–2004_2	8
1995–1999_8	2000–2004_1	2
1995–1999_8	2000–2004_4	2
1995–1999_8	2000–2004_1	1
1995–1999_8	2000–2004_3	1
1995–1999_8	2000–2004_4	1
1995–1999_8	2000–2004_7	1
1995–1999_8	2000–2004_8	1
1995–1999_8	2000–2004_9	1
1995–1999_9	2000–2004_1	11
1995–1999_9	2000–2004_3	2
1995–1999_9	2000–2004_4	2
1995–1999_9	2000–2004_8	2
1995–1999_9	2000–2004_1	1
1995–1999_9	2000–2004_2	1
1995–1999_9	2000–2004_3	1
1995–1999_9	2000–2004_4	1
1995–1999_9	2000–2004_5	1
1995–1999_9	2000–2004_7	1
From	To	Edges
2000–2004_0	2005–2009_0	149
2000–2004_0	2005–2009_3	5
2000–2004_0	2005–2009_1	2
2000–2004_0	2005–2009_2	2
2000–2004_0	2005–2009_4	2
2000–2004_0	2005–2009_5	2
2000–2004_0	2005–2009_7	2
2000–2004_0	2005–2009_9	2
2000–2004_0	2005–2009_1	1

Table 7 (continued)

From	To	Edges
2000–2004_0	2005–2009_3	1
2000–2004_0	2005–2009_4	1
2000–2004_0	2005–2009_8	1
2000–2004_0	2005–2009_9	1
2000–2004_1	2005–2009_0	79
2000–2004_1	2005–2009_5	56
2000–2004_1	2005–2009_3	51
2000–2004_1	2005–2009_0	34
2000–2004_1	2005–2009_2	17
2000–2004_1	2005–2009_0	16
2000–2004_1	2005–2009_7	16
2000–2004_1	2005–2009_7	15
2000–2004_1	2005–2009_8	9
2000–2004_1	2005–2009_9	9
2000–2004_1	2005–2009_1	8
2000–2004_1	2005–2009_1	7
2000–2004_1	2005–2009_3	7
2000–2004_1	2005–2009_5	7
From	To	Edges
2000–2004_1	2005–2009_2	6
2000–2004_1	2005–2009_9	6
2000–2004_1	2005–2009_5	5
2000–2004_1	2005–2009_0	4
2000–2004_1	2005–2009_0	3
2000–2004_1	2005–2009_2	3
2000–2004_1	2005–2009_1	2
2000–2004_1	2005–2009_3	2
2000–2004_1	2005–2009_4	2
2000–2004_1	2005–2009_6	2
2000–2004_1	2005–2009_7	2
2000–2004_1	2005–2009_8	2
2000–2004_1	2005–2009_0	1
2000–2004_1	2005–2009_1	1
2000–2004_1	2005–2009_2	1
2000–2004_1	2005–2009_4	1
2000–2004_1	2005–2009_5	1
2000–2004_1	2005–2009_6	1
2000–2004_1	2005–2009_7	1
2000–2004_1	2005–2009_9	1
From	To	Edges
2000–2004_2	2005–2009_0	137
2000–2004_2	2005–2009_0	29
2000–2004_2	2005–2009_1	16
2000–2004_2	2005–2009_9	15
2000–2004_2	2005–2009_1	13
2000–2004_2	2005–2009_6	11
2000–2004_2	2005–2009_1	5

Table 7 (continued)

From	To	Edges
2000–2004_2	2005–2009_1	3
2000–2004_2	2005–2009_2	3
2000–2004_2	2005–2009_0	2
2000–2004_2	2005–2009_1	2
2000–2004_2	2005–2009_3	2
2000–2004_2	2005–2009_5	2
2000–2004_2	2005–2009_0	1
2000–2004_2	2005–2009_1	1
2000–2004_2	2005–2009_2	1
2000–2004_2	2005–2009_3	1
2000–2004_2	2005–2009_5	1
2000–2004_2	2005–2009_7	1
From	To	Edges
2000–2004_3	2005–2009_0	147
2000–2004_3	2005–2009_0	29
2000–2004_3	2005–2009_0	7
2000–2004_3	2005–2009_0	5
2000–2004_3	2005–2009_1	5
2000–2004_3	2005–2009_3	5
2000–2004_3	2005–2009_1	4
2000–2004_3	2005–2009_1	3
2000–2004_3	2005–2009_2	3
2000–2004_3	2005–2009_1	2
2000–2004_3	2005–2009_6	2
2000–2004_3	2005–2009_0	1
2000–2004_3	2005–2009_1	1
2000–2004_3	2005–2009_3	1
2000–2004_3	2005–2009_5	1
2000–2004_3	2005–2009_7	1
2000–2004_3	2005–2009_8	1
2000–2004_4	2005–2009_1	56
2000–2004_4	2005–2009_1	11
2000–2004_4	2005–2009_0	8
2000–2004_4	2005–2009_0	5
2000–2004_4	2005–2009_7	4
2000–2004_4	2005–2009_9	4
2000–2004_4	2005–2009_0	3
2000–2004_4	2005–2009_5	3
2000–2004_4	2005–2009_1	2
2000–2004_4	2005–2009_5	2
2000–2004_4	2005–2009_6	2
From	To	Edges
2000–2004_4	2005–2009_7	2
2000–2004_4	2005–2009_0	1
2000–2004_4	2005–2009_1	1
2000–2004_4	2005–2009_4	1
2000–2004_4	2005–2009_5	1

Table 7 (continued)

From	To	Edges
2000–2004_4	2005–2009_6	1
2000–2004_4	2005–2009_9	1
2000–2004_5	2005–2009_3	80
2000–2004_5	2005–2009_0	62
2000–2004_5	2005–2009_1	13
2000–2004_5	2005–2009_9	6
2000–2004_5	2005–2009_1	5
2000–2004_5	2005–2009_5	4
2000–2004_5	2005–2009_8	3
2000–2004_5	2005–2009_1	2
2000–2004_5	2005–2009_0	1
2000–2004_5	2005–2009_1	1
2000–2004_5	2005–2009_2	1
2000–2004_5	2005–2009_3	1
2000–2004_5	2005–2009_4	1
2000–2004_5	2005–2009_7	1
2000–2004_5	2005–2009_8	1
2000–2004_5	2005–2009_9	1
From	To	Edges
2000–2004_6	2005–2009_1	4
2000–2004_6	2005–2009_3	4
2000–2004_6	2005–2009_3	3
2000–2004_6	2005–2009_1	2
2000–2004_6	2005–2009_3	2
2000–2004_6	2005–2009_4	2
2000–2004_6	2005–2009_9	2
2000–2004_6	2005–2009_1	1
2000–2004_6	2005–2009_8	1
2000–2004_6	2005–2009_9	1
2000–2004_7	2005–2009_1	6
2000–2004_7	2005–2009_0	4
2000–2004_7	2005–2009_2	4
2000–2004_7	2005–2009_0	2
2000–2004_7	2005–2009_1	2
2000–2004_7	2005–2009_1	1
2000–2004_7	2005–2009_3	1
2000–2004_7	2005–2009_5	1
2000–2004_8	2005–2009_4	12
2000–2004_8	2005–2009_0	3
2000–2004_8	2005–2009_2	3
2000–2004_8	2005–2009_4	3
2000–2004_8	2005–2009_1	2
2000–2004_8	2005–2009_0	1
2000–2004_8	2005–2009_9	1
From	To	Edges
2000–2004_9	2005–2009_1	44
2000–2004_9	2005–2009_0	4

Table 7 (continued)

From	To	Edges
2000–2004_9	2005–2009_0	2
2000–2004_9	2005–2009_4	2
2000–2004_9	2005–2009_1	1
2000–2004_9	2005–2009_2	1
2000–2004_9	2005–2009_3	1
2000–2004_9	2005–2009_7	1
2000–2004_9	2005–2009_8	1
2005–2009_0	2010–2014_0	832
2005–2009_0	2010–2014_1	164
2005–2009_0	2010–2014_1	53
2005–2009_0	2010–2014_6	51
2005–2009_0	2010–2014_2	18
2005–2009_0	2010–2014_1	12
2005–2009_0	2010–2014_2	9
2005–2009_0	2010–2014_5	8
2005–2009_0	2010–2014_2	6
2005–2009_0	2010–2014_1	5
2005–2009_0	2010–2014_4	4
2005–2009_0	2010–2014_2	3
2005–2009_0	2010–2014_7	3
2005–2009_0	2010–2014_1	2
2005–2009_0	2010–2014_3	2
2005–2009_0	2010–2014_5	2
2005–2009_0	2010–2014_2	1
2005–2009_0	2010–2014_3	1
2005–2009_0	2010–2014_8	1
From	To	Edges
2005–2009_0	2010–2014_9	1
2005–2009_1	2010–2014_2	183
2005–2009_1	2010–2014_1	120
2005–2009_1	2010–2014_5	13
2005–2009_1	2010–2014_6	6
2005–2009_1	2010–2014_1	5
2005–2009_1	2010–2014_3	5
2005–2009_1	2010–2014_0	4
2005–2009_1	2010–2014_6	4
2005–2009_1	2010–2014_1	3
2005–2009_1	2010–2014_4	3
2005–2009_1	2010–2014_5	3
2005–2009_1	2010–2014_6	3
2005–2009_1	2010–2014_0	2
2005–2009_1	2010–2014_1	2
2005–2009_1	2010–2014_2	2
2005–2009_1	2010–2014_3	2
2005–2009_1	2010–2014_5	2
2005–2009_1	2010–2014_6	2
2005–2009_1	2010–2014_0	1
2005–2009_1	2010–2014_1	1

Table 7 (continued)

