

Multimodal Data and Open Science

Innovations in the Study of Political Communication and Behaviour

Doctoral Defence, University of Mannheim

Andreas Küpfer (University of Mannheim & TU Darmstadt)

January 13th, 2025



- I Overview of Dissertation Studies
- II Multimodality & Political Interactions (Study 1-3)
- III Open Science in Political Communication Studies (Study 4)
- IV Core Contributions, Limitations & Future Avenues
- V Conclusion

Overview of Dissertation Studies

Multimodal Data & Open Science

1. Alignment Helps Make the Most of Multimodal Data (with Christian Arnold)
2. Look Who's Confronting: Opposition Status, Gender, and the Far Right
3. The Politics of Seeking and Avoiding Discourse in Parliament
(with Elias Koch, published in the *European Journal of Political Research*)
4. Nonrandom Tweet Mortality and Data Access Restrictions:
Compromising the Replication of Sensitive Twitter Studies
(Published in *Political Analysis*)



Multimodality &
Political Interactions

Open Science in
PolComm Studies

Multimodality & Political Interactions (Study 1-3)

PUBLIC COMMUNICATION - CLOSED SESSION:

This is an opportunity for citizens to speak to the City Council for up to 3 minutes on the following Closed Session. The Mayor and City Council reserve the right to adjust this time limit based on the number of speakers who wish to address the Mayor and City Council.

A. Public Communications - Closed Session**CLOSED SESSION:****A. 1:00 P.M. CLOSED SESSION****A. 1. CONFERENCE WITH REAL PROPERTY NEGOTIATORS** [25-3981](#)

(Gov. Code Section 54906.8 (a)
City of Fortuna
Project: 10166 Main Street
City Negotiator: Philip Barnes, Deputy City Manager
Negotiating Party: Adles Fernando/Foothill, LLC
Under Negotiator: Price and Terms of payment

2. CONFERENCE WITH LEGAL COUNSEL – EXISTING LITIGATION PURSUANT TO GOVERNMENT CODE

Page 1 of 14

City Council Meeting	Regular Agenda	December 8, 2016
SECTION 54906.8 (a)		
City of Fortuna	Inland Coalition for Immigrant Justice v. City of Fortuna	
3. CONFERENCE WITH LABOR NEGOTIATOR PURSUANT TO GOVERNMENT CODE SECTION 54907.8		
CITY Negotiator: Mayor Acquarone Warren and Mayor Pro Tem	City Negotiator: Mayor Acquarone Warren and Mayor Pro Tem	
Employee Organization(s): City Manager, Unrepresented		

CALL TO ORDER/ROLL CALL:**A. Call To Order/Roll Call:****INVOCATION/PLEDGE OF ALLEGIANCE:****A. Invocation/Pledge of Allegiance:****43. Sitzung**

Berlin, Mittwoch, den 26. November 2014

Beginn: 09:00 Uhr

Präsidentin Julia Klöckner:

Guten Morgen, wir erinnern uns ich begrüße Sie am zweiten Tag des Haushaltsschweigs. Wir wollen heute sehr intensiv debattieren, und deshalb eröffne ich jetzt die 43. Sitzung des Deutschen Bundestages.

Bevor wir gemeinsam in die Tagessitzung einsteigen, möchte ich nachdrücklich sehr herzlich danken. – Den Inhaber der Pressemappe, Herrn Dr. Thomas Riedel, für das Ausarbeiten der Pressemappe. Vielen Dank. Es sei denn, die Kolleginnen oder Kollegen würden sich dagegen wenden, aber im Künzelsauer Karat muss das ja stimmen. Ich danken Ihnen sehr herzlich für Ihre Arbeit.

(II) Gedenken an die Opfer der Terroranschläge vom 11. September 2001
Kollegin Nicole Grottel sehr herzlich im Namen des gesamten Hauses zum 9/11-Gedenktag. Allen Guten und geschenkt Sie das Leben.

(Befehl)

Ich komme jetzt zur Tagessitzung. Interpellationen haben wir vereinbart, den Anfang der Präsidentin der AfD und Dr. Barbara Hendricks (Die Linke). Ich bitte um Punkt bei den Oben-Dekrete-Punkten aufzutreten. – Ich sage und bitte keine Widerrede. Darauf verzichten wir auch so.

