
Applying Network and Bibliometric Analyses to Mentions of Politicians in Plenary Speeches: Case ParliamentSampo – Parliament of Finland on the Semantic Web

Henna Poikkimäki¹, Kati Katajisto², Petri Leskinen^{1,3} and Eero Hyvönen^{1,3}

Abstract

Members of Parliament (MPs) mention each other for various reasons in parliamentary debate speeches. Recognizing person name mentions from textual speeches and linking them to corresponding speakers allows construction of mention networks of politicians that can be analyzed using methods of network science and bibliometrics. Studying name mentions brings new perspective to political history and politology questions, such as the personalization of politics, analyzing the rise of populism and the hypothesis of strengthening or weakening of the position of the Parliament. Constructing and analyzing networks based on name mentions in parliamentary speeches can reveal patterns in person name mentions, and the results can be used to find potentially interesting MPs and related parliamentary speeches for closer study. We show how networks based on person name mentions in speeches can be constructed and analyzed based on the speech corpus 2015–2022 of the Parliament of Finland. Our results indicate that the party of the MP and its political role (government or opposition), as well as MPs own activity in parliamentary debate speeches affect who mentions whom. Naming practises in the debate speeches also suggest that not only political matters fight, but also persons. Even though this study concentrates on the debate speeches given in the Parliament of Finland, the same methods can be used to study other speech or text corpora containing person name mentions.

Keywords

parliamentary studies, digital humanities, network analysis, linked data, bibliometrics

¹Department of Computer Science, Aalto University, Finland

² Helsinki Institute of Urban and Regional Studies (Urbaria), University of Helsinki, Finland

³ Helsinki Centre for Digital Humanities (HELDIG), University of Helsinki, Finland

Corresponding author:

Henna Poikkimäki, Aalto University Department of Computer Science Konemiehentie 2 02150 Espoo, Finland
Email: henna.poikkimaki@aalto.fi

Introduction

Openness and transparency of parliamentary work is a foundation of democracy. An important public part of parliamentary work are the plenary debates where the members of Parliament (MPs) discuss and enact new laws, oversee the work of the government, and decide on the state budget. The minutes of the plenary sessions therefore provide interesting information about the state and functioning of democratic systems and enable study of political life, language, and culture (Benoît & Rozenberg, 2020).

The minutes of the plenary debates of various Parliaments have been forged into parliamentary corpora, see, e.g., (Lapponi, Søyland, Velldal, & Oepen, 2018). Parliamentary discussions and other materials have also been transformed into Linked Data (LD) when, e.g., creating the LinkedEP (Van Aggelen, Hollink, Kemman, Kleppe, & Beunders, 2017) system based on the European Parliament's data¹, the LinkedSacima for the Latvian parliament (Bojārs, Dargis, Lavrinovičs, & Paikens, 2019), and the Finnish ParliamentSampo (Hyvönen et al., 2024, 2022; Leskinen, Hyvönen, & Tuominen, 2021; Sinikallio et al., 2021). Transforming parliamentary data into LD provides well-defined semantics for representing and enriching knowledge² aggregated from heterogeneous data sources (Bojārs et al., 2019; Van Aggelen et al., 2017), which makes it easier to query the data and to construct networks for data analyses. The ParliamentSampo linked open data set Sinikallio et al. (2023) is used in this work.

Parliamentary corpora have been used mostly for linguistic analyses. For example, in (Blaxill & Beelen, 2016) the contents of women's parliamentary speeches in the British Parliament were analyzed, and thematic and conceptual analyses of the opinions and language were made in (Beelen et al., 2017; Guldi, 2019; Ihalainen & Sahala, 2020; Kettunen & La Mela, 2021; Quinn, Monroe, Colaresi, Crespin, & Radev, 2010). In earlier research, sociocentric, and egocentric networks connecting the actors have been constructed from different texts based on, e.g., mentioned names, hypertext links, genealogical relations, or similarities in characteristics, such as lifetime events (Elson, McKeown, & Dames, 2010; Leskinen, Rantala, & Hyvönen, 2022; Tamper, Leskinen, Hyvönen, Valjus, & Keravuori, 2023).

In this paper, the latter idea is applied to parliamentary speeches where speakers mention each other. This paper presents, how different networks of MPs and parties can be constructed based on person name mentions in parliamentary speeches, and how these networks can be analyzed using methods of network science and bibliometrics. As a case study, networks were created using the ParliamentSampo data and infrastructure (Hyvönen et al., 2024), specifically the speech subcorpus 2015–2022 of the Parliament of Finland (Hyvönen et al., 2022; Sinikallio et al., 2021) and the knowledge graph (KG) of the MPs (Leskinen et al., 2021). Analyses of networks based on person name mentions reveal, does the party of the speakers (right-wing, left-wing, opposition, government) affect how the MPs are mentioned or who they mention, and who are the most central people in parliamentary discussions from a network analytic point of view. More detailed descriptions of the analyses presented can be found in (Poikkimäki, 2023). How the parliament works in Finland is documented in (Hidén & Honka-Hallila, 2006).

Interpreting Mentions in the Context of Political History

Interdisciplinary research faces often different kind of barriers, which range from research methods, practices to disciplinary siloing (Daniel, McConnell, Schuchardt, & Pepper, 2022). Therefore, this article deepens the preceding analysis by viewing the results in an angle of political history studies in which plenary speech data is highly relevant source material. What kind of new perspectives networks based on name mentions in plenary speeches can offer? To begin with it can be assumed that the naming in plenary

speeches is in many ways similar to the public speeches of politicians in general, as both are connected by the presence of the media and the wider public.

One striking difference is of course that the parliament is a forum in which all political parties execute their main duties; enact laws, decide on the state's budget, and approve international agreements. Therefore, parliamentary speeches may potentially have more value for so-called ordinary MPs, who have a harder time getting their message across in the media than ministers and party leaders. In principle, the same still applies to ministers, as parliament is the official public forum of MPs. Parliament is often spoken of as a theater (Pekonen, 2011), but it is nevertheless a critically important stage for all politicians. The value of the parliamentary speeches demonstrates for example in many meanings and functions of the questions made in parliament, such as a request of information, testing of a minister in a controversial subject and a pressure to action (Franks, 1985; Ilie, 2022; Wiberg, 2014).

To begin with, naming someone else is a double-edged sword for a politician. Naming directs the message to a specific person, as a result of which this person is most likely to respond to the speech made through naming. If an unskilled politician mentions by name a skilled and competent politician, the unskilled or ignorant one can be laughed at. On the positive case, an MP in a non-significant position can have his name appear in the media if the speech where the naming takes place is successful (Wiberg, 2014).

On the other hand, the issue can also be approached from the point of view that all publicity is good publicity. If an unknown member of parliament rises to the public, to people's awareness, then it might be a good thing in the long run. People's political memory has often been described as short. In any way, naming an opponent is always a potential "advertisement" and a recognition, because insignificant or harmless types will not be mentioned. Sometimes politicians also deliberately avoid mentioning names in the media, which can be due, for example, to a hidden sneer. If criticism happened by naming a person, it would seem mean and tasteless (Katajisto, 2023). It can be assumed that there are similar cases in the parliament, where the representatives understand who is being referred to, even if the name is not mentioned, which factor should also be taken into consideration.

Examining name mentions opens perspectives in various research debates in political history and politology. The following passage addresses shortly three topical issues: 1) the personalization of politics 2) analyzing the rise of populism 3) the hypothesis of strengthening/weakening of the position of the Parliament.

The personalization of politics is a trend that has been identified in all the liberal democracies (Karvonen, 2014; McAllister, 2007). The personalization of politics can be defined a process in which the importance of the individual politician increases at the cost of the political party (Rahat & Zamir, 2018; Zamir, 2024). The personalization of politics is not a new phenomenon, although the emergence of various social media platforms has accentuated the process.

The trend of personalization has been linked especially on the role of leaders, presidents, and party leaders, but it is more broadly an essential feature of the changing democratic politics of the recent decades. The personalization of politics underlines the fact that political parties are in decline in most advanced industrial societies. The dealignment thesis thus shows that we are witnessing a comprehensive and ongoing decline in the role of political parties for contemporary publics, and it is not an issue of temporary public dissatisfaction with parties (Dalton, 1984; Dalton & Wattenberg, 2002).

In Finland one strong indication of dealignment is decrease of members of political parties, especially since 1990s, which has affected all old established parties (Mickelsson, 2021). Dealignment will

inevitably produce modifications on democratic politics. Without stable electoral base, parties and politicians must find new ways of mobilizing political support (Dalton & Wattenberg, 2002). Therefore, name mentions could be one method to study personalization of politics for Parliament is still the main arena of politics for MPs.

Other significant trend in politics has been the rise of right-wing populism in western liberal democracies. Right-wing populist parties have succeeded in the elections in recent two decades even in the countries like Austria, Netherlands, and Nordic countries, which have been seen as models of welfare state, consensual decision making and equality (Albertazzi, 2008; J. Herkman, 2019; Jungar & Jupskås, 2014). In Finland the landslide victory of the True Finn Party (nowadays known as the Finns Party) in the elections of 2011 and its strong performance in parliamentary elections ever since has shaken the party politics. The Finns Party has been the second biggest party ever since 2015 in national politics.

Populism in particular has often been associated with a charismatic leader, although the role of party leaders in current media saturated politics is typical for all political parties (J. P. Herkman, 2015; Taggart, 2000). The study of name mentions could deepen the analysis of the nature of populism and how it is related to a charismatic or visible persons. Or is the generally assumed populist polarization on “us” (people) and “them” (political elite) somehow visible in naming practices in plenary speeches (J. Herkman, 2019)?

Third promising area of study in terms on name mentions is the hypothesis of the strengthening of the position of the Parliament. The power of the Parliament has increased in recent decades through legislation in connection with the constitutional reform. The right of the President of the Republic to dissolve the parliament and call for early elections and the right to appoint and dismiss cabinets and individual ministers has been abolished (Karvonen, 2014). In addition, changes in the political system have increased power of the Parliament.

With the EU, the prime minister’s position as a political leader has strengthened, which in part has meant the return of politics to parliament. As a result of the weakening of the importance of president and parties, the independent status of parliament, parliamentary groups and individual MPs has been strengthened. The position of the Parliament has reinforced also because of its own actions, of which the most obvious sign is that parliament increasingly alters the government’s proposals. Jaakko Nousiainen has emphasized that in the 1970s the prime minister spoke to the Parliament only a few times a year, but today the prime ministers give dozens of speeches every year in the parliament (Nousiainen, 2000; Pekonen, 2011).