From	To	Edges
2005–2009_1	2010–2014_2	1
2005–2009_1	2010–2014_3	1
2005–2009_1	2010–2014_4	1
2005–2009_1	2010–2014_5	1
2005–2009_1	2010–2014_7	1
2005–2009_1	2010–2014_8	1
2005–2009_1	2010–2014_9	1
From	To	Edges
2005–2009_2	2010–2014_1	47
2005–2009_2	2010–2014_2	35
2005–2009_2	2010–2014_2	15
2005–2009_2	2010–2014_1	11
2005–2009_2	2010–2014_2	10
2005–2009_2	2010–2014_1	7
2005–2009_2	2010–2014_2	5
2005–2009_2	2010–2014_3	5
2005–2009_2	2010–2014_2	3
2005–2009_2	2010–2014_5	3
2005–2009_2	2010–2014_1	2
2005–2009_2	2010–2014_2	2
2005–2009_2	2010–2014_5	2
2005–2009_2	2010–2014_0	1
2005–2009_2	2010–2014_2	1
2005–2009_2	2010–2014_6	1
2005–2009_2	2010–2014_8	1
2005–2009_2	2010–2014_9	1
2005–2009_3	2010–2014_1	118
2005–2009_3	2010–2014_2	51
2005–2009_3	2010–2014_1	15
2005–2009_3	2010–2014_1	11
2005–2009_3	2010–2014_0	9
2005–2009_3	2010–2014_1	5
2005–2009_3	2010–2014_0	4
2005–2009_3	2010–2014_1	3
2005–2009_3	2010–2014_0	2
2005–2009_3	2010–2014_2	2
From	To	Edges
2005–2009_3	2010–2014_5	2
2005–2009_3	2010–2014_0	1
2005–2009_3	2010–2014_1	1
2005–2009_3	2010–2014_3	1
2005–2009_3	2010–2014_4	1
2005–2009_3	2010–2014_5	1
2005–2009_3	2010–2014_6	1
2005–2009_3	2010–2014_9	1
2005–2009_4	2010–2014_1	22
2005–2009_4	2010–2014_0	8

Table 7 (continued)

From	To	Edges
2005–2009_4	2010–2014_1	5
2005–2009_4	2010–2014_4	3
2005–2009_4	2010–2014_2	2
2005–2009_4	2010–2014_6	2
2005–2009_4	2010–2014_9	2
2005–2009_4	2010–2014_3	1
2005–2009_4	2010–2014_9	1
2005–2009_5	2010–2014_6	108
2005–2009_5	2010–2014_1	8
2005–2009_5	2010–2014_0	5
2005–2009_5	2010–2014_1	4
2005–2009_5	2010–2014_0	3
2005–2009_5	2010–2014_8	3
2005–2009_5	2010–2014_2	2
2005–2009_5	2010–2014_9	2
2005–2009_5	2010–2014_0	1
2005–2009_5	2010–2014_1	1
2005–2009_5	2010–2014_2	1
From	To	Edges
2005–2009_5	2010–2014_7	1
2005–2009_6	2010–2014_8	29
2005–2009_6	2010–2014_5	3
2005–2009_6	2010–2014_9	3
2005–2009_6	2010–2014_1	2
2005–2009_6	2010–2014_2	2
2005–2009_6	2010–2014_6	2
2005–2009_6	2010–2014_0	1
2005–2009_6	2010–2014_1	1
2005–2009_6	2010–2014_2	1
2005–2009_6	2010–2014_4	1
2005–2009_6	2010–2014_6	1
2005–2009_7	2010–2014_9	45
2005–2009_7	2010–2014_1	14
2005–2009_7	2010–2014_1	8
2005–2009_7	2010–2014_6	7
2005–2009_7	2010–2014_2	4
2005–2009_7	2010–2014_1	2
2005–2009_7	2010–2014_5	2
2005–2009_7	2010–2014_6	2
2005–2009_7	2010–2014_0	1
2005–2009_7	2010–2014_1	1
2005–2009_7	2010–2014_2	1
2005–2009_7	2010–2014_3	1
2005–2009_7	2010–2014_4	1
2005–2009_7	2010–2014_5	1
2005–2009_7	2010–2014_6	1

Table 7 (continued)

From	To	Edges
2005–2009_8	2010–2014_8	18
2005–2009_8	2010–2014_1	4
2005–2009_8	2010–2014_6	3
2005–2009_8	2010–2014_6	2
2005–2009_8	2010–2014_1	1
2005–2009_8	2010–2014_2	1
2005–2009_8	2010–2014_4	1
2005–2009_8	2010–2014_9	1
2005–2009_9	2010–2014_1	66
2005–2009_9	2010–2014_0	2
2005–2009_9	2010–2014_1	2
2005–2009_9	2010–2014_3	2
2005–2009_9	2010–2014_6	2
2005–2009_9	2010–2014_0	1
2005–2009_9	2010–2014_1	1
2005–2009_9	2010–2014_2	1
2005–2009_9	2010–2014_4	1
2005–2009_9	2010–2014_6	1
2005–2009_9	2010–2014_9	1
From	To	Edges
2010–2014_0	2015–2019_4	557
2010–2014_0	2015–2019_1	428
2010–2014_0	2015–2019_9	127
2010–2014_0	2015–2019_8	57
2010–2014_0	2015–2019_0	22
2010–2014_0	2015–2019_6	22
2010–2014_0	2015–2019_7	9
2010–2014_0	2015–2019_4	8
2010–2014_0	2015–2019_2	5
2010–2014_0	2015–2019_1	4
2010–2014_0	2015–2019_1	2
2010–2014_0	2015–2019_2	2
2010–2014_0	2015–2019_5	2
2010–2014_0	2015–2019_1	1
2010–2014_0	2015–2019_3	1
2010–2014_0	2015–2019_4	1
2010–2014_0	2015–2019_5	1
2010–2014_0	2015–2019_7	1
2010–2014_1	2015–2019_9	337
2010–2014_1	2015–2019_0	115
2010–2014_1	2015–2019_1	89
2010–2014_1	2015–2019_8	89
2010–2014_1	2015–2019_0	62
2010–2014_1	2015–2019_9	60
2010–2014_1	2015–2019_1	51
2010–2014_1	2015–2019_4	31
2010–2014_1	2015–2019_7	27
2010–2014_1	2015–2019_2	26

Table 7 (continued)

From	To	Edges
2010–2014_1	2015–2019_0	16
2010–2014_1	2015–2019_1	14
2010–2014_1	2015–2019_4	14
2010–2014_1	2015–2019_5	13
2010–2014_1	2015–2019_1	10
2010–2014_1	2015–2019_2	10
2010–2014_1	2015–2019_5	9
2010–2014_1	2015–2019_1	8
2010–2014_1	2015–2019_4	7
2010–2014_1	2015–2019_0	6
2010–2014_1	2015–2019_9	6
2010–2014_1	2015–2019_0	5
2010–2014_1	2015–2019_4	5
2010–2014_1	2015–2019_1	4
2010–2014_1	2015–2019_3	4
2010–2014_1	2015–2019_1	3
2010–2014_1	2015–2019_6	3
2010–2014_1	2015–2019_8	3
2010–2014_1	2015–2019_0	2
2010–2014_1	2015–2019_1	2
2010–2014_1	2015–2019_2	2
2010–2014_1	2015–2019_4	2
2010–2014_1	2015–2019_8	2
2010–2014_1	2015–2019_9	2
2010–2014_1	2015–2019_0	1
2010–2014_1	2015–2019_1	1
2010–2014_1	2015–2019_2	1
2010–2014_1	2015–2019_3	1
From	To	Edges
2010–2014_1	2015–2019_4	1
2010–2014_1	2015–2019_5	1
2010–2014_1	2015–2019_7	1
2010–2014_1	2015–2019_8	1
2010–2014_1	2015–2019_9	1
2010–2014_2	2015–2019_0	375
2010–2014_2	2015–2019_5	35
2010–2014_2	2015–2019_1	24
2010–2014_2	2015–2019_9	12
2010–2014_2	2015–2019_1	11
2010–2014_2	2015–2019_6	9
2010–2014_2	2015–2019_6	8
2010–2014_2	2015–2019_4	7
2010–2014_2	2015–2019_1	5
2010–2014_2	2015–2019_3	5
2010–2014_2	2015–2019_7	5
2010–2014_2	2015–2019_8	5
2010–2014_2	2015–2019_0	4
2010–2014_2	2015–2019_2	4

Table 7 (continued)

From	To	Edges
2010–2014_2	2015–2019_3	4
2010–2014_2	2015–2019_3	3
2010–2014_2	2015–2019_9	3
2010–2014_2	2015–2019_0	2
2010–2014_2	2015–2019_1	2
2010–2014_2	2015–2019_4	2
2010–2014_2	2015–2019_7	2
2010–2014_2	2015–2019_8	2
2010–2014_2	2015–2019_9	2
From	To	Edges
2010–2014_2	2015–2019_1	1
2010–2014_2	2015–2019_2	1
2010–2014_2	2015–2019_4	1
2010–2014_2	2015–2019_5	1
2010–2014_2	2015–2019_8	1
2010–2014_2	2015–2019_9	1
2010–2014_3	2015–2019_3	5
2010–2014_3	2015–2019_2	4
2010–2014_3	2015–2019_8	4
2010–2014_3	2015–2019_2	3
2010–2014_3	2015–2019_4	3
2010–2014_3	2015–2019_1	2
2010–2014_3	2015–2019_4	2
2010–2014_3	2015–2019_7	2
2010–2014_3	2015–2019_1	1
2010–2014_3	2015–2019_3	1
2010–2014_3	2015–2019_4	1
2010–2014_3	2015–2019_5	1
2010–2014_3	2015–2019_6	1
2010–2014_3	2015–2019_8	1
2010–2014_3	2015–2019_9	1
2010–2014_4	2015–2019_3	26
2010–2014_4	2015–2019_3	5
2010–2014_4	2015–2019_3	3
2010–2014_4	2015–2019_0	2
2010–2014_4	2015–2019_1	2
2010–2014_4	2015–2019_4	2
2010–2014_4	2015–2019_8	2
From	To	Edges
2010–2014_4	2015–2019_1	1
2010–2014_4	2015–2019_4	1
2010–2014_4	2015–2019_5	1
2010–2014_4	2015–2019_8	1
2010–2014_4	2015–2019_9	1
2010–2014_5	2015–2019_1	41
2010–2014_5	2015–2019_0	13
2010–2014_5	2015–2019_4	5