Wir setzen die Haushaltserörterungen – Tagessitzungsbeginn – fort.
a) Zweite Befragung des von der Bundesregierung eingereichten Entwurfs eines Gesetzes über die Feststellung des Haushaltshaushalts-

Ich rufe den Tagessitzungsausschuss 1.9 auf:

- a) hier: **Einschlag 04**
Bundeskabinett und Bundeskanzleramt
Drucksachen 21/3841, 21/2062
- b) hier: **Einschlag 12**
Umweltministerium
Drucksache 21/3842

Befehl

Die Bezeichnungstagung zum Einschlag 04 haben die Abgeordneten Dr. Barbara Hendricks, Dr. Michael Stübgen, Dr. Thomas Riedel, Andreas Auerswald, Lothar Siebert und Ines Schwahn.

Die Bezeichnungstagung zum Einschlag 22 haben die Abgeordneten Andreas Scheuer, Philip Heitbrink, Wolfgang Wieland, Dr. Schäfer-Schäffer und Dr. Dietmar Brügel.

Wir werden später über den Einschlag 04 nun natürlich abstimmen.

Für die Ansprache haben wir eine Dauer von 210 Minuten vereinbart. Entsprechend ist die Redezeitung gut geöffnet.

Ich eröffne die Ansprache mit der Opposition. Für die AfD-Fraktion hat Frau Abgeordnete Dr. Alice Weidel das Wort. Bitte sehr.

(Berief bei der AfD – Miriam Ede (Die Linke):

Miriam, Alice, das waren doch jetzt nicht sehr se

sehr wie Margot – Ursula)

AMERICA FIRST: A RETURN TO COMMON SENSE

Our Nation's History is filled with the stories of brave men and women who gave everything they had to build America into the Greatest Nation in the History of the World. Generations of American Patriots have summoned the American Spirit of Strength, Determination, and Love of Country to overcome seemingly insurmountable challenges. The American People have proven time and again that we can overcome any obstacle and any force pitted against us.

In the early days of our Republic, the Founding Generation defined what

PUBLIC COMMUNICATION - CLOSED SESSION:

This is an opportunity for citizens to speak to the City Council for up to 3 minutes on the following Closed Session. The Mayor and City Council reserve the right to adjust this time limit based on the number of speakers who wish to address the Mayor and City Council.

A. Public Communications - Closed Session

CLOSED SESSION:

A. 1.00 P.M. CLOSED SESSION

A. 1. CONFERENCE WITH REAL PROPERTY NEGOTIATORS

[25-3981](#)

(Gov. Code Section 54906.8 (a))

Proposed: 10166 Main Street Blvd.

City Negotiator: Philip Barnes, Deputy City Manager

Negotiating Party: Adles Fernando/Foothill, LLC

Under Negotiator: Price and Terms of payment

B. 2. CONFERENCE WITH LEGAL COUNSEL - EXISTING LITIGATION PURSUANT TO GOVERNMENT CODE

Page 1 of 14

City Council Meeting Regular Agenda December 8, 2023

SECTION 54906.8 (a)

City v. Inland Coalition for Immigrant Justice v. City of Fortuna

3. CONFERENCE WITH LABOR NEGOTIATOR PURSUANT

TO GOVERNMENT CODE SECTION 54907.8

CITY Negotiator: Mayor Apyanetta Warren and Mayor Pro

Tempski, Unrepresented

Employee Organization(s): City Manager, Unrepresented

CALL TO ORDER/ROLL CALL:

A. Call To Order/Roll Call:

INVOCATION/PLEDGE OF ALLEGIANCE:

A. Invocation/Pledge of Allegiance:



43. Sitzung

Berlin, Mittwoch, den 26. November 2025

Beginn: 09:00 Uhr

Ich rufe die Tagessitzungsgegenwart I.9 auf.

a) hier: Europäischer Handelskonsulent und Handelskonsulent

Brüsseler Straße 20/20a, 112062

b) hier: Erste Konsulin

Brüsseler Straße 15/2062

Die Berichtserstattung zum Einzelblatt 8 ist haben die Abgeordneten: Karina Radek, Marcus Bölk, (D),

Dr. Thomas Rudolph, Andreas Andraus, Leon Ecker, Wolfgang Wielert, Dr. Sebastian Schäfer und Dr. Dietmar Bartsch.