Related Works

During the last two decades, network science (Saramäki & Moro, 2015; Vespignani, 2018; Watts & Strogatz, 1998) has become an increasingly significant field by successfully explaining phenomena and fundamental concepts in a wide array of systems from cellular biology to societies. In the context of parliamentary speech data, especially discourse network analysis (DNA) has been used. Discourse network analysis, combining network analysis and qualitative content analysis, can reveal connections between political actors at the discursive level (Leifeld, 2020).

For example, Curran, Higham, Ortiz, Vasques Filho, and Gargiulo (2018) clustered speeches given in the Parliament of New Zealand according to their topics and created a weighted network where MPs were connected when they had spoken about the same topics. Networks of MPs for different parliaments

were analyzed using complex network techniques to study, e.g., community structure of networks. [Bhattacharya \(2020\)](#) constructed a network of German MPs based on how they agreed with each other in speeches and written explanations of votes related to the Greek crisis in 2010–2015. Bhattacharya studied how party unity held in discussions and decisions related to the Greek crisis.

To the best of our knowledge, how MPs mention each other in their parliamentary speeches has not been studied before. Instead, the behavior of politicians on social media has been studied. For example, [Esteve Del Valle, Broersma, and Ponsioen \(2022\)](#) studied how Dutch MPs interact on Twitter, using a mention function and concluded that mention networks based on tweets do not indicate political polarization. Overall, there is surprisingly little crossover between political studies and computer science in the means of using computational methods for analyzing political texts ([Abercrombie & Batista-Navarro, 2020](#)). Also, discussions about the advantages and problems of computational methods for political studies are important ([Aarnio, 1996](#)).

The idea of our work is to construct different kind of networks based on person name mentions on parliamentary speeches and analyze these networks using methods from network analysis and bibliometrics in order to find out possibly interesting MPs or mention patterns in parliamentary discussions. Bibliometrics is a study of publications that is often based on citations between scientific publications ([Forsman, 2022](#)). Bibliometric studies can be done, e.g., on document, author or journal level in order to find central actors and possible clusters of publications or authors ([Yan & Ding, 2012](#)). In our work parliamentary speeches correspond to the documents, MPs to authors, and parties to journals. Bibliometric methods used in this work include citation analysis (CA), author co-citation analysis (ACA) and author bibliographical coupling analysis (ABCA).

CA can reveal the most significant documents or authors on the chosen field of analysis. It is assumed that a large number of mentions to a document or an author tells that the document or author in question is influential on their own field ([Culnan, 1987](#)). ACA is often used to study the intellectual structure of chosen disciplines by clustering authors based on co-citations whereas ABCA can also give hints of the future directions of the field ([Zupic & Čater, 2015](#)).

Traditional methods of bibliometrics are purely citation-based and do not take into account the context of citations. Context has been taken into account by manually sorting citations into categories ([D. Zhao, Cappello, & Johnston, 2017](#)). Manual sorting is not feasible when the number of citations to be studied is large. An other way for including citation context into analyses is to compare the location of citations in the articles or to calculate similarity of citation sentences ([Jeong, Song, & Ding, 2014](#)). One way to take the dynamics of citation-based networks into account is to construct networks for different time periods and compare results ([Backhaus, Lügger, & Koch, 2011](#)).

There are a plenty of examples of analyses for citation data. For example, [McLaren and Bruner \(2022\)](#) presented how to use citation analysis in the field of sport and exercise psychology and provided different visualizations of citation networks. Co-citation analysis have been widely used for studying the intellectual structure of some field, e.g. ([Andrews, 2003](#); [Nerur, Rasheed, & Natarajan, 2008](#); [D. Zhao & Strotmann, 2022](#)). Methods of co-citation analysis have also been used for analyses of user interactions on instant messaging groups where users were considered as "co-cited" when they participated in discussions of the same topics ([R. Zhao & Chen, 2014](#)), or analyses of companies where companies were considered as co-cited when they were mentioned in the same news article [Sidorov et al. \(2018\)](#).

Analyses based on bibliographical couplings rather than citations or co-citations are less common. [Ma \(2012\)](#) constructed different types of author networks based on bibliographical couplings and studied

the quality of clusters obtained from networks. [D. Zhao and Strotmann \(2008a\)](#) compared the results of co-citation analysis and bibliographical coupling analysis for information science and concluded that the methods complement each other.

Motivations and goals of mentioning person names in parliamentary speeches differ from citations in scientific publications that form the basis for bibliographical analyses. Similar methods can be used in both cases but these differences must be taken into account while analysing the data and interpreting the results.

Data

We used the ParliamentSampo data that contains all parliamentary debate speeches in Finland from 1907 as well as data about the MPs parliamentary organizations as Linked Open Data ([Hyvönen et al., 2024](#)). The ParliamentSampo data publication consists of two parts: 1) a knowledge graph (KG) of parliamentary debate speeches ([Sinikallio et al., 2021](#)) and 2) a KG of the political actors ([Leskinen et al., 2021](#)). In order to extract networks based on person name mentions, the original RDF speech graph was enriched with Natural Language Processing (NLP) methods, such as named entity recognition (NER) and linking (NEL) ([Tamper et al., 2022](#)).

The named entities (NE) were extracted from the parliamentary speeches from the end of April 2015 until May 2022, which limits the analyses for this particular time period and parliament. Recognized named entities, the mentioned people, places, groups, organizations, and their related information were linked internally to the ParliamentSampo KG of MPs. For a broader data enrichment, linkings to external data sources were created, including the KANTO³ vocabulary for Finnish actors provided by the National Library, the YSO Places ontology⁴ and PNR⁵ gazetteer of Finnish place names by the National Survey. Named entity recognition and linking of person name mentions are explained in more detail in ([Poikkimäki, Leskinen, Tamper, & Hyvönen, 2022](#)) and the person name linkage have been improved by linking also family name mentions.

The accuracy of the NER was estimated for 100 randomly selected mentions of people, places, organizations, and expressions of time. The precision was 97%, recall 77%, and F1-score 86%. Low recall is mostly due to problems in recognizing organizations, and it should not have too great effect on our work. The results for linking people were calculated for 100 randomly selected speeches that contained 100 entities in total. The precision was 98%, recall 96%, and F1-score 97%.

Table 1 contains the number of speeches and number of speeches in which at least one person name mention has been recognized and linked. In total NEL and NER have been done for about 120 000 speeches and 64 000 of them contain linked person name mentions. NEL and NER have not been done properly for speeches given in Swedish. The number of Swedish speeches is, however, quite low (1400) compared to the total number of speeches and leaving them out affects mostly the Swedish People's Party as one third of the party's speeches are given in Swedish. The number of speeches of the Speaker of the Parliament of Finland is higher on the later electoral term even if all the speeches of the electoral term are not in the data. This is due to differences on how those speeches are written down and it does not concern our work as the speeches of the Speaker of the Parliament are excluded from our analyses.

Table 1 Number of speeches and number of speeches that contain at least one person name mention. Numbers inside brackets tell the number of speeches when speeches of the Speaker of Parliament of Finland are also taken into account. *Speeches from the electoral term 2019–2022 were available only until May 6, 2022.

Electoral term	Speeches	Speeches with name mentions
2015–2018	51807 (64934)	24428 (31075)
2019–2022*	33146 (55104)	16405 (31578)
Total	86820 (120038)	40833 (64221)

Methods

Constructing Networks

Different networks based on mentions between MPs were created and analyzed using NetworkX (Hagberg, Schult, & Swart, 2008). For the networks where nodes are MPs, speeches from the electoral term 2015–2018 were used. Limiting speeches for one electoral term prevents situations where MPs who were chosen for both terms have had more opportunities to mention other MPs and to be mentioned by other MPs, which causes them to surface in the analyses.

For the networks where nodes are parties, speeches from the first half of electoral term 2019–2022 were also used. Because many parties' parliamentary role, government or opposition, changed when the electoral term changed, including speeches from both electoral terms allows to study, if mentions received and made by the members of the party is affected by the party's parliamentary role. Speeches that do not contain any linked person names were excluded from the analysis. In addition, administrative speeches of the Speaker of the Parliament of Finland and speeches given in Swedish were not taken into account as person name recognition and linking is done using tools related to the Finnish language.

In citation (or mention) network of MPs the nodes are MPs. A directed link goes from one MP to other MP when an MP mentions another MP in his/her speech. The link weight is the number of speeches, where the first MP mentions the second MP at least once. Self-mentions are not taken into account, i.e., there is no links from a node to node itself. To obtain citation networks between parties, MPs were grouped by their parties and link weight summed. If an MP had changed party during an electoral term, mentions made and received by the MP were added to the party that the MP was member at the time of each speech where mentions were made.

Co-citation and bibliographical coupling based networks were also constructed for MPs. In co-citation networks a link was added between MPs when some other MP had mentioned both MPs in his/her speeches. When one MP has mentioned two other MPs in their speeches, we take the minimum of the number of times the MP has mentioned one or the other MP. By summing up minimums from all MPs we get the total co-citation count between two other MPs as link weight. In a network based on bibliographical coupling there is link between two MPs when they have mentioned at least one same person in their speeches. Bibliographical coupling strengths or link weights were calculated using similar idea as for co-mention graphs, but now summing up minimums of mentions made instead of received mentions.

To take mention context into account in co-citation and bibliographical coupling analyses, ideas presented by Jeong et al. Jeong et al. (2014) were followed with some modifications. They calculated

cosine similarities for each citing sentence pair in the document and summed cosine similarities in all documents related to two authors to get co-citation count between those two authors. Networks presented in our work are based on MP level mentions instead of speech level mentions, and co-citation counts are then calculated differently.

Sentences that contain mentions of MPs were first extracted from speeches and then lemmatized using Voikko linguistic software⁶. Cosine similarity for each sentence pair was calculated, where the MP mentions one MP in the first sentence and other one in the second sentence. Maximum cosine similarity was chosen and total co-citation count for the two mentioned MPs was acquired by summing all maximum cosine similarities. For content based bibliographical coupling analysis, a similar idea was used to get total bibliographical coupling strengths.

