Name-Mention Networks of Politicians in the Finnish Parliament

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The most important task of the Parliament of Finland—or, indeed, the parliament of any Western democracy—is enacting legislation. During plenary sessions Parliament debates government proposals, and sometimes Citizens' initiatives through parliamentary speeches, forms them into legislation and votes for approval. Within these debates, Members of the Parliament (MPs) can mention each other directly by name, or indirectly using other expressions, to show support or to challenge the other MP.

We take a look at the name-mention networks of yearly parliamentary sessions during electoral terms 2015–2018 and 2019–2022 in the Finnish parliament. In these networks, the 200 elected MPs represent nodes with directed links weighted by the frequency of automatically recognized and linked name mentions connecting them. The speeches and speakers of the Parliament of Finland are available through ParliamentSampo as harmonized linked open data [1].

After removing a few isolates, we are left with weakly connected networks. Each network is run through a disparity filter to obtain the backbone of the network [3], which is used for visualizations shown in figure1a). We note that nodes are not polarized into near-disconnected subnetworks, although nodes with the same color (political party) tend to be closer to each other. This type of assortative mixing, that is the nodes tend to be closer to other nodes with similar attributes, is typical for social networks [2]. To measure the potential bias towards mentioning fellow party members, we use unweighted networks after filtering. We define *cohesion* (equation 1) based on the shortest paths for this purpose:

$$\text{Cohesion} = \frac{D_{\text{different}}/n_{\text{different}}}{D_{\text{same}}/n_{\text{same}}} \tag{1}$$

where $D_{\text{different}}$ is the sum of the shortest distances between pairs of nodes that belong to different parties, $n_{\text{different}}$ is the number of such node pairs. Similarly, D_{same} and n_{same} are defined for nodes belonging to the same party. The cohesion value of 1.0 indicates that the attribute of a node does not have an effect on the distance between nodes. A cohesion value larger than 1.0 indicates assortativity. Cohesion is calculated for each parliamentary session, and by shuffling the party labels we obtain p-values for each network. The results are shown in Figure 1b). Every cohesion value is greater than 1.0, implying assortativity, and the results are significant for all parliamentary sessions except 2016. Cohesion is a little higher for the later electoral term, meaning that MPs have mentioned fellow party members more. Assortativity with respect to party labels can also indicate party unity.

While our initial results shown here suggest slight bias towards mentioning members of MP's own party they do not indicate systematic polarization in the parliamentary discussions, giving us no reason to believe the parliamentary floor does not retain its democratic purpose. For further studies of the structure of the parliamentary name mention networks, the core-periphery and community detection algorithms can be used for the global structure, and motif analysis for local structures. To identify influential actors within the Finnish Parliament, centrality metrics for nodes in each network can be calculated, and ranked for comparisons between parliamentary sessions. The context around the name mentions could also be used to classify the mentions, for example to support, attack or neutral, for forming signed networks and getting a clearer picture of the party dynamics.

References

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[2] M. E. J. Newman. “Mixing patterns in networks”. In: *Phys. Rev. E* 67 (2 Feb. 2003), p. 026126. DOI: 10.1103/PhysRevE.67.026126. URL: https://link.aps.org/doi/10.1103/PhysRevE.67.026126.