Die Berichtserstattung zum Einzelblatt 22 haben die Abgeordneten: Andrea Schwabe, Philip Hoffmann,

Wolfgang Wielert, Dr. Sebastian Schäfer und Dr. Dietmar Bartsch.

Wir werden später über den Einzelblatt 64 abstimmen

Für die Aussprache haben wir eine Dauer von 210 Minuten verordnet. Entsprechend ist die Redezeitung gut geöffnet.

Ich eröffne die Aussprache mit der Opposition. Für die AfD hat sich die Frau Abgeordnete Dr. Alice Winkel das Wort. Bitte sehr.

(Beruf bei der AfD – Mirja Edin [Da Linke]:

Mann, Alice, das muss doch jetzt nicht sein so leicht aus Morgen – Und siehe)



AMERICA FIRST: A RETURN TO COMMON SENSE

Our Nation's History is filled with the stories of brave men and women who gave everything they had to build America into the Greatest Nation in the History of the World. Generations of American Patriots have summoned the American Spirit of Strength, Determination, and Love of Country to overcome seemingly insurmountable challenges. The American People have proven time and again that we can overcome any obstacle and any force pitted against us.

In the early days of our Republic, the Founding Generation defined what



Parliamentary Debates as a Form of Political Communication

- Debating on proposals, explaining stances, attacking competitors
- Utilised for establishing and maintaining a positive public image
- Speeches available via plenary protocols and video recordings
- Politicians and citizens perceive debates with all their senses



Study 1: Text, Audio & Video Data

- Focusing on text only often means neglecting relevant channels of information
- Different modalities represent the same phenomena with often fundamentally different signals (*Baltrušaitis et al. 2017*)
- Combining multiple modalities requires careful consideration

Study 1: Text, Audio & Video Data

- Focusing on text only often means neglecting relevant channels of information
- Different modalities represent the same phenomena with often fundamentally different signals (*Baltrušaitis et al. 2017*)
- Combining multiple modalities requires careful consideration

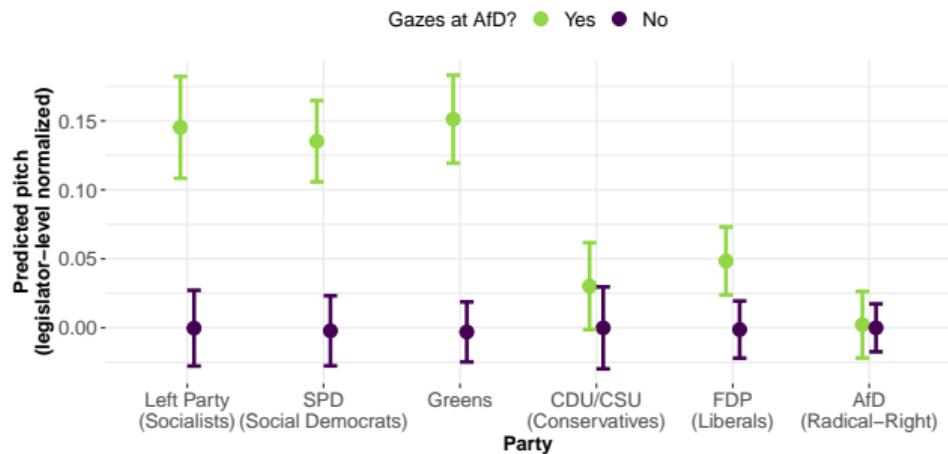
How can multimodal data be meaningfully combined and analysed jointly?

Study 1: Aligning Multimodal Data

- Challenges: Heterogeneity, Connectedness and Interaction
- Aligning multiple modalities helps to address these challenges
- E.g., cross-modal queries: What happens in one modality during an event in another modality?

Study 1: Aligning Multimodal Data

- Challenges: Heterogeneity, Connectedness and Interaction
- Aligning multiple modalities helps to address these challenges
- E.g., cross-modal queries: What happens in one modality during an event in another modality?