Bibliometric Methods

Traditional methods of bibliometrics are often based on multivariate analysis, such as factor analysis, clustering analysis, and multidimensional scaling of matrices based on citations, e.g., a co-citation matrix C , citation matrix J , or bibliographical coupling matrix B (Leydesdorff & Vaughan, 2006; McCain, 1990; D. Zhao & Strotmann, 2008b). In a citation matrix J each element $j_{i,j}$ corresponds to the number of citations from actor i to actor j and self-citations can be ignored by assigning zero to corresponding elements in the matrix (West, Jensen, Dandrea, Gordon, & Bergstrom, 2013). In case of our work, element $j_{i,j}$ corresponds to the number of speeches in which MP i has mentioned MP j or members of party i have mentioned members of other party j .

A co-citation matrix is based on co-citations, i.e., how often actors are cited together by a third actor (Andrews, 2003). Elements of a bibliographical coupling matrix are based on the similarity of reference lists of the documents or actors (D. Zhao & Strotmann, 2008b). These matrices are symmetric similarity matrices. In multivariate analysis, the diagonals of these matrices can be handled as missing values and replaced by column means (Hyun, Cho, & Yoon, 2015). On author level analysis there are multiple ways to count co-citations and bibliographical couplings between authors (Ma, 2012; Rousseau & Zuccala, 2004). In the case of our work, co-citation and bibliographical coupling counts are calculated as described previous section.

The previous matrices can be seen as adjacency matrices to networks where nodes are documents, authors, or journals, and links are based on the citations between them. In our work, nodes are MPs or parties, and links are based on person name mentions in parliamentary speeches. The citation matrix gives the corresponding directed citation network (McLaren & Bruner, 2022). The co-citation matrix and bibliographical coupling matrix give an undirected co-citation network and a bibliographical coupling network (Yan & Ding, 2012). This allows usage of network analysis methods for finding communities and central nodes as well as for creating interesting visualizations (Zupic & Čater, 2015).

Figure 1 shows a simple citation network and its adjacency matrix that corresponds to a citation matrix, and co-citation and bibliographical coupling networks based on citation network and their adjacency matrices. For example, node 2 has cited node 1 so there is a link from node 2 to node 1 and $j_{2,1} = 1$. Node 1 has cited nodes 3 and 4 so they are connected in a co-citation network. Nodes 2 and 4 have both cited node 1 in the original citation network and are then connected in a bibliographical coupling network. In the case of the co-citation and bibliographical networks, the diagonals of the adjacency matrices are set to zero as nodes do not have self-links. If adjacency matrices are used in the analysis as co-citation and bibliographical coupling matrices, the diagonal values can be considered as missing values.

In co-citation analysis, multidimensional scaling (MDS), factor analysis (FA), and agglomerative hierarchical clustering (HC) are often used in order to find possible groups of authors and consequently possible subfields within the chosen research field. Same methods can be used for author bibliographical coupling analysis, in which case input matrix is a bibliographical coupling matrix instead of a co-citation matrix [D. Zhao and Strotmann \(2008b\)](#). In the case of our work, it would be interesting to see if there is some pattern behind person name mentions made in parliamentary speeches, e.g., are some MPs clearly often mentioned together compared to other MP groups, or can MPs be divided into groups based on how they mention other MPs.

Multidimensional scaling is a group of visualization methods that try to represent data in lower dimensions while preserving the distances between the data points ([Van Eck, Waltman, Dekker, & Van Den Berg, 2010](#)). For example, in case of co-citation analysis, items that have been often cited together appear to be close to each other in visualization. MDS does not assign clusters to items but resulting visualization can be used as supporting evidence for HC and FA results ([Andrews, 2003](#)). For FA we used principal factor extraction with Promax rotation. An item was thought to belong to component (or cluster) when the corresponding loading was over 0.4 and one item might belong to multiple components.

There are some fundamental differences between citations in scientific publications and person name mentions in parliamentary speeches. Some of these differences remove common problems in bibliometrics, some differences bring new problems to be considered. In bibliometrics, citations, co-citations, and bibliographical couplings are always based on the document level counts even if the analyses are done, e.g., on an author or a journal level. In parliamentary discussions, person name

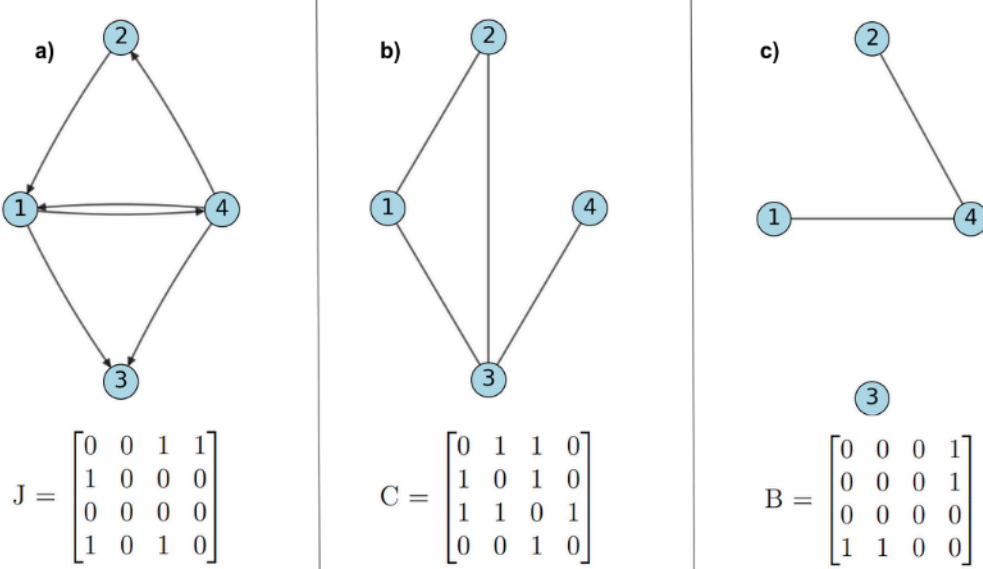


Fig. 1 Example of a) simple citation network and its adjacency matrix or citation matrix b) co-citation network based on citation matrix and its adjacency matrix and c) bibliographical coupling network and corresponding adjacency matrix.

mentions might be direct mentions to people rather than mentions to their speeches. For example, during the electoral term 2015–2018 about 15% of the sentences in speeches that contain person name mentions contain also the words "puheenvuoro" or "puhe" (speech) that indicates direct mention to mentioned person's speech rather than mention to the person themselves. Person name mentions, co-mentions, and bibliographical couplings are then calculated on an MP level instead of speech level.

Parliamentary speeches in the Parliament of Finland are often quite short and there are not many person name mentions per speech. Speeches given during the electoral term 2015–2018 contained on the average 0.73 person name mentions to MPs chosen for the term when speeches of the Speaker of Parliament are not taken into account. Speeches that contained person name mentions had on the average 1.54 mentions. Figure 2 shows the proportion of speeches given during 2015–2018 term that contain mentions to certain number of different MPs and only 15.7% of speeches contain mentions to more than one people. For this reason, we ended up defining co-citation, or co-mention, between two MPs as a situation where the third MP mentions two MPs in their speeches but mentions do not have to happen in the same speech. Similarly bibliographical coupling happens when two MPs mention the same MP in some of their speeches.

These differences make, e.g., some bibliometrics indicators meaningless in the context of parliamentary speeches. In addition, results of CA, ACA, and ABCA have to be interpreted accordingly.

Number of mentioned MPs in 2015–2018 speeches

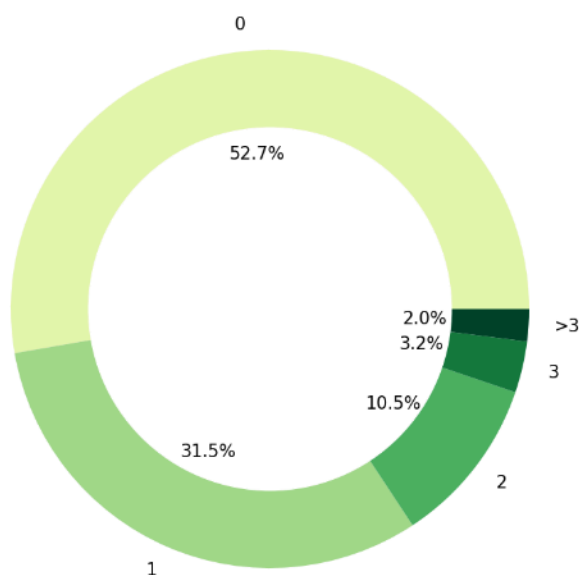


Fig. 2 The proportion of speeches given during the electoral term 2015–2018 that contain mentions to 0, 1, 2, 3 or more different MPs chosen for 2015–2018 term. The speeches given by the Speaker of the Parliament are not taken into account.

For example, if two persons have cited the same document, it is more safe to assume that they are interested in the same topic than if they cite the same author but not necessarily the same document. The cited author could, for example, provide publications related to two different topics. The first citing author might be interested in the first topic and the second citing author in the other topic. Similarly in parliamentary debates when two persons mention the same person but we do not know if they refer to the same speech, we can not really know if mentioning MPs are interested in similar topics. Presumably person name mentions in parliamentary debate speeches also contain more often mentions that rise from disagreements than scientific citations. Figure 3 in section [Citation Networks of Parties](#) is one indication of this.

Bibliographical studies rely often on different citation databases. The used database may not contain all works of all interesting authors, which may have some effect on the results (Zupic & Čater, 2015). In our work all the speeches from chosen time period are available, but mistakes in recognising and linking person name mentions may cause missing person name mentions or mentions are linked to wrong people. And even if all the speeches are in the data set, the number of speeches related to each topic are limited and all MPs may not have chance to give a speech (Makkonen & Loukasmäki, 2019). In CA and ACA, older publications have had more time to accumulate citations, which makes them show up more prominent than newer publications (Zupic & Čater, 2015). If person name mentions in parliamentary speeches are limited to, e.g., some electoral term, all MPs have had same time to accumulate mentions. However, here are some exceptions when, for example, an MP has left the Parliament in the middle of the electoral term.

Network Analysis

For networks, some basic metrics like the number of nodes and edges and network density were calculated. Network density corresponds to the number of links in the network divided by the number of all possible links in the network. For example, in the case of the citation network, the density tells how comprehensively MPs mention each other. In-degree tells the number of citations an MP or a party has received from other MPs or parties. Out-degree is the number of mentions an MP or members of a party have made to other MPs or members of other parties. If link weights are not taken into account, in-degree corresponds to the number of MPs that one MP has mentioned and out-degree is the number of MPs that have mentioned that one MP.