Table 7 (continued)

From	To	Edges
2010–2014_5	2015–2019_1	3
2010–2014_5	2015–2019_5	3
2010–2014_5	2015–2019_1	2
2010–2014_5	2015–2019_3	2
2010–2014_5	2015–2019_0	1
2010–2014_5	2015–2019_1	1
2010–2014_5	2015–2019_2	1
2010–2014_5	2015–2019_3	1
2010–2014_5	2015–2019_4	1
2010–2014_5	2015–2019_5	1
2010–2014_6	2015–2019_8	235
2010–2014_6	2015–2019_9	54
2010–2014_6	2015–2019_4	17
2010–2014_6	2015–2019_1	8
2010–2014_6	2015–2019_1	5
2010–2014_6	2015–2019_0	4
2010–2014_6	2015–2019_2	4
2010–2014_6	2015–2019_4	3
2010–2014_6	2015–2019_5	3
2010–2014_6	2015–2019_0	2
From	To	Edges
2010–2014_6	2015–2019_5	2
2010–2014_6	2015–2019_6	2
2010–2014_6	2015–2019_7	2
2010–2014_6	2015–2019_8	2
2010–2014_6	2015–2019_9	2
2010–2014_6	2015–2019_1	1
2010–2014_6	2015–2019_2	1
2010–2014_6	2015–2019_4	1
2010–2014_6	2015–2019_5	1
2010–2014_6	2015–2019_6	1
2010–2014_6	2015–2019_8	1
2010–2014_6	2015–2019_9	1
2010–2014_7	2015–2019_9	4
2010–2014_7	2015–2019_3	2
2010–2014_7	2015–2019_5	2
2010–2014_7	2015–2019_0	1
2010–2014_7	2015–2019_3	1
2010–2014_7	2015–2019_5	1
2010–2014_7	2015–2019_9	1
2010–2014_8	2015–2019_1	70
2010–2014_8	2015–2019_9	11
2010–2014_8	2015–2019_8	7
2010–2014_8	2015–2019_3	4
2010–2014_8	2015–2019_0	2
2010–2014_8	2015–2019_4	2
2010–2014_8	2015–2019_1	1
2010–2014_8	2015–2019_2	1

Table 7 (continued)

From	To	Edges
2010–2014_8	2015–2019_4	1
From	To	Edges
2010–2014_8	2015–2019_5	1
2010–2014_8	2015–2019_6	1
2010–2014_9	2015–2019_5	61
2010–2014_9	2015–2019_8	8
2010–2014_9	2015–2019_2	4
2010–2014_9	2015–2019_1	3
2010–2014_9	2015–2019_5	3
2010–2014_9	2015–2019_1	2
2010–2014_9	2015–2019_0	1
2010–2014_9	2015–2019_3	1
2010–2014_9	2015–2019_4	1
2010–2014_9	2015–2019_5	1
2010–2014_9	2015–2019_9	1

The number at the end of the timeframe denotes the number of the detected center–periphery structure

Appendix 6: Sensitivity analyses

See Tables 8, 9, 10, 11 and Figs. 13, 14, 15, 16, 17, 18, 19, 20, 21, 22.

Table 8 Differences in the number of nodes and edges included in the analysis by threshold

	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
# Cited papers issued in the included journals	376	1420	2837	4005	5589	7678	10,704	13,803
# Co-citations of papers issued in the included journals	1903	24,689	103,897	176,615	270,224	454,496	899,189	1,392,882
# Papers (nodes) included (threshold = 3)	44	349	994	1581	2078	3122	4907	6490
# Papers included (threshold = 5)	11	142	502	787	1061	1540	2610	3572
Δ Papers included, threshold 5 − threshold 3	− 33	− 207	− 492	− 794	− 1017	− 1582	− 2297	− 2918
# Papers included (threshold = 10)	0	25	120	226	314	482	865	1218
Δ Papers included, threshold 10 − threshold 3	− 44	− 324	− 874	− 1355	− 1764	− 2640	− 4042	− 5272
# Papers included (threshold = 15)	0	5	34	76	124	190	365	556

Table 8 (continued)

	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
Δ Papers included, threshold 15 − threshold 3	−44	−344	−960	−1505	−1954	−2932	−4542	−5934
# Papers included (threshold = 20)	0	4	4	34	49	98	177	252
Δ Papers included, threshold 20 − threshold 3	−44	−345	−990	−1547	−2029	−3024	−4730	−6238
	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
# Co-citations (edges) (threshold = 3)	203	5010	31,369	60,824	76,747	129,212	256,297	388,121
# Co-citations (edges) (threshold = 5)	44	1737	12,911	28,243	37,081	61,803	118,947	176,423
Δ Co-citations, threshold 5 − threshold 3	−159	−3273	−18,458	−32,581	−39,666	−67,409	−137,350	−211,698
# Co-citations (edges) (threshold = 10)	0	390	2334	7362	12,014	19,809	34,941	47,957

Table 8 (continued)

	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
Δ Co-citations, threshold 10 − threshold 3	−203	−4620	−29,035	−53,562	−64,733	−109,403	−221,356	−340,164
# Co-citations (edges) (threshold = 15)	0	180	541	2380	5418	8834	14,790	18,702
Δ Co-citations, threshold 15 − threshold 3	−203	−4830	−30,828	−58,444	−71,329	−120,378	−241,507	−369,419
# Co-citations (edges) (threshold = 20)	0	95	47	1141	2845	4975	7696	8564
Δ Co-citations, threshold 20 − threshold 3	−203	−4915	−31,322	−59,683	−73,892	−124,237	−248,601	−379,557

Descriptive statistics of local measures per timeframe and threshold

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1980–1984	3	Betweenness	0	0	0.0261	0.257	0.0279	0.0816	2.7719	8.0987
1980–1984	5	Betweenness	0	0	0	0	0	0	0	0
1980–1984	3	Brokerage	0.2581	0.7309	0.7385	1.125	1	1.0049	−0.2309	−1.5303
1980–1984	5	Brokerage	1	1	1.0341	1.125	1.0625	1.125	1.1894	−0.7639
1980–1984	3	Closeness	0.0233	0.1614	0.1387	0.2989	0.2037	0.2381	−0.1743	−1.3854
1980–1984	5	Closeness	0.1	0.1	0.1273	0.2	0.15	0.2	1.1894	−0.7639
1980–1984	3	Degree	0.0233	0.0465	0.0603	0.186	0.0756	0.1326	1.4584	1.5931

Table 8 (continued)

Descriptive statistics of local measures per timeframe and threshold										
Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1980–1984	5	Degree	0.1	0.1	0.1273	0.2	0.15	0.2	1.1894	−0.7639
1980–1984	3	Eigenvector	0	0.0162	0.0834	0.4347	0.1268	0.287	1.5954	1.4332
1980–1984	5	Eigenvector	0	0	0.1575	0.5774	0.2887	0.5774	1.1894	−0.7639
Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1985–1989	3	Betweenness	0	0	0.0056	0.2504	0.0033	0.0139	8.3354	91.728
1985–1989	5	Betweenness	0	0	0.0111	0.1903	0.0073	0.0378	3.8248	17.347
1985–1989	10	Betweenness	0	0	0.0022	0.0127	0	0.0094	1.759	1.6619
1985–1989	15	Betweenness	0	0.0556	0.0333	0.0556	0.0556	0.0556	−0.6086	−3.3333
1985–1989	20	Betweenness	0	0	0.1667	0.6667	0.1667	0.4667	2	4
1985–1989	3	Brokerage	0.0391	0.4075	0.5173	1.0069	1	1	0.3445	−1.5227
1985–1989	5	Brokerage	0.1151	0.6014	0.6595	1	1	1	−0.1716	−1.6244
1985–1989	10	Brokerage	0.3333	1	0.8234	1.125	1	1.075	−0.4523	−1.3459
1985–1989	15	Brokerage	0.7405	0.7405	0.7443	0.75	0.75	0.75	0.6086	−3.3333
1985–1989	20	Brokerage	0.6111	1.0035	0.9062	1.0069	1.0069	1.0069	−1.9983	3.9944
1985–1989	3	Closeness	0.0029	0.2143	0.1807	0.3579	0.2472	0.276	−0.9363	−0.4042
1985–1989	5	Closeness	0.0071	0.1957	0.1637	0.3135	0.2181	0.2505	−0.8044	−0.7043
1985–1989	10	Closeness	0.0417	0.0833	0.1054	0.25	0.15	0.1875	1.1241	0.2635
1985–1989	15	Closeness	0.8	1	0.92	1	1	1	−0.6086	−3.3333
1985–1989	20	Closeness	0.6	0.75	0.775	1	0.8125	0.925	0.8771	1.9339
1985–1989	3	Degree	0.0029	0.0115	0.0205	0.1954	0.023	0.0575	2.4996	8.1196
1985–1989	5	Degree	0.0071	0.0142	0.0255	0.1277	0.0337	0.0638	1.7183	2.2737
1985–1989	10	Degree	0.0417	0.0833	0.09	0.25	0.0833	0.1667	1.4909	1.5109
1985–1989	15	Degree	0.75	1	0.9	1	1	1	−0.6086	−3.3333