Political Communication Relies on Interactions

- Interactions are the basis of political discourse
- Political actors interact amongst themselves and with citizens
- They consciously decide with whom they want to interact on different levels
- We know surprisingly little about these dynamics

Political Communication Relies on Interactions

- Interactions are the basis of political discourse
- Political actors interact amongst themselves and with citizens
- They consciously decide with whom they want to interact on different levels
- We know surprisingly little about these dynamics

When and how do different actors seek and eventually allow interactions?

Study 2: Eye Contact Seeking as a Mode of Interaction

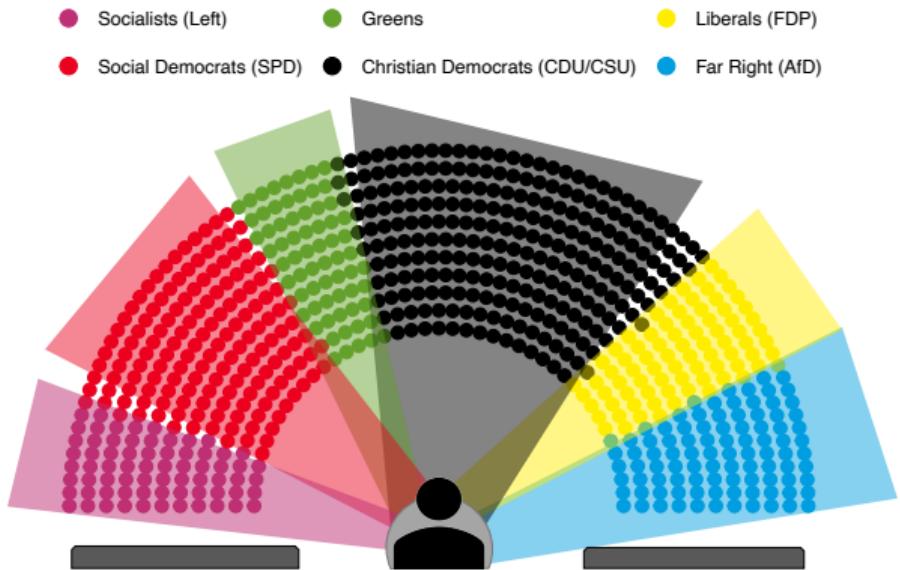
- Fundamental nonverbal act of interpersonal communication
- Continuously available, directed and single staged
- Social psychology suggests, that eye contact in competitive settings indicates confrontation (*Exline 1963, Segrin 1993*)

Study 2: Confrontation in the German Bundestag

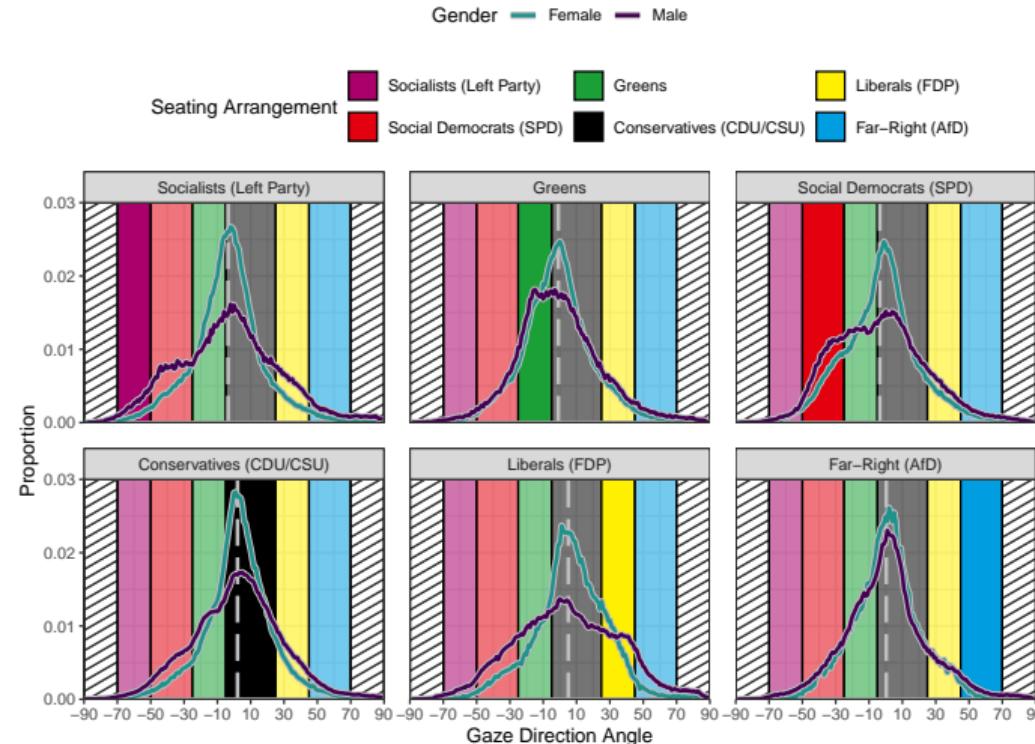
- 15,553 video recordings of speeches in the 19th German Bundestag (2017–2021)
- Audio: Word-level transcription
Video: Head pose extraction
Text: Sentence-level valence score
- Patterns of party competition,
government-opposition, gender,
and the far right