For directed citation networks, hub and authority values were calculated for the nodes. In general, good hub links to several good authorities and good authority has links from good hubs (J. Kleinberg, 1999). In citation analysis, authorities are high quality sources and hubs cite many high quality sources, and ideal work has then high values in both (Calero-Medina & Noyons, 2008). MPs who have high authority values have probably been in charge of something significant and MPs who have high hub values have mentioned lot of other MPs. If an MP has a high hub and authority value, (s)he is probably central in parliamentary discussions in some way.

In addition, eigenvector centrality was calculated for the nodes. In the case of undirected networks, nodes with high eigenvector centrality have many neighbours and the neighbours in turn have many neighbours. In a directed citation network, a node has high eigenvector centrality if it has been cited often and those citing it have also been cited often.

Period	Days	Parties	Speeches	Mentions	%	% of ministers	Network density
22.4.2015–12.6.2017	783	8	27467	14378	41	27	1.0
13.6.2017–16.4.2019	673	11	23634	12096	39	26	0.83
24.4.2019–2.7.2021	801	10	25292	13353	41	33	0.92

Table 2 Number of days, parties, speeches, and person name mentions on chosen time periods. In addition, the there are columns for the proportion of speeches where a speaker has mentioned at least one member of another party, proportion of minister mentions out of all person name mentions, and density of the corresponding citation network. Mentions to speakers' fellow party members are not taken into account.

Analyzing Networks of Politicians

Citation Networks of Parties

For parties, three citation networks for different time periods were constructed. The first citation network is based on speeches from the beginning of the electoral term 2015–2018 until June 12, 2017, when a group of politicians parted ways with the Finns party (PS) and formed the new party Finnish Reform Movement (KL), and the remaining MPs of the Finns party moved from government to opposition. Other parties that had MPs during the first time period were the National Coalition Party (Kok.), Centre Party (Kesk.), Social Democratic Party (SDP), Left Alliance (Vas.), Green League (Vihr.), Swedish People's Party (RKP), and Christian Democrats (KD).

The second network is based on speeches from the remaining period of the electoral term, and in addition to parties mentioned above the Movement Now (Liik.) and Seven Star Movement (TL) had both one MP. The third network is formed from speeches given during the first half of the electoral term 2019–2022. In addition to the parties in the first time period, the parties Liik. and Power Belongs to the People (VKK) had both one MP. Networks from different time periods allow studying how a party's parliamentary role affects person name mentions made and referred to by the party members.

Table 2 provides statistics for the different time periods when speeches of speakers' fellow party members are not taken into account. The proportion of speeches that contain person name mentions remains stable. Almost one third of these mentions are mentions of ministers. The resulting citation networks are dense and for the last two networks small "one man parties" lower the density.

Figure 3 shows the proportion of the speeches containing at least one person name mention to an other MP given by party members during different parliamentary sessions. For some parties (Vas. and Vihr.) the proportion of speeches containing mentions seems to get smaller as the parties move from opposition to government from the parliamentary session 2019 onward. Similarly, the proportion of speeches that contain mentions to other MPs by National Coalition members rises as the party moves from government to opposition when the electoral term changes. These observations, however, do not hold for all parties.

Figure 3 seems to indicate that a topic to be discussed and the differences of opinion between the parties have a significant effect. The SOTE (social and healthcare services) reform was widely disputed topic in 2018 and raised disputes between the governing parties as well (Rautiainen, Taskinen, & Rissanen, 2020). The approaching elections of 2019 heated up emotions even more. Rising curves of the Centre Party and Greens in 2015 could be explained that parties argue often on matters concerning agriculture,

hunting, fishing, conservation, and animal rights. RKP on the other was upset in 2015 that it did not fit into the bourgeois government. It was the first time since 1979 that RKP was left out of the government.

In the case of parties, a citation matrix normalized by Pearson correlations was used as basis for HC and MDS and parties whose members had been mentioned under 50 times were left out. Figure 4 shows results of MDS where nodes are colored according to HC results. Based on how the members of other parties have mentioned parties' politicians, parties can be divided into government and opposition parties. In other words, members of opposition parties and members of government parties are mentioned with different patterns by other parties' members. The results do not change even if mentions to ministers are left out.

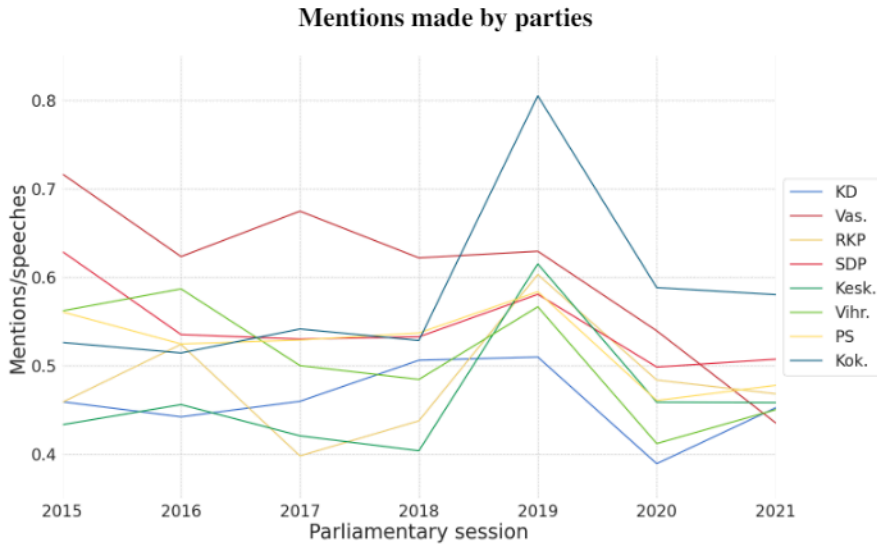


Fig. 3 Proportion of biggest parties' speeches that contain at least one mention to MPs from other parties during different parliamentary sessions. Speeches of the Speaker of Parliament and speeches given in Swedish are not taken into account.

Citation Network of MPs

The citation network of MPs was constructed based on over 51 000 speeches given during the electoral term 2015–2018 of which over 24 000 contained at least one mention to an other MP chosen for the term. About 24% of person name mentions were mentions of ministers. In total 214 different MPs were active during the electoral term. MPs mention surprisingly often other MPs in their speeches. Politics is therefore quite person-oriented, although in ideal situations things fight, not persons. From a normative perspective, there is a widespread consensus that MPs should act in accordance with the interests of those they represent (Bengtsson & Wass, 2011). Naming practices indicate strongly that not only political matters fight, but also persons.

To study and visualize part of the citation network, hub and authority values were calculated for nodes using the HITS algorithm (J. M. Kleinberg, 1999). In case of our work, MPs with high authority values

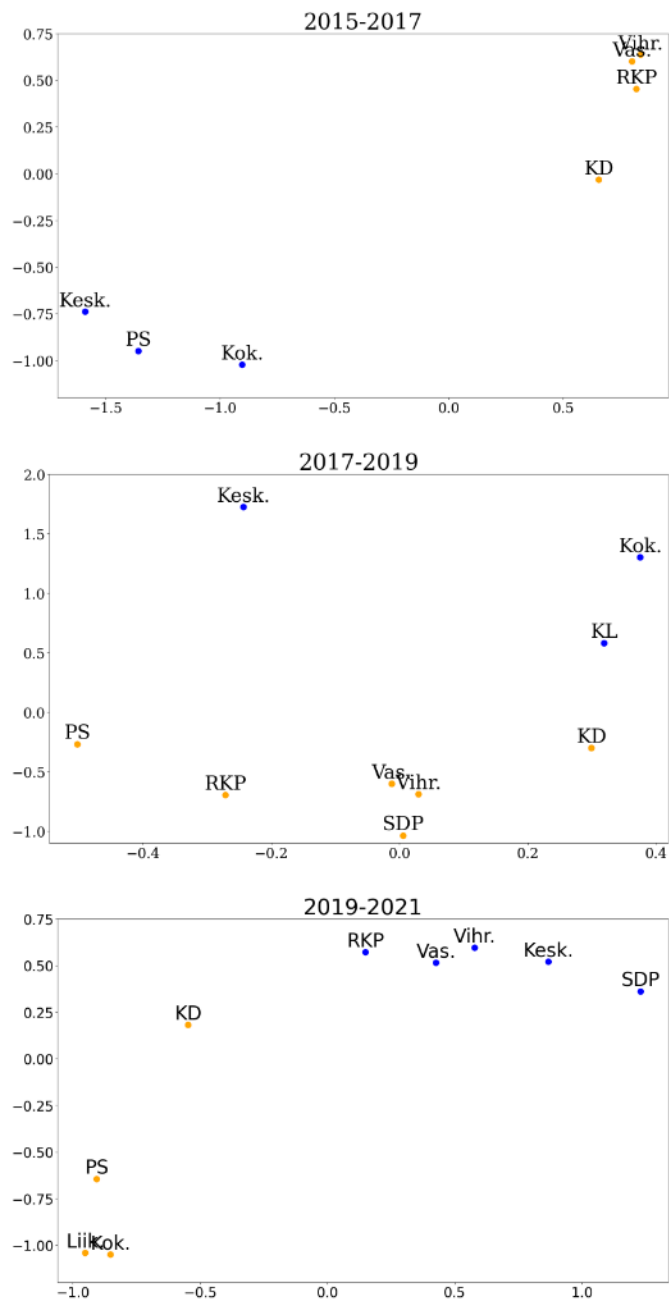


Fig. 4 MDS and HC results for parties during three different time periods. Parties are colored based on HC results. Parties colored with blue are also government parties whereas parties colored with orange are opposition parties.

have been mentioned often by good hubs, and MPs with high hub values have made mentions often especially of good authorities. Ten MPs with highest authority values and ten MPs with highest hub values are shown in Figure 5.