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1985–1989	20	Degree	0.3333	0.6667	0.6667	1	0.75	0.9	0	1.5
1985–1989	3	Eigenvector	0	0.0084	0.0289	0.2657	0.0389	0.0932	2.1899	5.0919
1985–1989	5	Eigenvector	0	0.0122	0.042	0.3832	0.044	0.1267	2.5662	6.7002
1985–1989	10	Eigenvector	0	0	0.102	0.472	0.2143	0.3927	1.3277	0.0296
1985–1989	15	Eigenvector	0.3943	0.4792	0.4453	0.4792	0.4792	0.4792	−0.6086	−3.3333
1985–1989	20	Eigenvector	0.2818	0.5227	0.4847	0.6116	0.5449	0.585	−1.4553	2.7324
Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1990–1994	3	Betweenness	0	0	0.0021	0.1252	0.0015	0.0051	8.9936	112.0491
1990–1994	5	Betweenness	0	0	0.0034	0.2752	0.0018	0.0083	13.3034	224.7963
1990–1994	10	Betweenness	0	0	0.0129	0.4143	0.0007	0.0306	6.2113	47.5339
1990–1994	15	Betweenness	0	0	0.0064	0.0701	0.0019	0.0084	3.0755	8.2552
1990–1994	3	Brokerage	0.0139	0.2374	0.3825	1.125	0.5448	1	0.8478	−0.8095
1990–1994	5	Brokerage	0.0241	0.3759	0.4944	1.125	1	1	0.4684	−1.3581
1990–1994	10	Brokerage	0.0571	0.9058	0.731	1.0069	1	1	−0.578	−1.2797
1990–1994	15	Brokerage	0.2517	1	0.8483	1.125	1	1.125	−0.97	−0.6941
1990–1994	3	Closeness	0.001	0.2771	0.2585	0.4354	0.3155	0.3411	−1.6191	2.4804
1990–1994	5	Closeness	0.002	0.2546	0.2289	0.4453	0.2958	0.3189	−1.3515	0.802
1990–1994	10	Closeness	0.0084	0.2074	0.1808	0.3824	0.2568	0.2608	−0.7716	−0.5648
1990–1994	15	Closeness	0.0303	0.0606	0.0878	0.2182	0.1322	0.1707	0.7639	−0.7551
1990–1994	3	Degree	0.001	0.006	0.0153	0.2397	0.0181	0.041	3.3458	17.3876
1990–1994	5	Degree	0.002	0.008	0.0155	0.2435	0.02	0.0379	4.055	27.8424
1990–1994	10	Degree	0.0084	0.0168	0.0269	0.2437	0.0336	0.0588	3.7127	17.7606
1990–1994	15	Degree	0.0303	0.0606	0.057	0.1818	0.0606	0.0909	1.9154	4.0041
1990–1994	3	Eigenvector	0	0.0045	0.0167	0.2172	0.0211	0.051	2.6036	8.6754
1990–1994	5	Eigenvector	0	0.0075	0.0229	0.2458	0.0253	0.0666	2.7514	8.3434

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1990–1994	10	Eigenvector	0	0.0193	0.0483	0.4013	0.0554	0.1047	2.8907	8.9377
1990–1994	15	Eigenvector	0	0	0.0908	0.513	0.1383	0.3436	1.5884	1.4247
Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
1995–1999	3	Betweenness	0	0	0.0014	0.127	0.0008	0.0035	12.1264	219.8006
1995–1999	5	Betweenness	0	0	0.0027	0.2086	0.0013	0.0055	11.9663	186.1902
1995–1999	10	Betweenness	0	0	0.0088	0.4359	0.0034	0.0206	8.7807	92.6387
1995–1999	20	Betweenness	0	0	0.0125	0.1383	0.009	0.0363	3.2649	12.5593
1995–1999	3	Brokerage	0.0107	0.217	0.3629	1.125	0.5347	1	0.9248	−0.6275
1995–1999	5	Brokerage	0.0209	0.3044	0.4434	1.125	0.7275	1	0.6556	−1.1054
1995–1999	10	Brokerage	0.0713	0.4793	0.5745	1.0069	1	1	0.3221	−1.4941
1995–1999	20	Brokerage	0.2641	0.7734	0.7544	1	1	1	−0.4223	−1.328
1995–1999	3	Closeness	0.0006	0.2796	0.266	0.4519	0.3153	0.341	−1.8465	4.041
1995–1999	5	Closeness	0.0013	0.2609	0.2366	0.4216	0.2914	0.3115	−1.6203	2.0945
1995–1999	10	Closeness	0.0044	0.2096	0.184	0.3732	0.2389	0.2637	−1.0976	0.1494
1995–1999	20	Closeness	0.0303	0.1337	0.1369	0.2873	0.1836	0.2362	0.1744	−0.8035
1995–1999	3	Degree	0.0006	0.0044	0.0111	0.2063	0.0127	0.031	3.5609	20.4317
1995–1999	5	Degree	0.0013	0.0064	0.0129	0.2087	0.0153	0.0344	3.6026	21.8649
1995–1999	10	Degree	0.0044	0.0133	0.0217	0.1778	0.0267	0.0489	2.7357	10.9403
1995–1999	20	Degree	0.0303	0.0606	0.0802	0.2424	0.1136	0.1515	1.2774	1.2059
1995–1999	3	Eigenvector	0	0.0026	0.012	0.205	0.0128	0.0355	3.1479	12.3023
1995–1999	5	Eigenvector	0	0.0035	0.0163	0.2541	0.0161	0.0452	3.3343	12.8804
1995–1999	10	Eigenvector	0	0.0058	0.0319	0.3125	0.0302	0.1153	2.7025	7.6016
1995–1999	20	Eigenvector	0	0.005	0.0943	0.4806	0.1077	0.3362	1.5319	1.1832

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
2000–2004	3	Betweenness	0	0	0.001	0.0979	0.0005	0.0021	13.0558	211.1869
2000–2004	5	Betweenness	0	0	0.0022	0.1635	0.0012	0.0049	10.8077	143.1961
2000–2004	10	Betweenness	0	0	0.0041	0.1628	0.0003	0.0083	6.8531	51.6739
2000–2004	15	Betweenness	0	0	0.0045	0.1305	0.0011	0.012	6.2509	49.5567
2000–2004	20	Betweenness	0	0	0.0153	0.2605	0.0027	0.0548	4.3877	22.7378
2000–2004	3	Brokerage	0.01	0.2178	0.3597	1.125	0.5123	1	1.0033	−0.4721
2000–2004	5	Brokerage	0.0207	0.3551	0.4636	1.2346	0.7812	1	0.5804	−1.1611
2000–2004	10	Brokerage	0.0534	0.5554	0.6223	1.7778	1	1	0.201	−0.906
2000–2004	15	Brokerage	0.0839	0.5684	0.6679	4	1	1	3.428	25.052
2000–2004	20	Brokerage	0.1413	0.5688	0.6789	4	1	1	4.2168	24.1606
2000–2004	3	Closeness	0.0005	0.2875	0.2741	0.451	0.3184	0.3426	−2.0851	5.5726
2000–2004	5	Closeness	0.0009	0.2478	0.2305	0.4032	0.2819	0.302	−1.6315	2.52
2000–2004	10	Closeness	0.0032	0.1716	0.1382	0.3213	0.2102	0.2379	−0.4428	−1.315
2000–2004	15	Closeness	0	0.1742	0.1326	0.3543	0.2182	0.2514	0.0173	−1.4748
2000–2004	20	Closeness	0	0.2804	0.2449	0.5317	0.3403	0.38	−0.5641	−0.8679
2000–2004	3	Degree	0.0005	0.0034	0.0078	0.1887	0.0091	0.0193	5.2239	42.246
2000–2004	5	Degree	0.0009	0.0038	0.0088	0.1877	0.0094	0.0198	5.2868	41.0395
2000–2004	10	Degree	0.0032	0.0064	0.017	0.2045	0.0192	0.0447	3.6956	18.46
2000–2004	15	Degree	0.0081	0.0163	0.0338	0.2846	0.0407	0.0789	2.9732	11.9617
2000–2004	20	Degree	0.0208	0.0417	0.0859	0.4583	0.1042	0.1708	2.3881	6.5319
2000–2004	3	Eigenvector	0	0.0021	0.0098	0.2127	0.0098	0.0285	4.0915	22.7254
2000–2004	5	Eigenvector	0	0.0019	0.0127	0.2593	0.0107	0.0369	3.9616	19.7812
2000–2004	10	Eigenvector	0	0.0007	0.0256	0.3382	0.0248	0.0846	2.9658	10.2826
2000–2004	15	Eigenvector	0	0.0119	0.047	0.4006	0.0586	0.1462	2.2222	5.2389
2000–2004	20	Eigenvector	0	0.0547	0.0948	0.4291	0.1521	0.2344	1.3241	1.4174

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
2005–2009	3	Betweenness	0	0	0.0007	0.1705	0.0002	0.0012	22.4041	625.6593
2005–2009	5	Betweenness	0	0	0.0016	0.2059	0.0004	0.0028	15.852	297.257
2005–2009	10	Betweenness	0	0	0.0045	0.2788	0.0006	0.0072	8.8791	92.9309
2005–2009	15	Betweenness	0	0	0.0074	0.2616	0.0007	0.0107	6.2412	44.0494
2005–2009	20	Betweenness	0	0	0.0065	0.1375	0.0003	0.0178	4.5435	21.9499
2005–2009	3	Brokerage	0.0063	0.2066	0.3566	1.125	0.5157	1	0.9771	−0.5088
2005–2009	5	Brokerage	0.0134	0.3286	0.45	1.125	0.8334	1	0.6111	−1.1703
2005–2009	10	Brokerage	0.0364	0.5388	0.6002	1.2656	1	1	0.0265	−1.5505
2005–2009	15	Brokerage	0.056	0.6247	0.6531	1.7778	1	1	0.0333	−1.0424
2005–2009	20	Brokerage	0.104	0.7898	0.6976	1.7778	1	1	0.0034	−0.7151
2005–2009	3	Closeness	0.0003	0.3	0.2909	0.4754	0.3296	0.3528	−2.3217	8.0863
2005–2009	5	Closeness	0.0006	0.2738	0.2652	0.455	0.3041	0.3311	−2.0717	6.4777
2005–2009	10	Closeness	0.0021	0.2067	0.1837	0.3586	0.2514	0.2685	−1.0475	0.0738
2005–2009	15	Closeness	0.0053	0.2296	0.1951	0.4012	0.2698	0.3009	−0.7653	−0.7159
2005–2009	20	Closeness	0.0103	0.212	0.17	0.4081	0.2623	0.2942	−0.2344	−1.4325
2005–2009	3	Degree	0.0003	0.0022	0.0059	0.1971	0.0064	0.0151	6.6852	71.8935
2005–2009	5	Degree	0.0006	0.0026	0.007	0.1975	0.0078	0.0162	6.6376	67.2581
2005–2009	10	Degree	0.0021	0.0062	0.0119	0.2308	0.0125	0.027	5.7548	45.612
2005–2009	15	Degree	0.0053	0.0106	0.0232	0.291	0.0265	0.0429	4.838	28.9129
2005–2009	20	Degree	0.0103	0.0206	0.0385	0.3093	0.0412	0.0753	3.4817	13.7823
2005–2009	3	Eigenvector	0	0.0013	0.0074	0.1917	0.0064	0.0211	4.4891	27.4232
2005–2009	5	Eigenvector	0	0.0012	0.0103	0.2378	0.0086	0.0306	4.2431	23.7223
2005–2009	10	Eigenvector	0	0.001	0.0204	0.3248	0.022	0.0653	3.4568	15.4416
2005–2009	15	Eigenvector	0	0.0183	0.0391	0.3891	0.0495	0.1109	2.8215	10.3482
2005–2009	20	Eigenvector	0	0.0247	0.058	0.4148	0.0938	0.1568	2.2006	5.6682