Study 2: Confrontation in the German Bundestag

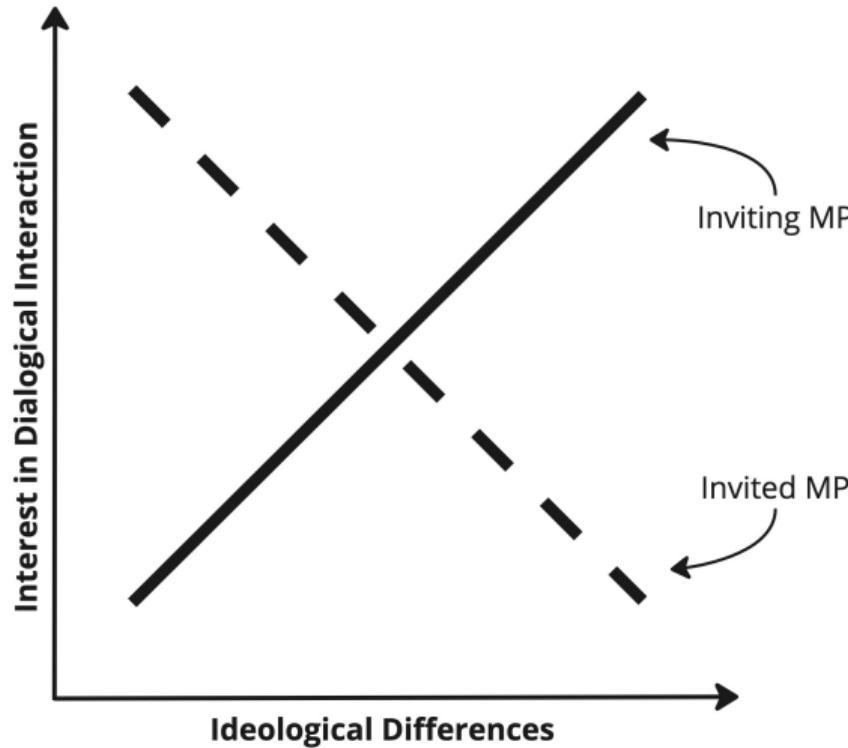
- 15,553 video recordings of speeches in the 19th German Bundestag (2017–2021)
- Audio: Word-level transcription
Video: Head pose extraction
Text: Sentence-level valence score
- Patterns of party competition, government-opposition, gender, and the far right



Study 2: (Gendered) Patterns of Confrontation



Study 3: Who Seeks an Avoids Discourse?