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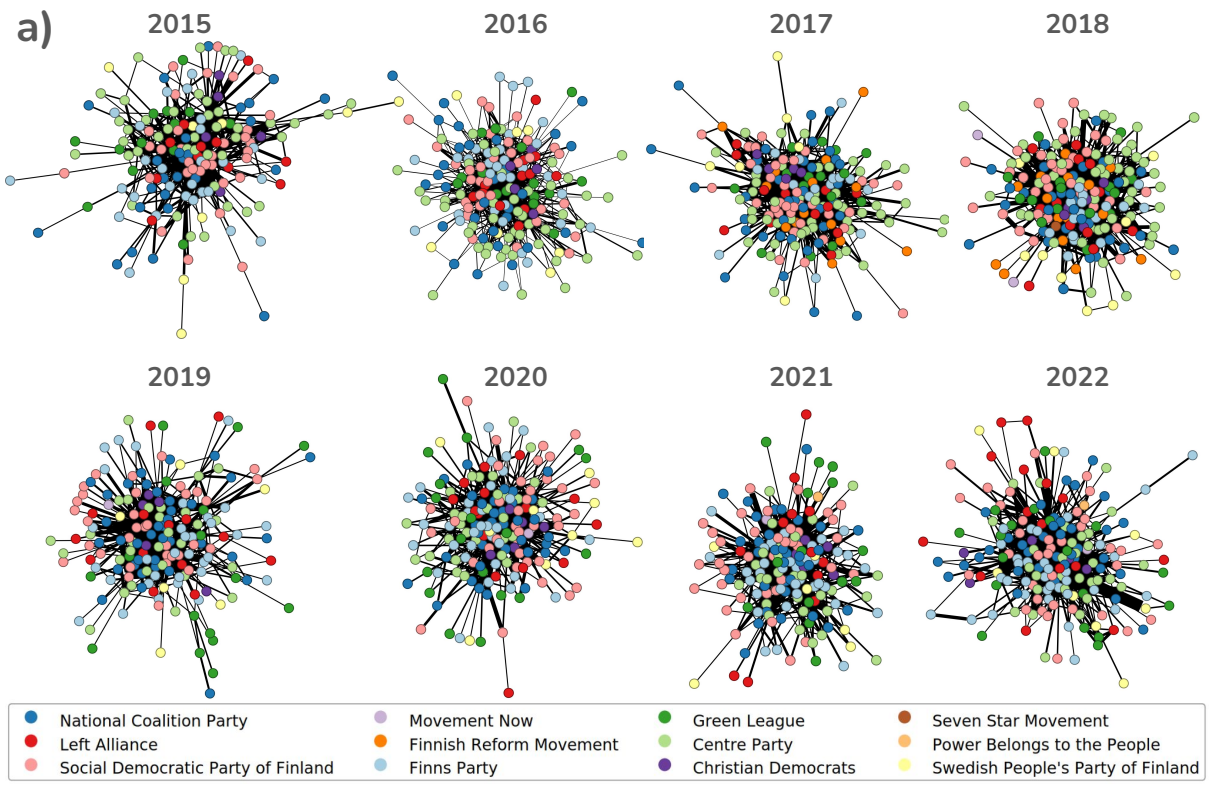

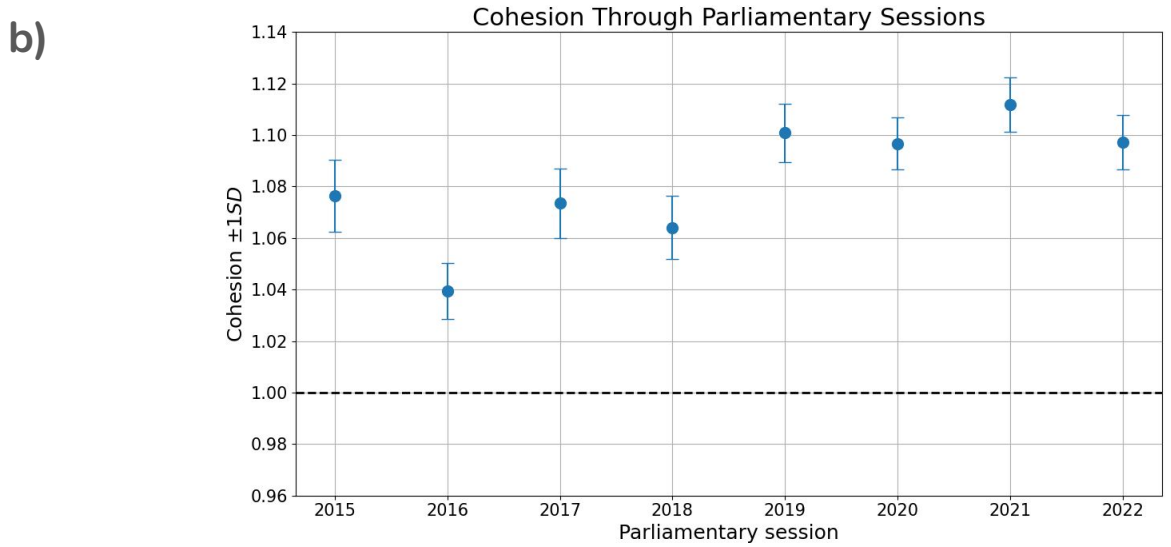

Figure 1: a) Visualizations of networks of MPs for each parliamentary session after disparity filter. Nodes are colored by the political parties and isolates are not shown, and Yifan Hu layout is used. b) Cohesion of the networks through parliamentary sessions (p-value < 0.01, except for parliamentary session 2016 p-value ≈ 0.27, $N = 1000$).