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
2010–2014	3	Betweenness	0	0	0.0004	0.1906	0.0001	0.0008	34.2421	1493.9924
2010–2014	5	Betweenness	0	0	0.0009	0.2058	0.0003	0.0015	21.3671	546.2176
2010–2014	10	Betweenness	0	0	0.0034	0.3304	0.001	0.0059	12.4398	187.5777
2010–2014	15	Betweenness	0	0	0.0056	0.3511	0.0001	0.0085	9.1529	94.6316
2010–2014	20	Betweenness	0	0	0.0106	0.2518	0.0002	0.0169	4.2899	19.3961
2010–2014	3	Brokerage	0.0038	0.1608	0.3042	1.125	0.468	1	1.2494	0.189
2010–2014	5	Brokerage	0.0081	0.2696	0.4095	1.125	0.5923	1	0.7748	−0.9223
2010–2014	10	Brokerage	0.0281	0.5057	0.5748	1.125	1	1	0.1534	−1.5023
2010–2014	15	Brokerage	0.0581	0.72	0.6822	1.0069	1	1	−0.3628	−1.3935
2010–2014	20	Brokerage	0.072	1	0.7248	1.2025	1	1	−0.4925	−1.3668
2010–2014	3	Closeness	0.0002	0.3156	0.3037	0.4797	0.3353	0.3583	−2.3539	10.6063
2010–2014	5	Closeness	0.0004	0.2796	0.2708	0.4354	0.3052	0.3271	−2.358	8.5344
2010–2014	10	Closeness	0.0012	0.2171	0.2057	0.3581	0.2545	0.2668	−1.7318	3.2448
2010–2014	15	Closeness	0.0027	0.1708	0.1444	0.309	0.1912	0.2281	−0.8441	−0.6201
2010–2014	20	Closeness	0.0057	0.127	0.0949	0.2061	0.1529	0.1686	−0.2678	−1.5432
2010–2014	3	Degree	0.0002	0.0016	0.0048	0.1814	0.0053	0.0122	6.9599	84.7109
2010–2014	5	Degree	0.0004	0.0019	0.0048	0.1629	0.0054	0.0111	7.2488	84.8573
2010–2014	10	Degree	0.0012	0.0035	0.0067	0.1435	0.0069	0.015	5.9326	51.9826
2010–2014	15	Degree	0.0027	0.0055	0.0108	0.1566	0.011	0.0247	4.8382	32.045
2010–2014	20	Degree	0.0057	0.0114	0.0185	0.2102	0.0227	0.0455	4.5181	26.0224
2010–2014	3	Eigenvector	0	0.0016	0.0062	0.1881	0.0059	0.0171	4.8981	35.9774
2010–2014	5	Eigenvector	0	0.0015	0.0077	0.2362	0.0068	0.0207	5.2221	38.0488
2010–2014	10	Eigenvector	0	0.0009	0.0128	0.3127	0.0098	0.0398	4.532	26.6336
2010–2014	15	Eigenvector	0	0.0006	0.0209	0.3716	0.0181	0.0653	3.7627	17.5001
2010–2014	20	Eigenvector	0	0.0003	0.0346	0.4312	0.0361	0.1272	3.0203	11.3822

Table 8 (continued)

Timeframe	Threshold	Measure	Minimum	Median	Mean	Maximum	75th Quantile	90th Quantile	Skewness	Kurtosis
2015–2019	3	Betweenness	0	0	0.0003	0.1261	0.0001	0.0005	30.4283	1331.8894
2015–2019	5	Betweenness	0	0	0.0007	0.1763	0.0001	0.0011	24.3842	798.8345
2015–2019	10	Betweenness	0	0	0.0025	0.263	0.0007	0.0052	14.3008	240.4096
2015–2019	15	Betweenness	0	0	0.0046	0.2558	0.0005	0.008	8.0291	73.6597
2015–2019	20	Betweenness	0	0	0.0014	0.0707	0.0001	0.0027	8.8773	90.7271
2015–2019	3	Brokerage	0.004	0.1436	0.2918	1.125	0.3798	1	1.3224	0.365
2015–2019	5	Brokerage	0.0082	0.267	0.4072	1.0133	0.5777	1	0.7634	−0.959
2015–2019	10	Brokerage	0.0283	0.5	0.5693	1.0449	1	1	0.1747	−1.5447
2015–2019	15	Brokerage	0.0554	0.7172	0.6952	1.1901	1	1	−0.3223	−1.417
2015–2019	20	Brokerage	0.0808	0.8958	0.7569	1	1	1	−0.6159	−1.0181
2015–2019	3	Closeness	0.0002	0.308	0.2961	0.4604	0.3286	0.3507	−2.5929	10.2987
2015–2019	5	Closeness	0.0003	0.2706	0.2628	0.4266	0.297	0.3181	−2.5189	8.5736
2015–2019	10	Closeness	0.0008	0.2007	0.1855	0.3255	0.2187	0.2441	−1.8402	3.2559
2015–2019	15	Closeness	0.0018	0.1314	0.1087	0.2306	0.1508	0.1768	−0.7321	−0.8466
2015–2019	20	Closeness	0.004	0.0254	0.0458	0.1674	0.0862	0.1129	0.7785	−0.8741
2015–2019	3	Degree	0.0002	0.0014	0.0042	0.1294	0.0043	0.0109	5.4736	47.8131
2015–2019	5	Degree	0.0003	0.0014	0.0039	0.105	0.0042	0.0098	5.4962	48.7523
2015–2019	10	Degree	0.0008	0.0025	0.0047	0.0953	0.0058	0.0115	5.2164	44.3472
2015–2019	15	Degree	0.0018	0.0036	0.0061	0.0865	0.0072	0.0144	4.8607	36.1359
2015–2019	20	Degree	0.004	0.008	0.0104	0.1195	0.012	0.0199	4.8253	33.3005
2015–2019	3	Eigenvector	0	0.0012	0.0053	0.1365	0.0051	0.0143	4.4953	27.4305
2015–2019	5	Eigenvector	0	0.0013	0.0067	0.1996	0.0059	0.0174	5.0734	35.462
2015–2019	10	Eigenvector	0	0.0007	0.01	0.3287	0.0061	0.0274	5.4539	41.4879
2015–2019	15	Eigenvector	0	0.0002	0.0137	0.3695	0.0049	0.0441	5.0321	31.4437
2015–2019	20	Eigenvector	0	0	0.0216	0.4135	0.009	0.0561	4.1058	18.5415

Table 9 Global network measures by threshold

Timeframe	Threshold	# Nodes	# Edges	Components	Nodes largest component	Modularity	Transitivity
1980–1984	3	44	57	7	29	0.6994	0.3952
1985–1989	3	349	1247	27	284	0.6106	0.3402
1990–1994	3	994	7574	32	919	0.5189	0.3097
1995–1999	3	1581	13,834	37	1494	0.5977	0.3153
2000–2004	3	2078	16,918	36	1976	0.5666	0.2465
2005–2009	3	3122	28,699	37	3029	0.5478	0.224
2010–2014	3	4907	57,899	30	4826	0.567	0.2032
2015–2019	3	6490	88,853	53	6328	0.5664	0.207
1980–1984	5	11	7	5	3	0.7521	1
1985–1989	5	142	255	14	108	0.6864	0.3514
1990–1994	5	502	1951	26	430	0.6116	0.3077
1995–1999	5	787	3995	26	710	0.6748	0.3389
2000–2004	5	1061	4927	29	972	0.6307	0.2766
2005–2009	5	1540	8268	24	1482	0.6018	0.2439
2010–2014	5	2610	16,294	29	2532	0.632	0.2143
2015–2019	5	3572	24,626	44	3434	0.6446	0.2242
1985–1989	10	25	27	7	7	0.5993	0.661
1990–1994	10	120	192	9	93	0.7267	0.2767
1995–1999	10	226	551	13	187	0.7588	0.3815
2000–2004	10	314	834	29	217	0.6257	0.3451
2005–2009	10	482	1384	21	406	0.592	0.2672
2010–2014	10	865	2496	24	804	0.6905	0.2494
2015–2019	10	1218	3519	38	1115	0.7611	0.2598
1985–1989	15	5	9	1	5	0	0.875
1990–1994	15	34	32	9	13	0.781	0.2885
2000–2004	15	124	258	15	68	0.5637	0.3725
2005–2009	15	190	416	16	148	0.5302	0.2417
2010–2014	15	365	719	27	284	0.7013	0.2718
2015–2019	15	556	944	43	419	0.8224	0.2751
1985–1989	20	4	4	1	4	0	0.6
1995–1999	20	34	45	6	17	0.6772	0.4809
2000–2004	20	49	101	7	36	0.4258	0.3726
2005–2009	20	98	183	12	62	0.5034	0.2814
2010–2014	20	177	288	20	117	0.6609	0.2766
2015–2019	20	252	329	40	87	0.8335	0.3073