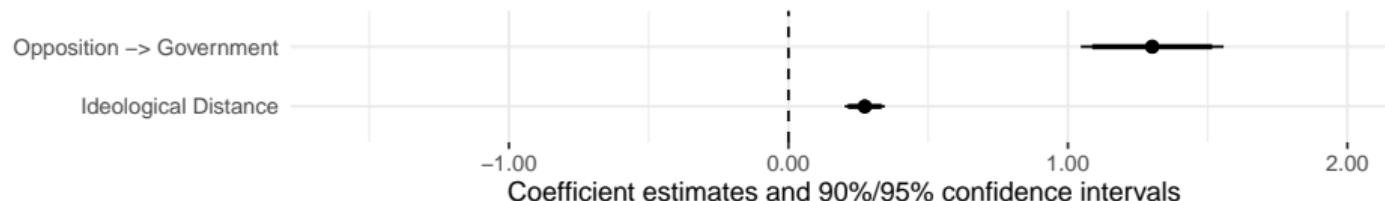
Study 3: Interventions in the German Bundestag

- All interventions (*Zwischenfragen*) in the German Bundestag between 1990 and 2020
- Automated coding of detection (Stage 1) as well as allowance and decline (Stage 2)

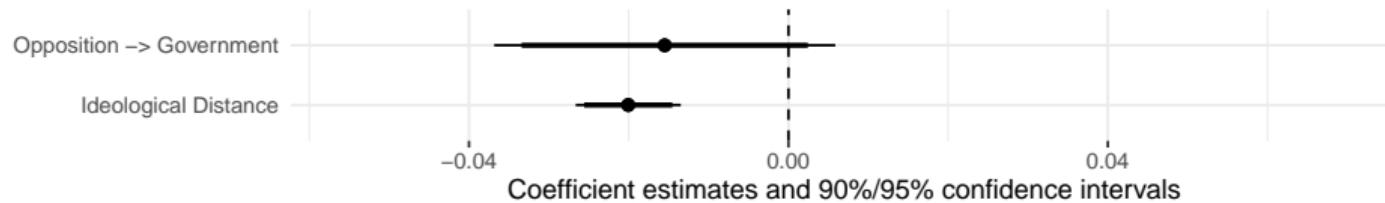
Study 3: Interventions in the German Bundestag

- All interventions (*Zwischenfragen*) in the German Bundestag between 1990 and 2020
- Automated coding of detection (Stage 1) as well as allowance and decline (Stage 2)

Stage 1 Model: Who tries to debate whom? (Inviting MP)



Stage 2 Model: Which intervention attempts do speakers accept? (Invited MP)



Open Science in Political Communication Studies (Study 4)

The Role of Social Media Platforms in Replication



The Role of Social Media Platforms in Replication



- Most platforms belong to large for-profit organisations
- Research is dependent on their changing regulations

To what extent are social media studies constrained by platform regulations and data availability?

Study 4: Nonrandom Removal of Tweets

- *Kim (2023)* studies violent political rhetoric on Twitter during the US Capitol Riot in 2020
- Replication archive only contains tweet IDs of original dataset
- Only 16.47% of tweets retrievable (as of November 2022)
- Replicated key findings significantly different

Core Contributions, Limitations & Future Avenues

Core Contributions

- Substantially:
 - When, who and how MPs initiate, respond to, and decline interaction
 - Confrontation-seeking during legislative debates
- Methodologically:
 - Framework for multimodal alignment
 - Gaze direction as a measure of single stage interactions
 - Pitfalls and open science challenges of social media studies

Limitations & Future Avenues

Limitations

- Correlational instead of causal evidence
- Interpretation of eye contact is context dependent

Future Avenues

- Further examine more subtle nonverbal interactions
- Enhancing unimodal studies with multimodal features
- Expanding to video recordings from other levels of politics (i.e., local, state, supranational)
- Long-term: Exploring multimodal generative LLMs to generate features

Conclusion

Substantial Research with Multimodal Data

- Political communication grounds on interactions
- New data sources bear great potential
- But: Modalities beyond text often neglected and data availability restricted

Substantial Research with Multimodal Data

- Political communication grounds on interactions
 - New data sources bear great potential
 - But: Modalities beyond text often neglected and data availability restricted
-
- Multimodal alignment helps addressing challenges
 - (Non-)verbal single- and two-stage interactions
 - Replicability of social media studies might be hampered

Thank you!