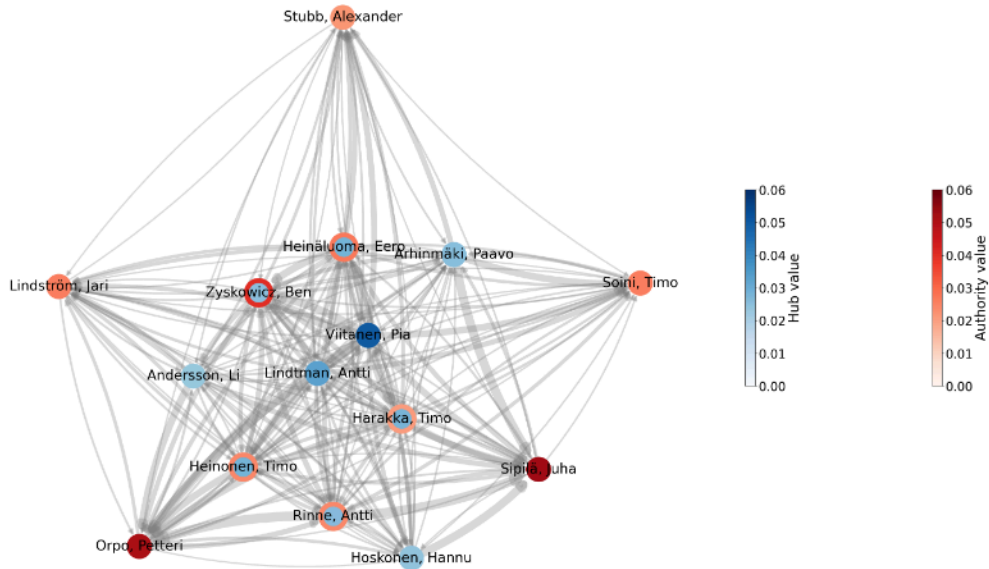


Fig. 5 Ten MPs with highest hub and authority values based on the HITS algorithm. The darker red, the larger authority value, and the darker blue, the larger hub value.

Table 3 contains MPs with highest hub and/or authority values. High in-degree, when the number of speeches where an MP has been mentioned is high, leads to high authority and eigenvector centrality values. Similarly, high out-degree, when the number of speeches where an MP has mentioned some other MP, results in high hub values. The most often mentioned MP was prime minister Juha Sipilä. We note, that big proportion, about two thirds, of mentions to Sipilä arise mistakenly from mentions to "Sipilän hallitus" (Sipilä Cabinet), not Juha Sipilä as a prime minister. This makes Sipilä look more central than he actually is in the network. Even still, Sipilä is one of the most mentioned MPs during the electoral term. Mrs. Pia Viitanen from opposition had mentioned other MPs most often, as well as given the largest number of speeches.

Nodes with highest authority values contain ministers and/or party leaders (Sipilä, Soini, Orpo, Stubb, Lindström, and Rinne) and MPs who have also highest hub values (Rinne, Zyskowitz, Heinonen, Heinaluoma, and Harakka). Ministers and party leaders presumably get mentions when discussing matters related to the minister's area of responsibility or issues related to parties. Nodes that have both high authority and hub values can be considered to be central people in parliamentary discussions; they mention other MPs often and they are also getting answers by receiving person name mentions. Hub and authority values of MPs have quite high Spearman correlation coefficient value: 0.71. This further

indicates that actively mentioning other MPs results getting mentioned often, or vice versa. Other hubs include Heinonen, Arhinmäki, Anderson, Viitanen, and Lindtman. Hubs have given a lot of speeches and were mentioned many other MPs. Seven of the top ten authorities are government politicians, and seven of the top hubs are members of opposition parties.

MP	Party	Speeches	In-degree	Out-degree	Eigenvector centrality
Sipilä, Juha	Kesk.	672 (8)	1725 (1)	406 (21)	0.153 (1)
Orpo, Petteri	Kok.	619 (12)	1293 (2)	363 (25)	0.138 (3)
Zyskowitz, Ben	Kok.	690 (7)	1001 (3)	963 (3)	0.128 (5)
Lindström, Jari	PS/KL	529 (19)	907 (4)	541 (14)	0.139 (2)
Heinonen, Timo	Kok.	929 (3)	799 (5)	1045 (2)	0.137 (4)
Soini, Timo	PS/KL	326 (56)	742 (6)	357 (26)	0.125 (6)
Rinne, Antti	SDP	492 (24)	733 (7)	454 (17)	0.112 (13)
Heinäluoma, Eero	SDP	727 (6)	695 (8)	804 (7)	0.120 (8)
Viitanen, Pia	SDP	1051 (1)	579 (9)	1183 (1)	0.107 (14)
Harakka, Timo	SDP	652 (9)	560 (11)	700 (8)	0.123 (7)
Hoskonen, Hannu	Kesk.	970 (2)	539 (12)	831 (5)	0.117 (12)
Stubb, Alexander	Kok.	205 (99)	469 (13)	129 (98)	0.099 (24)
Lindtman, Antti	SDP	603 (14)	384 (18)	821 (6)	0.101 (22)
Arhinmäki, Paavo	Vas.	439 (32)	371 (20)	595 (11)	0.098 (28)
Andersson, Li	Vas.	743 (5)	369 (21)	570 (12)	0.106 (15)

Table 3 MPs with ten highest hub and/or authority values, their parties, number of given speeches, in-degree (mentions received), out-degree (mentions made) and eigenvector centrality. Number inside brackets tell how MPs high rank out of all MPs active during electoral term 2015–2018.

In table 3, only two of the MPs with high hub and/or authority values are women. Figure 6 shows, that both male and female MPs mention more often males than females. With male MPs this difference is larger. At least part of the gap can be explained by the greater number of prominent male MPs: during the electoral term in total 14 male and 9 female MPs served as ministers, and 12 male and 3 female MPs served as party leaders. Even though there were changes and not all of minister and party leader positions were of equal length, most likely male MPs acquired more mentions because of the greater number of prominent political positions.

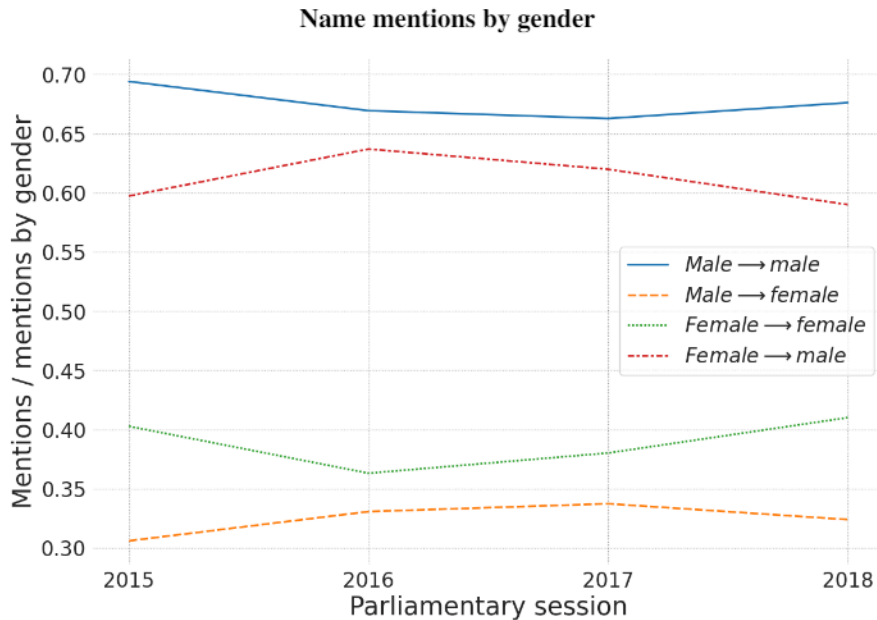


Fig. 6 Proportion of mentions made by male or female MPs to MPs of either gender.

Table 4 shows MPs who prime minister Juha Sipilä has mentioned at least 10 times during the electoral term. Out of Sipilä's 406 person name mentions, 222 goes to Opposition politicians and 15 to the Finns party members who later on moved to Opposition. Rinne, Arhinmäki and Niinistö were leaders of their (Opposition) parties at least for some time during the electoral term. Out of all the MPs who Sipilä has mentioned at least 10 times, only one belongs to Government party: Lindström who was Minister of Justice and Employment at the time. Similar patterns can be seen in the case of other ministers: out of often mentioned MPs most are from opposition parties, perhaps mentioned while answering to criticism or verbal questions asked by the Opposition politicians.

Table 4 MPs mentioned most often by prime minister Juha Sipilä during electoral term 2015–2018.

Mentions	MP	Party
33	Rinne, Antti	SDP
20	Arhinmäki, Paavo	Vas.
11	Lindström, Jari	PS/KL
11	Niinistö, Ville	Vihr.
11	Ihalainen, Lauri	SDP
10	Heinäluoma, Eero	SDP

Tables 3 and 4 supports the idea name mentioning being potential advertisement for mentioned MPs and a sign of significance: the prime minister and ministers do not quote everyone, even if they mention

them by name. Also, at least the results of this study (Table 3) do not support the importance of charismatic right-wing populist leader, at least in parliamentary discussions. Party leader Timo Soini nor any other populist MPs (PS/KL) do not stand out in the Table 3, although one must be somewhat cautious to analyze the results because of the party split of the Finns Party in 2017.

Co-citation and Bibliographical Coupling Networks of MPs

Co-citation and bibliographical coupling networks were also constructed for MPs based on the speeches of the electoral term 2015–2018. The resulting networks have densities close to 1.0, i.e., almost every pair of MPs have been mentioned by at least one same MP and almost every pair of MPs have mentioned at least one same person. We tried to look for clusters of MPs based on how often they have been co-mentioned and how often they have mentioned same MPs.

Figure 7 shows MDS mapping for 50 MPs that have mentioned most often other MPs based on bibliographical couplings. On the left side of the mapping there are opposition politicians, and government politicians are mostly placed on the right side. Based on figure 7, the party and therefore also political values that MP represents might also have some effect: the Finns party MPs are relatively close to each other and KD members (Tanus, Räsänen, Essayah) are on the right side of the figure, closer to centre and right leaning government parties rather than most of the SDP, Left Alliance and Green Party members.