Table 10 Descriptive statistics of core–periphery structures by threshold—nodes and components (KM-Algorithm)

Timeframe	Threshold	Nodes	Nodes in significant CP-structures	Share of nodes present in CP-structures	Number of nodes belonging to the significant cores	Cores and peripheries	Number of components with significant CP-structures
1980–1984	3	44	5	0.113636	4	1	1
1985–1989	3	349	239	0.684814	141	9	1
1990–1994	3	994	774	0.778672	485	13	1
1995–1999	3	1581	1245	0.787476	733	14	1
2000–2004	3	2078	1797	0.864774	1081	24	2
2005–2009	3	3122	2813	0.901025	1511	26	2
2010–2014	3	4907	4613	0.940086	2631	27	2
2015–2019	3	6490	6315	0.973035	3452	68	12
1980–1984	5	11	0	0	0	0	0
1985–1989	5	142	75	0.528169	38	4	2
1990–1994	5	502	378	0.752988	235	9	1
1995–1999	5	787	618	0.78526	328	11	1
2000–2004	5	1061	808	0.761546	439	13	1
2005–2009	5	1540	1323	0.859091	688	22	1
2010–2014	5	2610	2357	0.903065	1169	24	1
2015–2019	5	3572	3108	0.870101	1559	26	2
1980–1984	10	25	7	0.28	4	1	1
1985–1989	10	120	54	0.45	25	4	2
1990–1994	10	226	147	0.650442	95	6	1
1995–1999	10	314	206	0.656051	92	6	2
2000–2004	10	482	290	0.60166	192	8	3
2005–2009	10	865	549	0.634682	291	12	1
2010–2014	10	1218	812	0.666667	408	22	1
1980–1984	15	5	0	0	0	0	0
1985–1989	15	34	0	0	0	0	0
1990–1994	15	124	70	0.564516	49	4	2
1995–1999	15	190	104	0.547368	73	3	1
2000–2004	15	365	172	0.471233	79	6	2
2005–2009	15	556	127	0.228417	67	11	4
1980–1984	20	4	0	0	0	0	0
1985–1989	20	34	15	0.441176	7	2	2

Table 10 (continued)

Timeframe	Threshold	Nodes	Nodes in significant CP-structures	Share of nodes present in CP-structures	Number of nodes belonging to the significant cores	Cores	Number of components with significant CP-structures
1990–1994	20	49	0	0	0	0	0
1995–1999	20	98	34	0.346939	16	2	1
2000–2004	20	177	71	0.40113	33	6	3
2005–2009	20	252	49	0.194444	34	7	5

Table 11 Descriptive statistics of core–periphery structures by threshold—descriptives of core–periphery size (KM-Algorithm)

Timeframe	Threshold	Nodes	Minimum size of CP-structures	Median size of CP-structures	Mean size of CP-structures	Maximum size of CP-structures	Skewness of CP-structures	Kurtosis of CP-structures
1980–1985	3	44	5	5	5	5		
1985–1990	3	349	6	15	26.56	63	0.55	−1.07
1990–1995	3	994	15	32	59.54	187	1.15	−0.12
1995–2000	3	1581	11	39	88.93	286	1.03	−0.42
2000–2005	3	2078	13	25	74.88	369	2.13	3.64
2005–2010	3	3122	9	37	108.19	573	1.82	2.09
2010–2015	3	4907	9	32	170.85	1175	2.14	3.79
2015–2020	3	6490	2	11	92.87	1089	3.19	10.12
1980–1985	5	11	0	0	0	0	0	0
1985–1990	5	142	4	23	18.75	25	−1.04	−0.77
1990–1995	5	502	9	27	42	106	0.72	−1.14
1995–2000	5	787	12	46	56.18	150	0.87	−0.52
2000–2005	5	1061	10	22	62.15	319	2.33	4.66
2005–2010	5	1540	8	38	60.14	236	1.69	2.26
2010–2015	5	2610	11	37	98.21	545	1.94	2.68
2015–2020	5	3572	11	50	119.54	581	2	2.57
1985–1990	10	25	7	7	7	7		
1990–1995	10	120	4	12	13.5	25	0.1	−1.85
1995–2000	10	226	14	25	24.5	34	−0.13	−1.65
2000–2005	10	314	7	32	34.33	78	0.45	−1.08
2005–2010	10	482	10	29	36.25	69	0.29	−1.53
2010–2015	10	865	8	22	45.75	136	0.99	−0.35
2015–2020	10	1218	9	22	36.91	193	2.6	6.68

Table 11 (continued)

Timeframe	Threshold	Nodes	Minimum size of CP-structures	Median size of CP-structures	Mean size of CP-structures	Maximum size of CP-structures	Skewness of CP-structures	Kurtosis of CP-structures
1985–1990	15	5	0	0	0	0	0	0
1990–1995	15	34	0	0	0	0	0	0
2000–2005	15	124	2	15	17.5	37	0.4	−1.18
2005–2010	15	190	20	28	34.67	56	0.57	−1.5
2010–2015	15	365	1	28	28.67	70	0.48	−0.77
2015–2020	15	556	2	13	11.55	21	−0.19	−1.29
1985–1990	20	4	0	0	0	0	0	0
1995–2000	20	34	6	7	7.5	9	0	−2
2000–2005	20	49	0	0	0	0	0	0
2005–2010	20	98	5	17	17	29	0	−2
2010–2015	20	177	1	12	11.83	23	0	−1.3
2015–2020	20	252	3	8	7	10	−0.31	−1.34