Andreas Küpfer

 andreas.kuepfer@tu-darmstadt.de

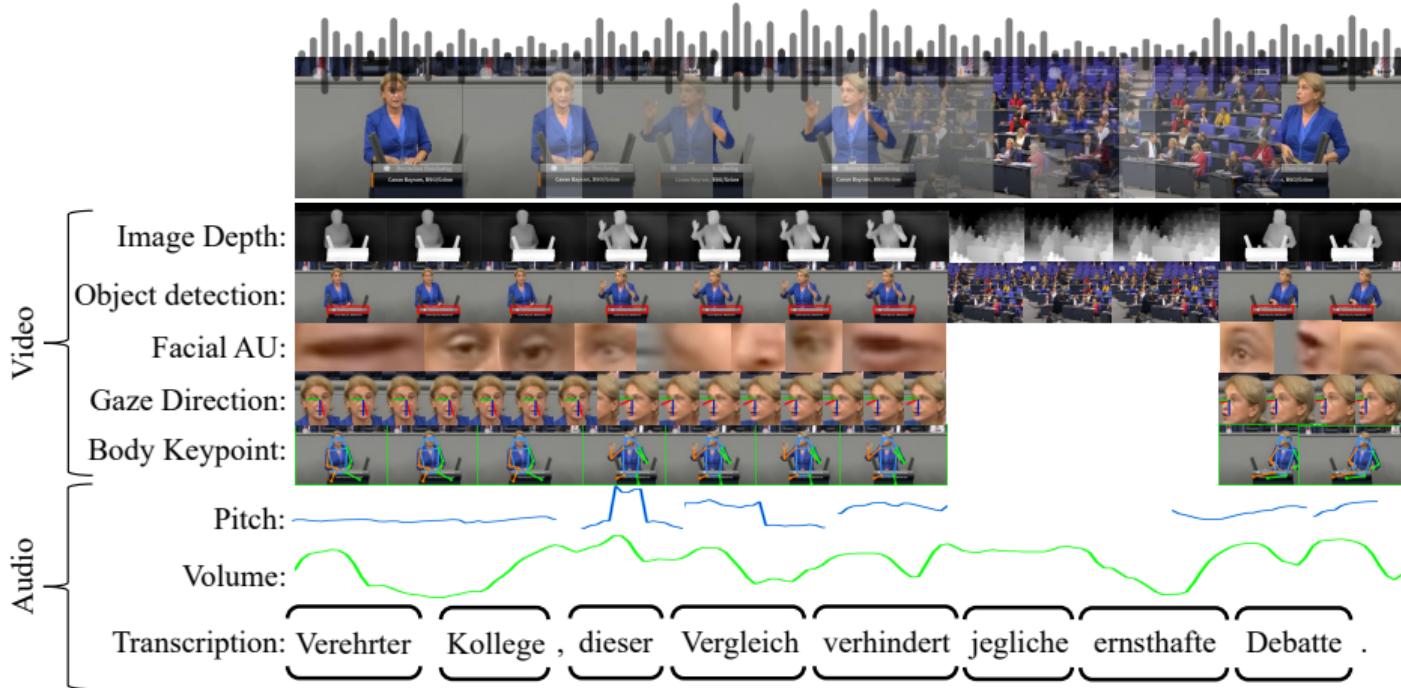
 andreaskuepfer.github.io

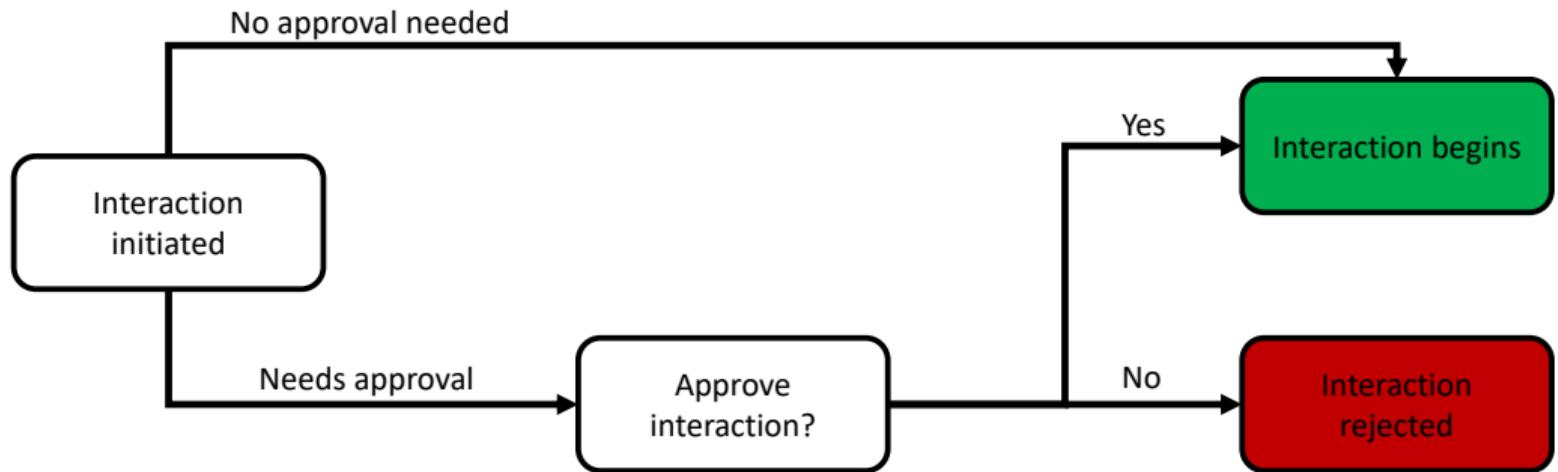
 ankuepfer.bsky.social

References

- Larson, J. M., Nagler, J., Ronen, J., & Tucker, J. A. (2019). Social Networks and Protest Participation: Evidence from 130 Million Twitter Users. *American Journal of Political Science*, 63(3), 690–705. <http://www.jstor.org/stable/45132505>
- Stier, S., Bleier, A., Lietz, H., & Strohmaier, M. (2018). Election Campaigning on Social Media: Politicians, Audiences, and the Mediation of Political Communication on Facebook and Twitter. *Political Communication*, 35(1), 50–74. <https://doi.org/10.1080/10584609.2017.1334728>
- Kim, T. (2023). Violent political rhetoric on Twitter. *Political Science Research and Methods*, 11(4), 673–695. <https://doi.org/10.1017/psrm.2022.12>
