



A Quantitative Social Network Analysis of Politicians' Tweets to Explore Political Communication

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Motivation

Combining different methods to explore communication behaviour on social media

Agenda

1. Case Study
2. Methods
3. Data Work
4. Results
5. Discussion

Case Study

- Twitter interactions (mentions, retweets, replies)
- between MPs of possible coalition partners (CDU, CSU, SPD, Greens, FDP)
- before and after the 2021 German federal election

differences in intra- and inter-party
communication

Hypotheses

- Different interactions between MPs can be observed during the pre- and post-election period (H1).
- The interaction networks of reply, mention and retweet for each period show a difference in intra- and inter-party communication (H2).
- “Ampel” MPs’ mutual sentiment changed positively (H3).
- Political tendencies towards an “Ampel” coalition can be observed (H4).

Network Scenarios

- Scenario 1: all interaction types together
- Scenario 2: a) mention, b) retweet, and c) reply interactions separately
- Scenario 3: the tweet author's sentiment towards the addressed MP
- Scenario 4: the average homophily within each party and party group

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Social Network Analysis

- Nodes: MPs
- Edges: Twitter interactions
 - Mention: One MP using another MP's handle.
 - Retweets: Redistribution of another user's tweet; can contain commentary by the retweeter.
 - Reply: Comment posted under another MP's tweet.

Cluster Analysis

- Groups of individuals based on similarity
 - Connectivity-based clustering identifies clusters based on the connections between nodes in the network, as well as the weights of connections.
 - Girvan-Newman Algorithm assumes that members of a cluster have more connections to other members of the same cluster, and fewer connections to other nodes in the remaining network.
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Sentiment Analysis

- The textual contexts of MPs' tweets were examined to analyze the sentiment for which the Python package TextBlob was used.
- The algorithm generated a polarity score from -1.0 to $+1.0$ for each tweet, which classified the tweet as either positive, neutral, or negative.

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Data Work

- Publicly available Twitter data can be divided into three categories:
 - User information, such as the username, the Twitter handle (identified by @), or account description;
 - following and liking behavior of a user, and the user's followers;
 - the user's tweet timeline, in which all self-published or retweeted tweets appear, as well as the user's replies to others' tweets.

Data Work

- Tweets from MPs of the 19th (2017-2021) and 20th (2021-2025) legislative sessions from parties which were relevant for coalition negotiations.
- For the period from July 26, 2021, 0:00 a.m. to November 26, 2021, 12:00 p.m. (Election was September 26)

**26,888 German language tweets from 736
Twitter accounts**

Data Work

- Enrichment of the data with information on party affiliation and membership of the 19th or 20th legislative period.
- All tweets that did not represent a connection between two MPs were removed.
- The dataset was then divided into a pre- and a post-election partition.

5,766 tweets from 466 MPs in the pre-election dataset and 3,816 from 476 MPs in the post-election dataset

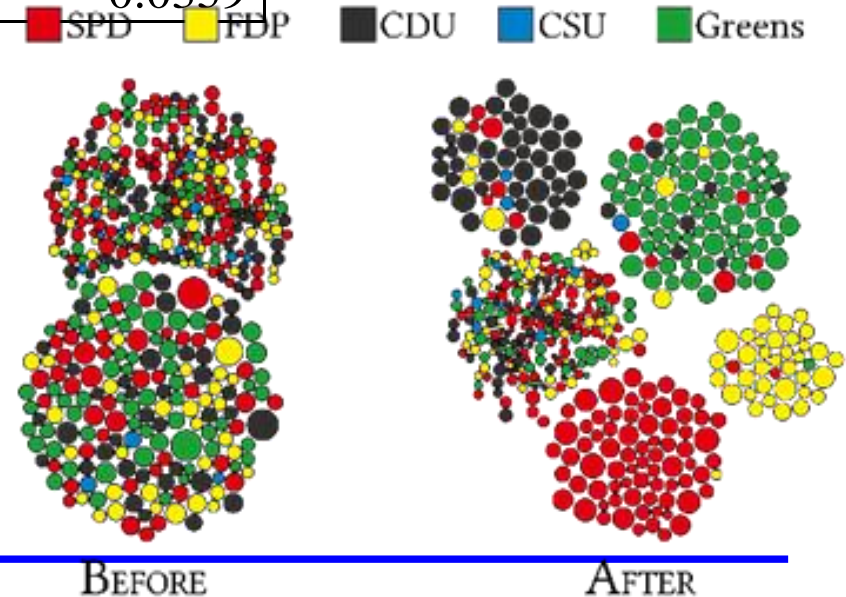
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Scenario 1: Multiple Interactions