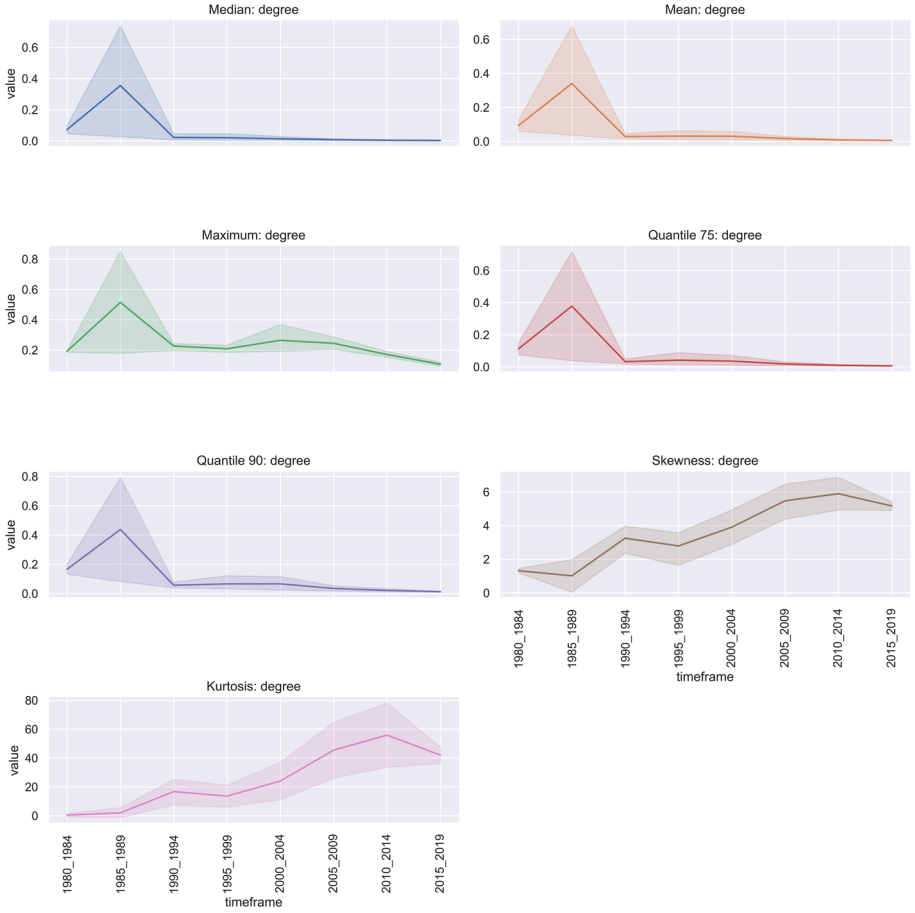

Fig. 13 Descriptive statistics of weighted degree centrality by timeframe

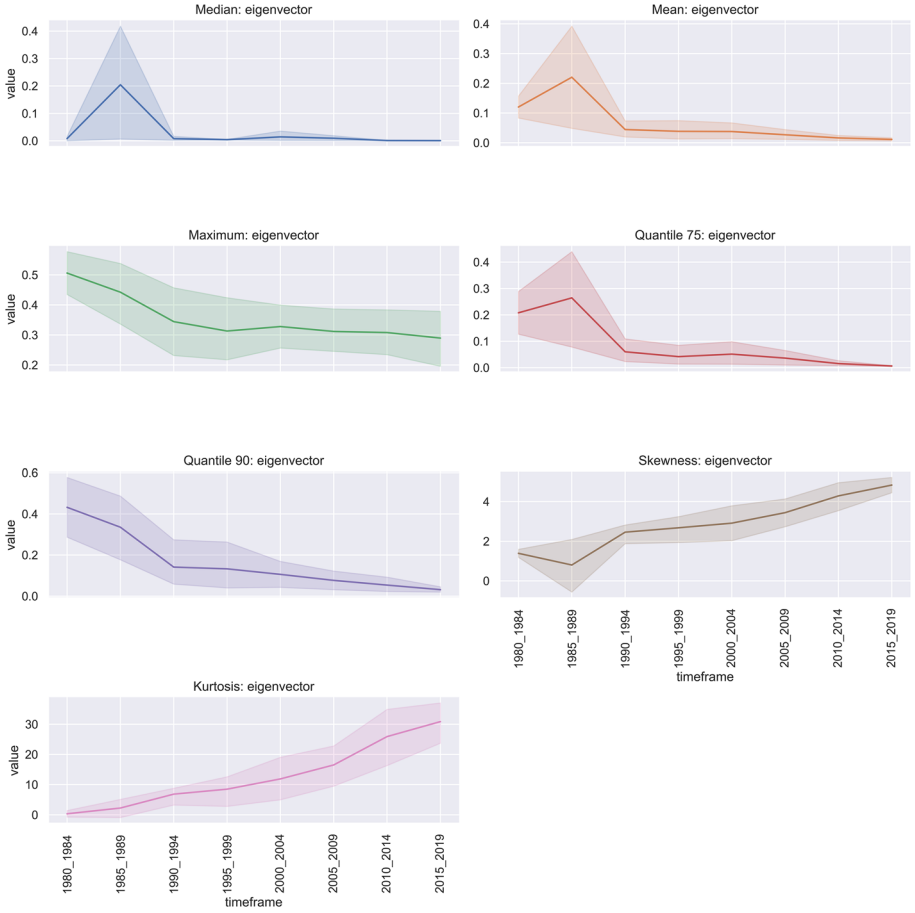

Fig. 14 Descriptive statistics of weighted eigenvector centrality by timeframe

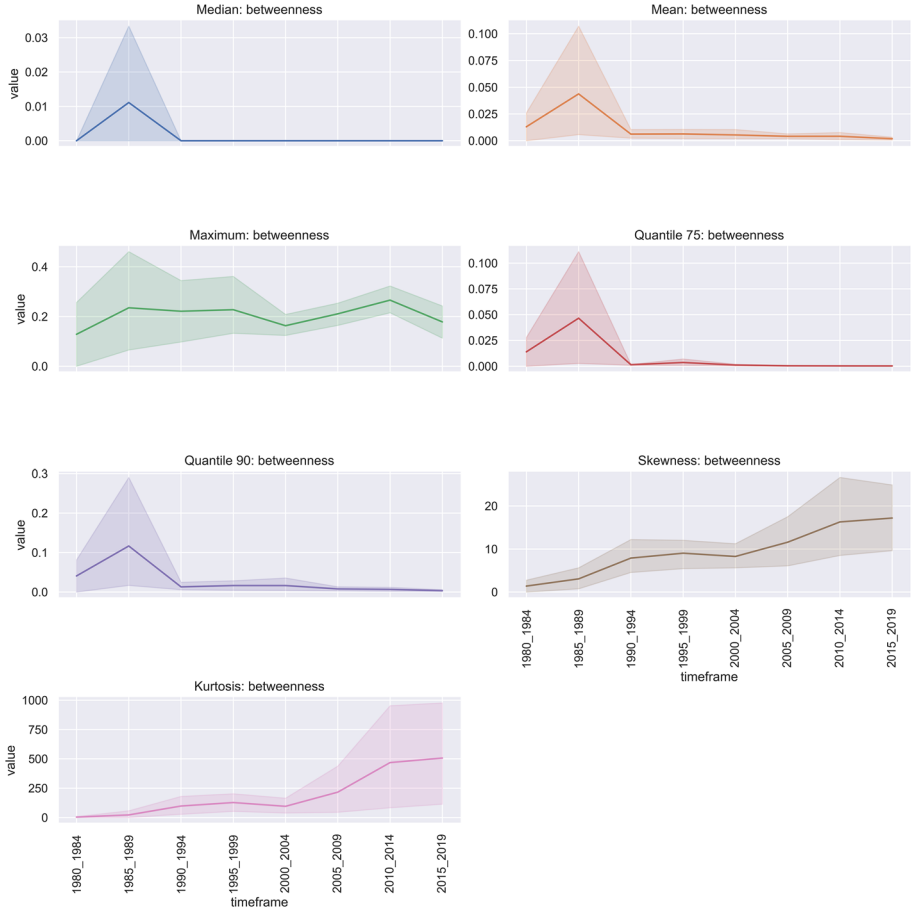

Fig. 15 Descriptive statistics of weighted betweenness centrality by timeframe

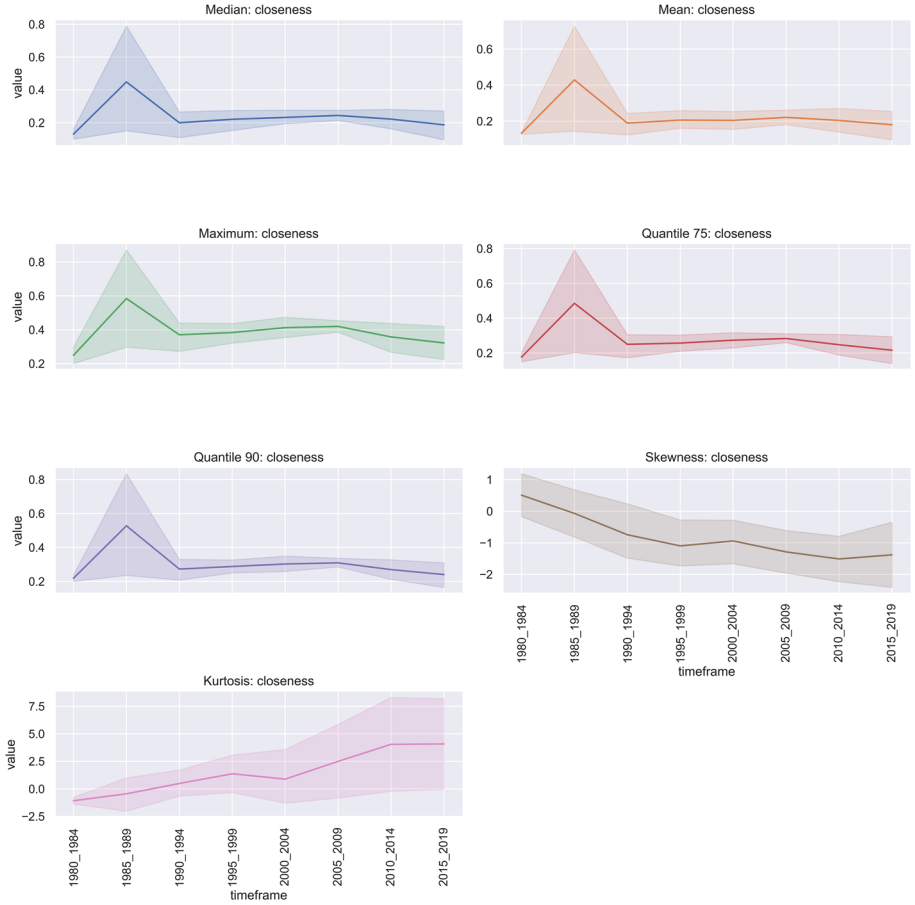

Fig. 16 Descriptive statistics of closeness centrality by timeframe

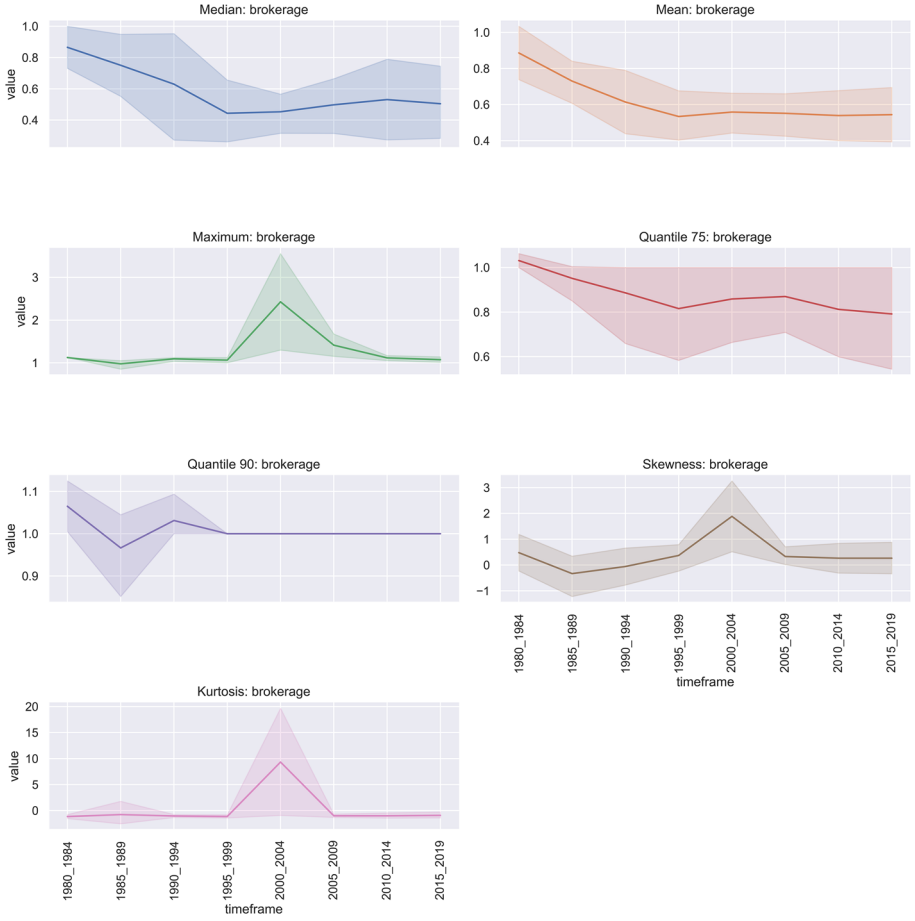

Fig. 17 Descriptive statistics of constraint by timeframe

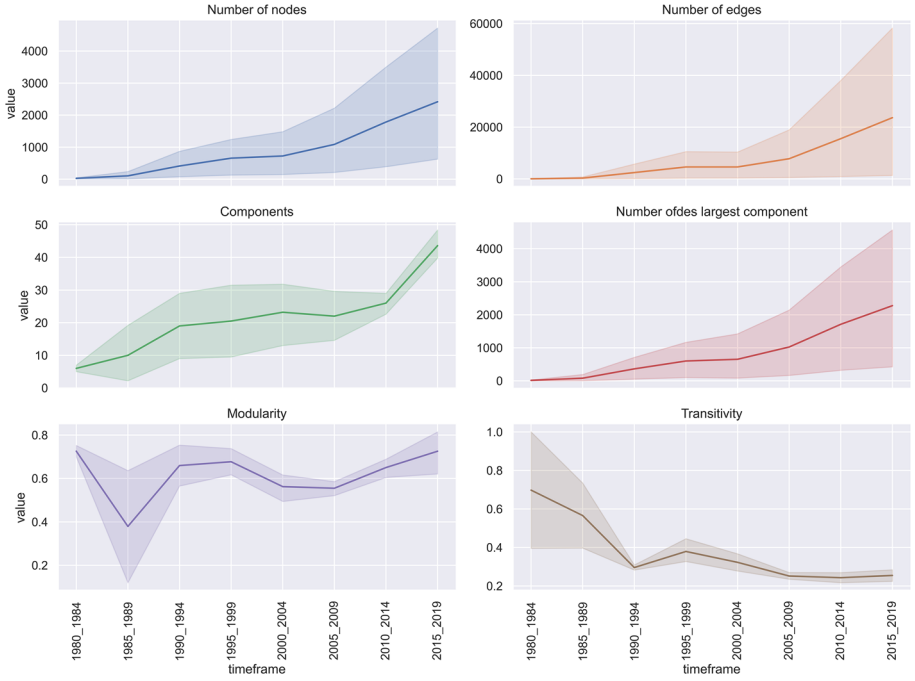