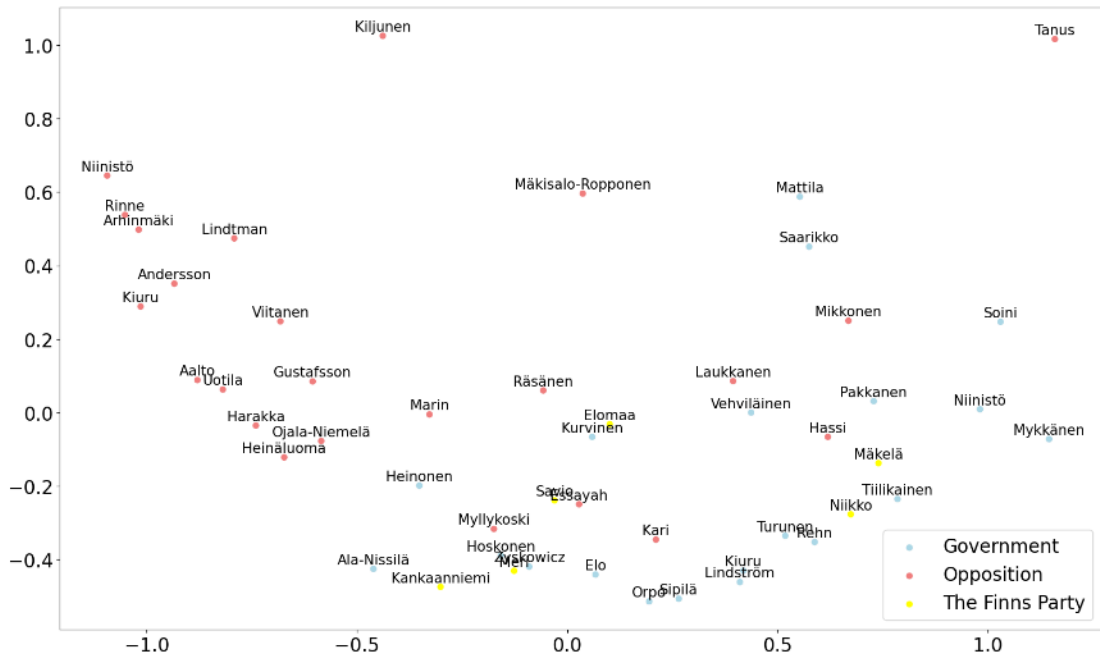


Fig. 7 MDS mapping of 50 MPs that have mentioned most often other MPs during electoral term 2015–2018 based on bibliographical couplings.

By taking into account the sentences where the mentions were made, a distinction between opposition and government MPs becomes more clear and visible. Figure 8 shows how MPs load to different factors based on bibliographical couplings between MPs and by taking mention sentences into account. The first factor contains mostly opposition politicians, the third factor contains both government and opposition politicians, and the fourth factor contains especially members of PS, the fifth the members of the KD. However, these observations do not hold for all MPs.

For the co-citation network, similar phenomena were observed. There was some distinction between opposition and government politicians and that distinction become more clear when the mention context was taken into account. In other words, MP's political values and political role seem to shape the patterns of how individual MP gets mentioned or mentions others in the parliamentary speeches to some extent.

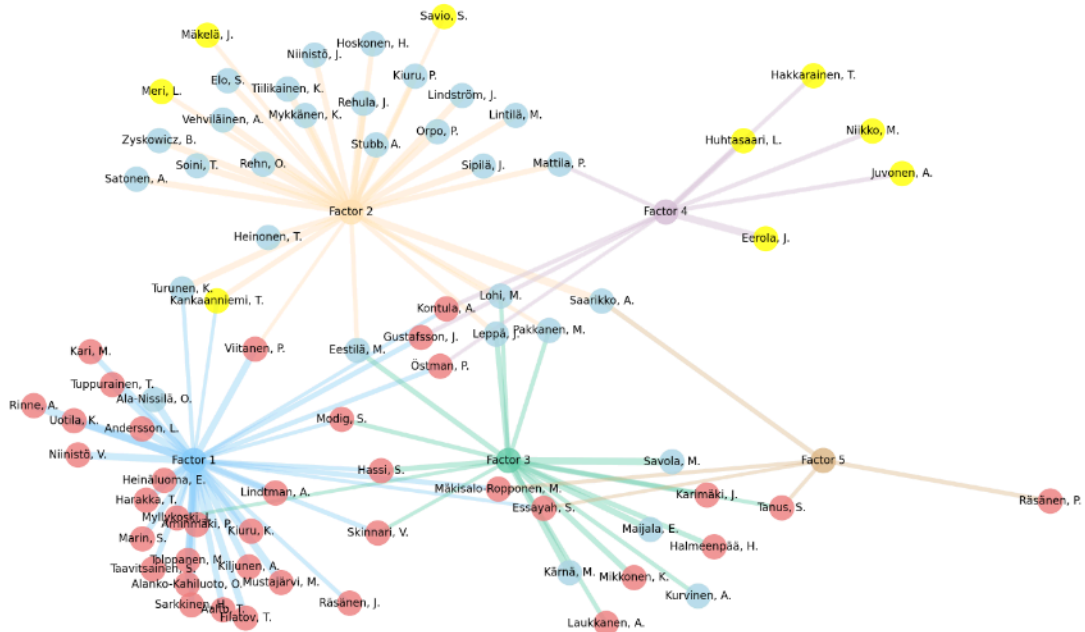


Fig. 8 FA with Promax rotation results based on content-based bibliographical couplings for 100 MPs that have mentioned most often other MPs during electoral term 2015–2018. MP is connected to the factor if they have loading of at least 0.4 to the factor. Five factors explain 81% of the variance. Members of opposition parties are colored with red, members of government parties with blue, and members of the Finns party that belonged first to government and then to opposition during chosen time period are colored with yellow.

Discussion and Conclusions

In this paper we presented the idea of creating and analyzing networks of MPs and parties based on mentions between speakers in parliamentary debate speeches. As a case study, networks of MPs and

parties based on 120 000 speeches were created by making use of named entities extracted from the speeches. Finally, resulting examples of network and bibliometric analyses were presented.

The results of our case study suggest that the methods used can reveal potentially interesting phenomena in parliamentary discussions. For example, the parliamentary role, government or opposition, of parties seems to have effect on who mentions whom. Political values and party of the MP have also effect on how MPs mention each other. Reference networks of MPs reveal the most active debaters as well as biggest authorities. However, interpreting results more profoundly requires domain knowledge and close reading of the related speeches. The ParliamentSampo semantic portal⁷ can support both distant and close reading tasks by integrating semantic faceted search and browsing facilities with data-analytic tools. Faceted search can be used to filtering subsets of speeches to be analyzed, or to finding certain speeches when interpreting the results Hyvönen, Leskinen, and Rantala (2023).

Our results suggest that taking the context into account, the distinction based on person name mentions between opposition and government politicians becomes more clear. In future analyses, it would be interesting to include the broader context of person name mentions in the analyses by, for example, taking into account the topics of the speeches. Alternatively, the speeches could be limited to a certain topic in order to study behaviour of parties and MPs related to certain topics.

Based on the results of this article, some more specific research questions emerge that would be intriguing to explore more closely. Do certain political questions become personal? Would it be possible to get access to such questions through observing name mentions? Figure 3 shows that the Left Alliance and the Christian Democrats deviated from the general trend of 2018. It would be interesting to study whether naming practices could help to identify political issues in which certain political parties are not eager to engage vigorously, possibly because they do not have so much to gain in the matter.

Table 3 raises, as well, several prominent follow-up question. It would be interesting to take a closer look, especially at those persons who are not ministers or party leaders. What kind of roles these persons played in the discussions, regarding both oppositions' MPs and members of the governing parties. The salient feature is there are two people from the Left Alliance, but not even one from the Greens or RKP. What does the use of names reveal about the party's ways of doing politics, its political culture?

Name mentions could also be compared to media visibility. Are the persons mentioned most often in the Parliament also the most visible politicians in the public. Which ones are surprising influencers? For example, Hannu Hoskonen (the Centre Party) and Pia Viitanen (SDP) are quite surprising names in the Table 3. By looking at Pia Viita, Hannu Hoskonen and Timo Heinonen, one could also analyze the question, should a member of parliament make a lot of speeches? Is it useful for a career in politics? And, on the contrary, what does it mean that someone is often mentioned, like Stubb, but he doesn't mention others? Is Stubb especially under the attack of other MPs? Is he arrogant and therefore does not mention others or was it simply because Stubb made only few speeches. It would also be interesting to analyse the results in reverse: Is there significant politicians, who are not mentioned? And if there is, why not? Also, gender issue is conspicuous. Only two women stand out in the Table 3. How do men mention women politicians and other men – and vice versa.

At the moment, dataset contains extracted mentions only for the speeches from latest electoral terms. When mentions from parliamentary speeches given before 2015 are extracted, it could be revealing to compare the plenary debates prior and after the institutional and legislative reforms, which have elevated the status of the Parliament. How do the naming practices differ and are visible in a time when parliament was not considered a significant political debate arena and prime ministers rarely appeared there? Also,

how have the pattern of name mentions changed in regards of dealignment? Are name mentions in the parliament in correlation with increasing dealignment since 1990 in Finland? On the other hand, it would be interesting to analyze who ministers, for example, the prime minister mentions and what it reveals about policy-making methods and political culture, and whether the name mentions vary from one prime minister to another. Does the prime minister specifically mention opposition MPs who are critical of the government, or are there other significant factors to be found?

Analyses of person name mentions in parliamentary speeches point out interesting people and phenomena and raise follow-up questions for further studies, requiring close reading of the speeches. In addition to revealing potentially interesting speeches to closer reading, combining bibliometric analysis and network analysis methods for person name mentions also brings new perspectives into studies of the personalization of politics, analyses of the rise of populism and the hypothesis of strengthening/weakening of the position of the Parliament.

Acknowledgements

We thank Minna Tamper for her work with named entity recognition and linking related to the ParliamentSampo system, and other members of the larger project team. Thanks to Ari Apiola, Sari Wilenius, Päivikki Karhula, and other collaborators at the Parliament of Finland for help regarding provision of the data. Our work was funded by the Research Council of Finland (formerly Academy of Finland) and is related to the EU project InTaVia⁸, the EU COST action Nexus Linguarum⁹, and the Eminentia Grant by the Finnish Cultural Foundation to the third author. Computing resources of the CSC – IT Center for Science were used.