Metric	Value (pre)	Value (post)	Difference
Number of nodes	466	476	10
Number of edges	5766	3816	-1950
Number of clusters	256	188	-68
Maximum modularity	0.026	0.356	0.330
Average IH	0.0212	0.0571	0.0359
p-value from χ^2 -Test	< 0.001	< 0.001	

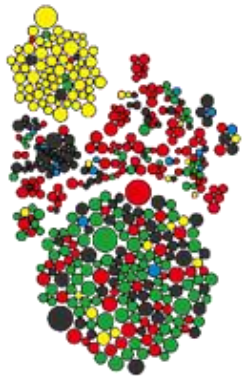
Post-election, MPs predominantly communicated within their own parties, while they communicated much more openly before the election.



Scenario 2: Single Interactions

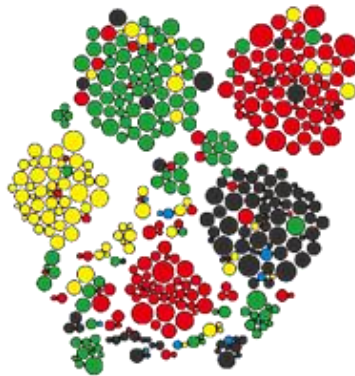
Mention:

■ SPD ■ FDP ■ CDU ■ CSU ■ Greens



BEFORE

Mentions of the green chancellor candidate



AFTER

MPs congratulating their party peers

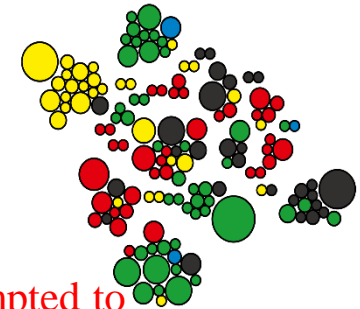
Retweet:

■ SPD ■ FDP ■ CDU ■ CSU ■ Greens



BEFORE

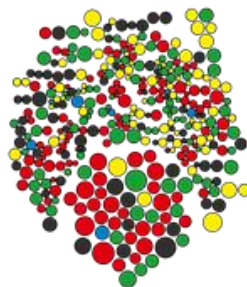
MPs attempted to promote tweets of party peers



AFTER

Reply:

■ SPD ■ FDP ■ CDU ■ CSU ■ Greens



BEFORE



AFTER

Cluster of CDU and FDP MPs indicates active conversations between these two parties because of coalition negotiations.

Scenario 3: Sentiment Analysis

Before election:

Source \ Target	SPD	FDP	CDU	CSU	Greens
SPD	0.25001	0.21293	0.00002	-0.11499	0.35683
FDP	0.05095	-0.01008	0.06981	0.09734	0.01032
CDU	0.00070	0.02997	0.13179	-0.12469	0.00483
CSU	0.04297	-0.01875	0.70728	0.10625	0.11405
Greens	-0.16582	0.03257	-0.16458	0.00053	0.35588

SPD scores positively towards the “Ampel” parties (FDP and Greens).

After election:

Source \ Target	SPD	FDP	CDU	CSU	Greens
SPD	0.00166	0.25408	0.31106	0.84063	0.06433
FDP	0.33102	0.54495	-0.11953	0.00391	0.27281
CDU	0.79865	-0.00598	0.09291	-0.08487	0.67012
CSU	-0.16250	0.24688	0.59688	0.12500	0.39146
Greens	0.43225	0.09978	0.62791	-0.06024	0.38109

The FDP especially shows notable increases in positive sentiments towards the SPD and the Greens, considering that the FDP moved towards the “Ampel”.

Scenario 4: Party and group dependent clustering

Clusters whose *inbreeding homophily index* is greater than 0 are considered homogeneous.

	Before	After	Difference
CDU	0.4749	0.5596	0.0848
CSU	0.0721	0.0516	-0.0205
SPD	0.5272	0.6392	0.1120
Greens	0.5682	0.5729	0.0047
FDP	0.5397	0.4618	-0.0779
“Ampel” Coalition	0.4519	0.6272	0.1754
Jamaica Coalition	0.5209	0.5307	0.0098
Union Group	0.4632	0.5422	0.0791
p-value from χ^2 -Test	0.057764	0.106983	

SPD wins die election.

The succesful coalition.

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- “Ampel” MPs’ mutual sentiment changed positively (H3). ? Congratulations created overall positive sentiments.
- Political tendencies towards an “Ampel” coalition can be observed (H4) ? No statistical significant results.

Conclusion

Application of techniques from social network analysis, sentiment analysis and cluster analysis in combination to analyze communication on social media especially on micro blogs (Twitter).