Fig. 18 Global network measures by threshold over time

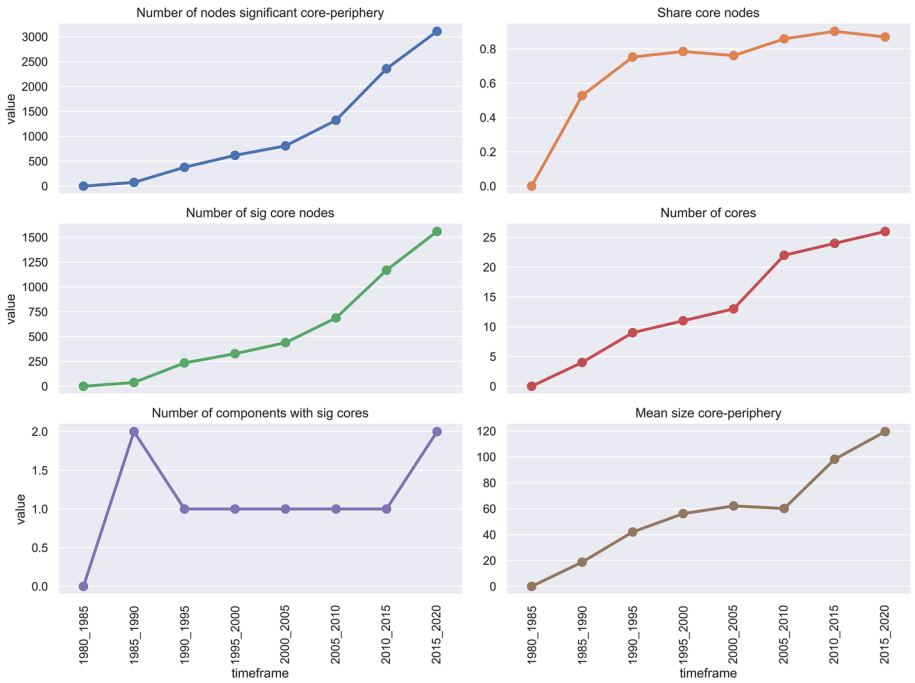

Fig. 19 Global Centrality Measures (threshold = 5 co-citations)

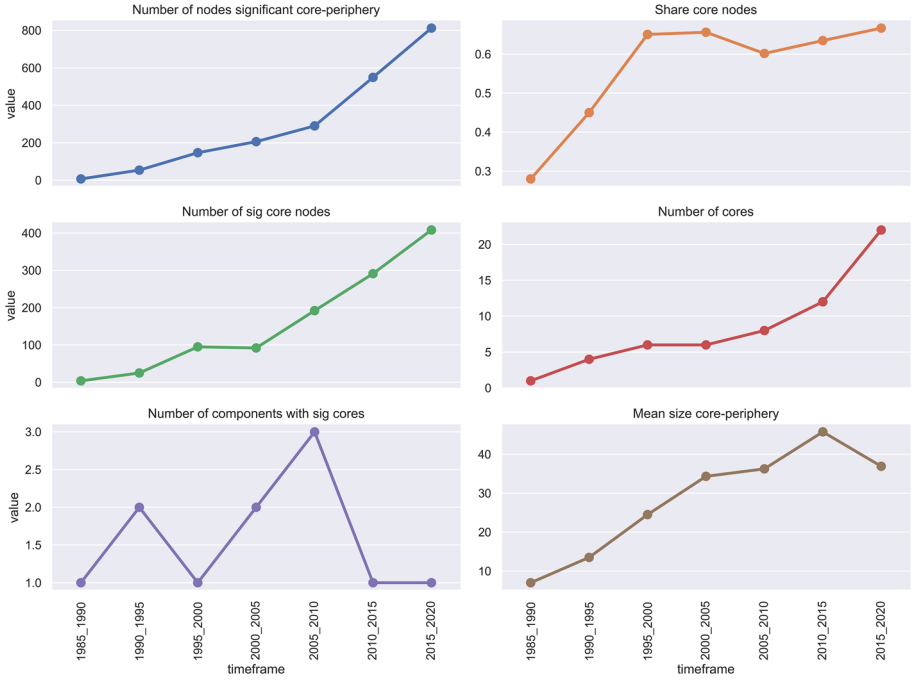

Fig. 20 Global Centrality Measures (threshold = 10 co-citations)

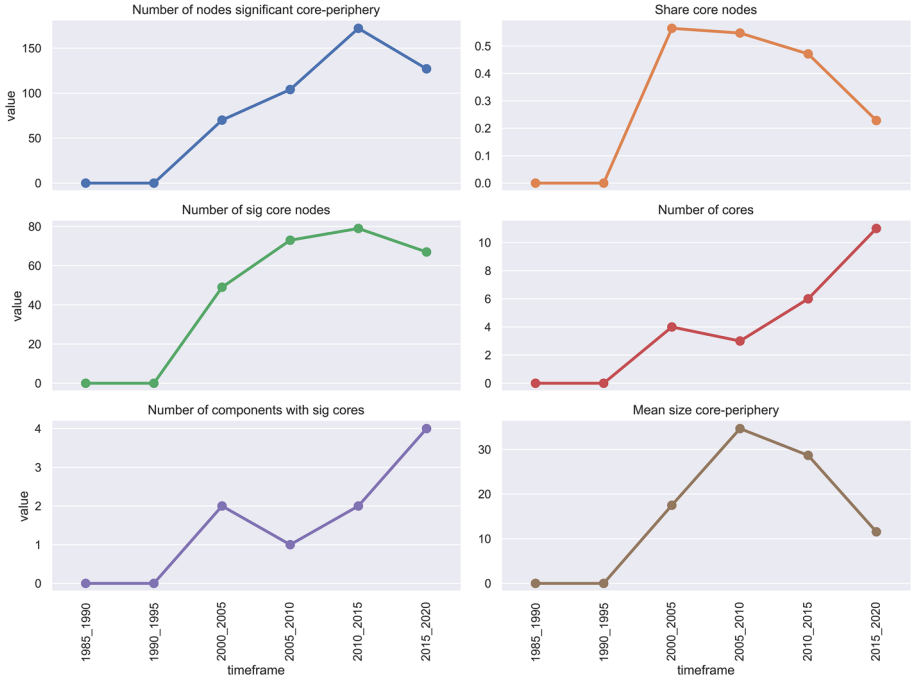

Fig. 21 Global Centrality Measures (threshold = 15 co-citations)

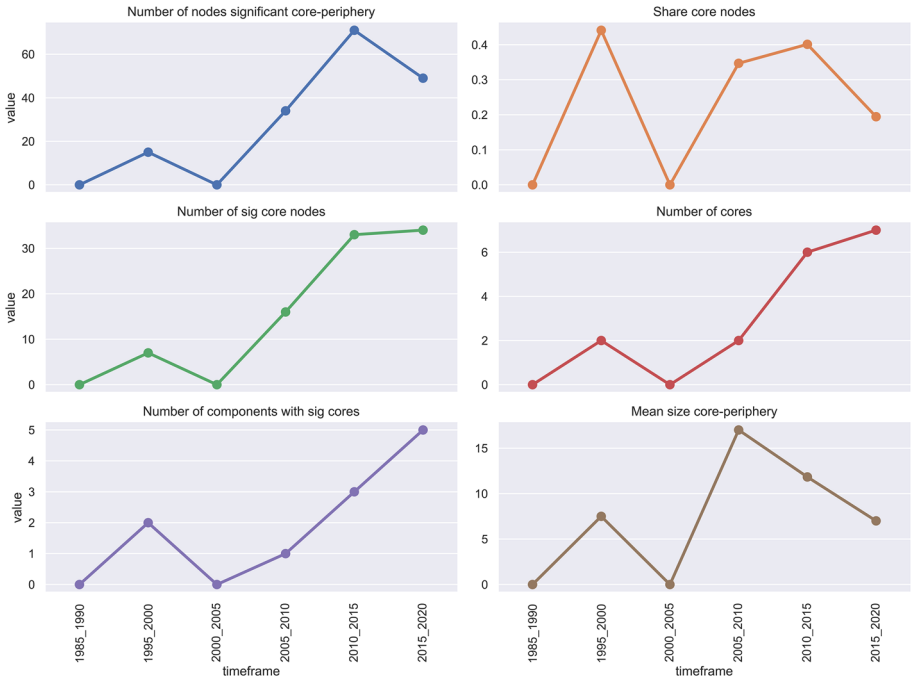

Fig. 22 Global Centrality Measures (threshold = 20 co-citations)

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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