Notes

1. The European Parliament publishes data about its work as LD online: <https://data.europarl.europa.eu/en/home>.
2. <https://www.w3.org/standards/semanticweb/>
3. <https://finto.fi/finaf/en/>
4. <https://finto.fi/yso-paikat/en/?clang=en>
5. <http://www.ldf.fi/dataset/pnr>
6. <https://voikko.puimula.org/>
7. Portal in use at: <https://parlamenttisampo.fi>; project homepage: <https://seco.cs.aalto.fi/projects/semparl/en/>
8. <https://intavia.eu>
9. <https://nexuslinguarum.eu>

References

- Aarnio, E. (1996). Puolueohjelmat ja analyysiohjelmat. In K. Palonen & H. Summa (Eds.), *Pelkkää retoriikkaa, tutkimuksen ja politiikan retoriikat* (pp. 293–317). Tampere, Finland: Vastapaino.
- Abercrombie, G., & Batista-Navarro, R. (2020). Sentiment and position-taking analysis of parliamentary debates: a systematic literature review. *Journal of Computational Social Science*, 3, 245–270. <https://doi.org/10.1007/s42001-019-00060-w>

- Albertazzi, D. (2008). Switzerland: Yet another populist paradise. In D. Albertazzi & D. McDonnell (Eds.), *Twenty-first century populism: The spectre of western european democracy* (pp. 100–118). London: Palgrave Macmillan UK. doi: 10.1057/9780230592100_7
- Andrews, J. (2003). An author co-citation analysis of medical informatics. *Journal of the Medical Library Association : JMLA*, 91(1), 47–56.
- Backhaus, K., Lügger, K., & Koch, M. (2011). The structure and evolution of business-to-business marketing: A citation and co-citation analysis. *Industrial Marketing Management*, 40(6), 940–951. doi: 10.1016/j.indmarman.2011.06.024
- Beelen, K., Thijm, T. A., Cochrane, C., Halvemaan, K., Hirst, G., Kimmins, M., ... Rheault, L. (2017). Digitization of the Canadian parliamentary debates. In T. Säily, A. Nurmi, M. Palander-Collin, & A. Auer (Eds.), *Exploring future paths for historical sociolinguistics* (pp. 83–107). Amsterdam: John Benjamins. doi: 10.1017/S0008423916001165
- Bengtsson, A., & Wass, H. (2011). The representative roles of mps: A citizen perspective. *Scandinavian Political Studies*, 34(2), 143–167. doi: <https://doi.org/10.1111/j.1467-9477.2011.00267.x>
- Benoît, C., & Rozenberg, O. (Eds.). (2020). *Handbook of parliamentary studies: Interdisciplinary approaches to legislatures*. UK: Edward Elgar Publishing. doi: 10.4337/9781789906516
- Bhattacharya, C. (2020). Gatekeeping the plenary floor: Discourse network analysis as a novel approach to party control. *Politics and Governance*, 8(2), 229–242. doi: 10.17645/pag.v8i2.2611
- Blaxill, L., & Beelen, K. (2016). A feminized language of democracy? the representation of women at Westminster since 1945. *Twentieth Century British History*, 27(3), 412–449. doi: 10.1093/tcbh/hww028
- Bojārs, U., Dargis, R., Lavrinovičs, U., & Paikens, P. (2019). LinkedSaeima: A linked open dataset of Latvia's parliamentary debates. In *Semantic systems. the power of AI and knowledge graphs. SEMANTICS 2019* (pp. 50–56). Berlin, Heidelberg: Springer. doi: 10.1007/978-3-030-33220-4_4
- Calero-Medina, C., & Noyons, E. (2008). Combining mapping and citation network analysis for a better understanding of the scientific development: The case of the absorptive capacity field. *Journal of Informetrics*, 2(4), 272–279. doi: 10.1016/j.joi.2008.09.005
- Culnan, M. (1987). Mapping the intellectual structure of MIS, 1980-1985: A co-citation analysis. *MIS Quarterly: Management Information Systems*, 11(3), 341–350. doi: 10.2307/248680
- Curran, B., Higham, K., Ortiz, E., Vasques Filho, D., & Gargiulo, F. (2018). Look who's talking: Two-mode networks as representations of a topic model of New Zealand parliamentary speeches. *PloS one*, 13(6), e0199072. doi: 10.1371/journal.pone.0199072
- Dalton, R. J. (1984). Cognitive mobilization and partisan dealignment in advanced industrial democracies. *The Journal of Politics*, 46(1), 264–284.
- Dalton, R. J., & Wattenberg, M. P. (2002). *Parties Without Partisans: Political Change in Advanced Industrial Democracies*. online edn: Oxford University Press. doi: 10.1093/0199253099.001.0001
- Daniel, K. L., McConnell, M., Schuchardt, A., & Pfeffer, M. E. (2022, 04). Challenges facing interdisciplinary researchers: Findings from a professional development workshop. *PLOS ONE*, 17(4), 1–16. doi: 10.1371/journal.pone.0267234
- Elson, D. K., McKeown, K., & Dames, N. J. (2010). Extracting social networks from literary fiction. In *Proceedings of the 48th annual meeting of the association for computational linguistics* (p. 138–147). Association for Computational Linguistics.

- Esteve Del Valle, M., Broersma, M., & Ponsioen, A. (2022). Political interaction beyond party lines: Communication ties and party polarization in parliamentary Twitter networks. *Social Science Computer Review*, 40(3), 736–755. doi: 10.1177/0894439320987569
- Forsman, M. (2022). *Julkaisut ja tieteen mittaaminen : Bibliometriikan käännekohtia* (2nd ed.). Vantaa, Finland: Enostone kustannus. doi: 10.31885/9789515150622
- Franks, C. E. S. (1985). Debates and Questions period in the Canadian House of Commons: What Purpose Do They Serve? *American Review of Canadian Studies*, 15(1), 1–15. doi: 10.1080/02722018509480799
- Guldi, J. (2019). Parliament's debates about infrastructure: An exercise in using dynamic topic models to synthesize historical change. *Technology and Culture*, 60(1), 1–33. doi: 10.1353/tech.2019.0000
- Hagberg, A. A., Schult, D. A., & Swart, P. J. (2008). Exploring network structure, dynamics, and function using networkx. In G. Varoquaux, T. Vaught, & J. Millman (Eds.), *Proceedings of the 7th python in science conference* (p. 11 - 15). Pasadena, CA USA.
- Herkman, J. (2019). *Suomen puolueet: Vapauden ajasta maailmantuskaan*. Tampere, Finland: Vastapaino.
- Herkman, J. P. (2015). Pelkkää retoriikkaa? Populismin kehykset Helsingin Sanomissa ja Ilta-Sanomissa vuoden 2011 eduskuntavaalien yhteydessä. *Media & viestintä*, 38(2), 74–89. <https://doi.org/10.23983/mv.62098>
- Hidén, M., & Honka-Hallila, H. (2006). *Miten eduskunta toimii (how Parliament of Finland works)*. Helsinki: Edita Publishing.
- Hyun, Y.-S., Cho, D., & Yoon, S. (2015). Landscape of human resource development research in korea: Results from author co-citation network analysis. *Human Resource Development International*, 18(5), 446–463. doi: 10.1080/13678868.2015.1079295
- Hyvönen, E., Leskinen, P., & Rantala, H. (2023, June). Integrating faceted search with data analytic tools in the user interface of ParliamentSampo - Parliament of Finland on the Semantic Web. In *The semantic web: Eswc 2023 satellite events* (pp. 16–21). Cham: Springer. https://doi.org/10.1007/978-3-031-43458-7_3
- Hyvönen, E., Sinikallio, L., Leskinen, P., Drobac, S., Leal, R., Mela, M. L., ... Rantala, H. (2024). Publishing and using parliamentary linked data on the Semantic Web: ParliamentSampo system for Parliament of Finland.. (In open review: <https://www.semantic-web-journal.net/system/files/swj3605.pdf>)
- Hyvönen, E., Sinikallio, L., Leskinen, P., Mela, M. L., Tuominen, J., Elo, K., ... Kesäniemi, J. (2022). Finnish parliament on the semantic web: Using ParliamentSampo data service and semantic portal for studying political culture and language. In *Dipada, digital parliamentary data in action*. Aachen: CEUR Workshop Proceedings, Vol. 3133. <http://ceur-ws.org/Vol-3133/paper05.pdf>
- Ihalainen, P., & Sahala, A. (2020). Evolving conceptualisations of internationalism in the UK parliament: Collocation analyses from the League to Brexit. In M. Fridlund, M., Oiva, & P. Paju (Eds.), *Digital histories: Emergent approaches within the new digital history* (p. 199—219). Helsinki: Helsinki University Press. doi: 10.33134/HUP-5-12
- Ilie, C. (2022). How to argue with questions and answers: Argumentation strategies in parliamentary deliberation. *Languages*, 7(3). doi: 10.3390/languages7030205
- Jeong, Y., Song, M., & Ding, Y. (2014). Content-based author co-citation analysis. *Journal of*

- Informetrics*, 8(1), 197–211. doi: 10.1016/j.joi.2013.12.001
- Jungar, A.-C., & Jupskås, A. R. (2014). Populist radical right parties in the nordic region: A new and distinct party family? *Scandinavian Political Studies*, 37(3), 215–238. doi: <https://doi.org/10.1111/1467-9477.12024>
- Karvonen, L. (2014). *Parties, Governments and Voters in Finland: Politics Under Fundamental Societal Transformation*. Colchester: ECPR Press. <https://books.google.fi/books?id=4SxmCgAAQBAJ>
- Katajisto, K. (2023). *Keskustan historia. 6. Väryksen ja Kääriäisen korkean profiilin aika 1981–1991*. Helsinki: Suomalaisen Kirjallisuuden Seura.
- Kettunen, K., & La Mela, M. (2021). Semantic tagging and the Nordic tradition of everyman's rights. *Digital Scholarship in the Humanities*, 37(2), 483–496. doi: 10.1093/llc/fqab052
- Kleinberg, J. (1999). Authoritative sources in a hyperlinked environment. *Journal of the Association for Computing Machinery*, 46(5), 604–632. doi: 10.1145/324133.324140
- Kleinberg, J. M. (1999). Authoritative sources in a hyperlinked environment. *Journal of the Association for Computing Machinery*, 46, 604–632. doi: 10.1145/324133.324140
- Lapponi, E., Søyland, M. G., Velldal, E., & Oepen, S. (2018). The Talk of Norway: a richly annotated corpus of the Norwegian parliament, 1998–2016. *Lang Resources & Evaluation*, 52, 873–893. doi: 10.1007/s10579-018-9411-5
- Leifeld, P. (2020). Policy debates and discourse network analysis: A research agenda. *Politics and Governance*, 8(2), 180–183. doi: 10.17645/pag.v8i2.3249
- Leskinen, P., Hyvönen, E., & Tuominen, J. (2021). Members of Parliament in Finland knowledge graph and its linked open data service. In *international conference on semantic systems, 6-9 september 2021, amsterdam, the netherlands* (p. 255–269). doi: 10.3233/SSW210049
- Leskinen, P., Rantala, H., & Hyvönen, E. (2022, March). Analyzing the Lives of Finnish Academic People 1640–1899 in Nordic and Baltic Countries: AcademySampo Data Service and Portal. In *6th digital humanities in nordic and baltic countries conference, long paper*. Aachen: CEUR Workshop Proceedings, Vol. 3232. <https://ceur-ws.org/Vol-3232/>
- Leydesdorff, L., & Vaughan, L. (2006). Co-occurrence matrices and their applications in information science: Extending ACA to the web environment. *Journal of the American Society for Information Science and Technology*, 57(12), 1616–1628. doi: 10.1002/asi.20335
- Ma, R. (2012). Author bibliographic coupling analysis: A test based on a chinese academic database. *Journal of Informetrics*, 6(4), 532–542. doi: 10.1016/j.joi.2012.04.006
- Makkonen, K., & Loukasmäki, P. (2019, 7). Eduskunnan täysistunnon puheenaiheet 1999–2014: Miten käsitellä Ida-aihemalleja? *Politiikka*, 61(2), 127–159. <https://journal.fi/politiikka/article/view/77163>
- McAllister, I. (2007, 08). The personalization of politics. In *The oxford handbook of political behavior*. online edn: Oxford University Press. doi: 10.1093/oxfordhb/9780199270125.003.0030
- McCain, K. (1990). Mapping authors in intellectual space: A technical overview. *Journal of the American Society for Information Science*, 41(6), 433–443. doi: 10.1002/(SICI)1097-4571(199009)41:6<433::AID-ASII11>3.0.CO;2-Q
- McLaren, C., & Bruner, M. (2022, 12). Citation network analysis. *International Review of Sport and Exercise Psychology*, 15(1), 179–198. doi: 10.1080/1750984X.2021.1989705
- Mickelsson, R. (2021). *Suomen puolueet: Vapauden ajasta maailmantuskaan*. Tampere, Finland:

Vastapaino.

- Nerur, S., Rasheed, A., & Natarajan, V. (2008). The intellectual structure of the strategic management field: An author co-citation analysis. *Strategic Management Journal*, 29(3), 319–336. doi: 10.1002/smj.659
- Nousiainen, J. (2000). Suomalaisen parlamentarismin kolmas kehitysvaihe: konsensuaalinen enemmistöhallinta, vireytyvä eduskunta. *Politiikka : Valtiotieteellisen yhdistyksen julkaisu*, 42(2), 83–96.
- Pekonen, K. (2011). *Puhe eduskunnassa*. Tampere, Finland: Vastapaino.
- Poikkimäki, H., Leskinen, P., Tamper, M., & Hyvönen, E. (2022). Analyses of networks of politicians based on linked data: Case ParliamentSampo – Parliament of Finland on the Semantic Web. In S. Chiusano et al. (Eds.), *New trends in database and information systems* (pp. 585–592). Cham: Springer. https://doi.org/10.1007/978-3-031-15743-1_53
- Poikkimäki, H. (2023). *Eduskunnan täysistuntojen puheenvuorojen henkilömainintoihin perustuvien verkostoiden analyysi* (Master's thesis, Aalto University, Department of Computer Science). <https://seco.cs.aalto.fi/publications/2023/poikkimaki-msc-2023.pdf> (MSc Thesis)
- Quinn, K., Monroe, B., Colaresi, M., Crespin, M. H., & Radev, D. R. (2010). How to analyze political attention with minimal assumptions and costs. *American Journal of Political Science*, 54, 209–228. doi: 10.1111/j.1540-5907.2009.00427.x
- Rahat, G., & Zamir, S. (2018). Personalized politics online. In W. P. Cross, R. S. Katz, & S. Pruyers (Eds.), *The personalization of democratic politics and the challenge for political parties* (pp. 103–124). online edn: ECPR Press, Rowman & Littlefield. <https://rowman.com/ISBN/9781785522956/The-Personalization-of-Democratic-Politics-and-the-Challenge-for-Political-Parties>
- Rautiainen, k., Pauli, Taskinen, k., Helena, & Rissanen, k., Sari. (2020). Sosiaali- ja terveystalvelujen uudistaminen : virstanpylväitä menneestä ja suuntia tulevasta. *Uudistuva sosiaali- ja terveystala*. <https://urn.fi/URN:ISBN:978-952-359-022-9>
- Rousseau, R., & Zuccala, A. (2004). A classification of author co-citations: Definitions and search strategies. *Journal of the American Society for Information Science and Technology*, 55(6), 513–529. doi: 10.1002/asi.10401
- Saramäki, J., & Moro, E. (2015). From seconds to months: an overview of multi-scale dynamics of mobile telephone calls. *The European Physical Journal B*, 88(6). doi: 10.1140/epjb/e2015-60106-6
- Sidorov, S., Faizliev, A., Balash, V., Gudkov, A., Chekmareva, A., Levshunov, M., ... Raigorodskii, A. (2018). *QAP analysis of company co-mention network* (1st ed. 2018. ed., Vol. 10836). Cham :: Springer International Publishing :: doi: 10.1007/978-3-319-92871-5_7
- Sinikallio, L., Drobac, S., Tamper, M., Leal, R., Koho, M., Tuominen, J., ... Hyvönen, E. (2021, August). Plenary debates of the Parliament of Finland as linked open data and in Parla-CLARIN markup. In *3rd conference on language, data and knowledge, ldk 2021* (pp. 1–17). Germany: Schloss Dagstuhl- Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing. <https://drops.dagstuhl.de/opus/volltexte/2021/14544/pdf/OASlcs-LDK-2021-8.pdf>
- Sinikallio, L., Leskinen, P., Drobac, S., Tamper, M., Leal, R., Tuominen, J., ... Hyvönen, E. (2023, February). *Parliamentsampo knowledge graph*. Zenodo. <https://doi.org/10.5281/>

[zenodo.7636420](https://zenodo.org/record/7636420) doi: 10.5281/zenodo.7636420

- Taggart, P. (2000). *Populism*. Buckingham: Open University Press.
- Tamper, M., Leal, R., Sinikallio, L., Leskinen, P., Tuominen, J., & Hyvönen, E. (2022). Extracting knowledge from parliamentary debates for studying political culture and language. In S. Tiwari, N. Mihindukulasooriya, F. Osborne, D. Kontokostas, J. D'Souza, & M. Kejriwal (Eds.), *Text2kg 2022 & mk 2022. first international workshop on knowledge graph generation from text and first international workshop on modular knowledge* (pp. 70–79). Aachen: CEUR Workshop Proceedings, Vol. 3184. http://ceur-ws.org/Vol-3184/TEXT2KG_Paper_5.pdf
- Tamper, M., Leskinen, P., Hyvönen, E., Valjus, R., & Keravuori, K. (2023). Analyzing biography collection historiographically as linked data: Case National Biography of Finland. *Semantic Web – Interoperability, Usability, Applicability*, 14(2), 385–419. doi: 10.3233/SW-222887
- Van Aggelen, A., Hollink, L., Kemman, M., Kleppe, M., & Beunders, H. (2017). The debates of the European Parliament as Linked Open Data. *Semantic Web – Interoperability, Usability, Applicability*, 8(2), 271–281. doi: 10.1007/s42001-019-00060-w
- Van Eck, N., Waltman, L., Dekker, R., & Van Den Berg, J. (2010). A comparison of two techniques for bibliometric mapping: Multidimensional scaling and VOS. *Journal of the American Society for Information Science and Technology*, 61(12), 2405–2416. doi: 10.1002/asi.21421
- Vespignani, A. (2018, June). Twenty years of network science. *Nature*, 558(7711), 528–529. doi: 10.1038/d41586-018-05444-y
- Watts, D. J., & Strogatz, S. H. (1998, June). Collective dynamics of ‘small-world’ networks. *Nature*, 393(6684), 440–442. doi: 10.1038/30918
- West, J., Jensen, M., Dandrea, R., Gordon, G., & Bergstrom, C. (2013). Author-level eigenfactor metrics: Evaluating the influence of authors, institutions, and countries within the social science research network community. *Journal of the American Society for Information Science and Technology*, 64(4), 787–801. doi: 10.1002/asi.22790
- Wiberg, M. (2014). Eduskunta hallituksen valvojana: kansanedustajat ovat kyselevinään ja ministerit ovat vastaavinaan. In T. Raunio & M. Wiberg (Eds.), *Eduskunta: kansanvaltaa puolueiden ja hallituksen ehdoilla* (pp. 215,221). Helsinki, Finland: Gaudeamus.
- Yan, E., & Ding, Y. (2012). Scholarly network similarities: How bibliographic coupling networks, citation networks, cocitation networks, topical networks, coauthorship networks, and cword networks relate to each other. *Journal of the American Society for Information Science and Technology*, 63(7), 1313–1326. doi: 10.1002/asi.22680
- Zamir, S. (2024). Explaining online personalized politics: A cross-national comparative analysis of social media consumption of parties and leaders. *Political Studies Review*, 22(1), 108–137. doi: 10.1177/14789299221147458
- Zhao, D., Cappello, A., & Johnston, L. (2017). Functions of uni- and multi-citations: Implications for weighted citation analysis. *Journal of Data and Information Science*, 2(1), 51–69. doi: 10.1515/jdis-2017-0003
- Zhao, D., & Strotmann, A. (2008a). Author bibliographic coupling: Another approach to citation-based author knowledge network analysis. *Proceedings of the American Society for Information Science and Technology*, 45(1), 1–10. doi: 10.1002/meet.2008.1450450292
- Zhao, D., & Strotmann, A. (2008b). Evolution of research activities and intellectual influences in information science 1996-2005: Introducing author bibliographic-coupling analysis. *Journal*

-
- of the American Society for Information Science and Technology*, 59(13), 2070–2086. doi: 10.1002/asi.20910
- Zhao, D., & Strotmann, A. (2022). Intellectual structure of information science 2011–2020: An author co-citation analysis. *Journal of Documentation*, 78(3), 728–744. doi: 10.1108/JD-06-2021-0119
- Zhao, R., & Chen, B. (2014). Applying author co-citation analysis to user interaction analysis: A case study on instant messaging groups. *Scientometrics*, 101(2), 985–997. doi: 10.1007/s11192-014-1314-7
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472. doi: 10.1177/1094428114562629