- Baltrušaitis, T., Ahuja, C., & Morency, L.-P. (2019). Multimodal machine learning: A survey and taxonomy. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 41(2), 423–443. <https://doi.org/10.1109/TPAMI.2018.2798607>
- Exline, Ralph V. (1963). Explorations in the process of person perception: visual interaction in relation to competition, sex, and need for affiliation. *Journal of Personality* 31(1):1–20. <https://doi.org/10.1111/j.1467-6494.1963.tb01836.x>
- Segrin, C. (1993). The effects of nonverbal behavior on outcomes of compliance gaining attempts. *Communication Studies* 44(3-4):169–187. Publisher: Routledge. <https://doi.org/10.1080/10510979309368393>

Supplementary Material

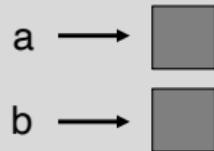




Alignment Helps Make the Most of Multimodal Data

Separate components

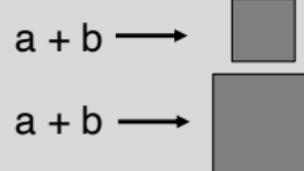
Signal Response



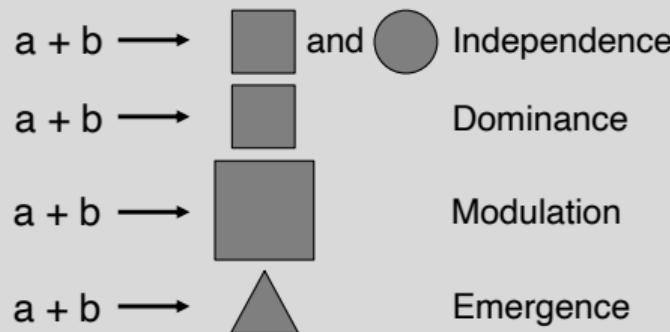
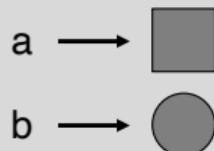
Multimodal composite signal

Signal Response

Category



Equivalence
(intensity unchanged)
Enhancement
(intensity increased)

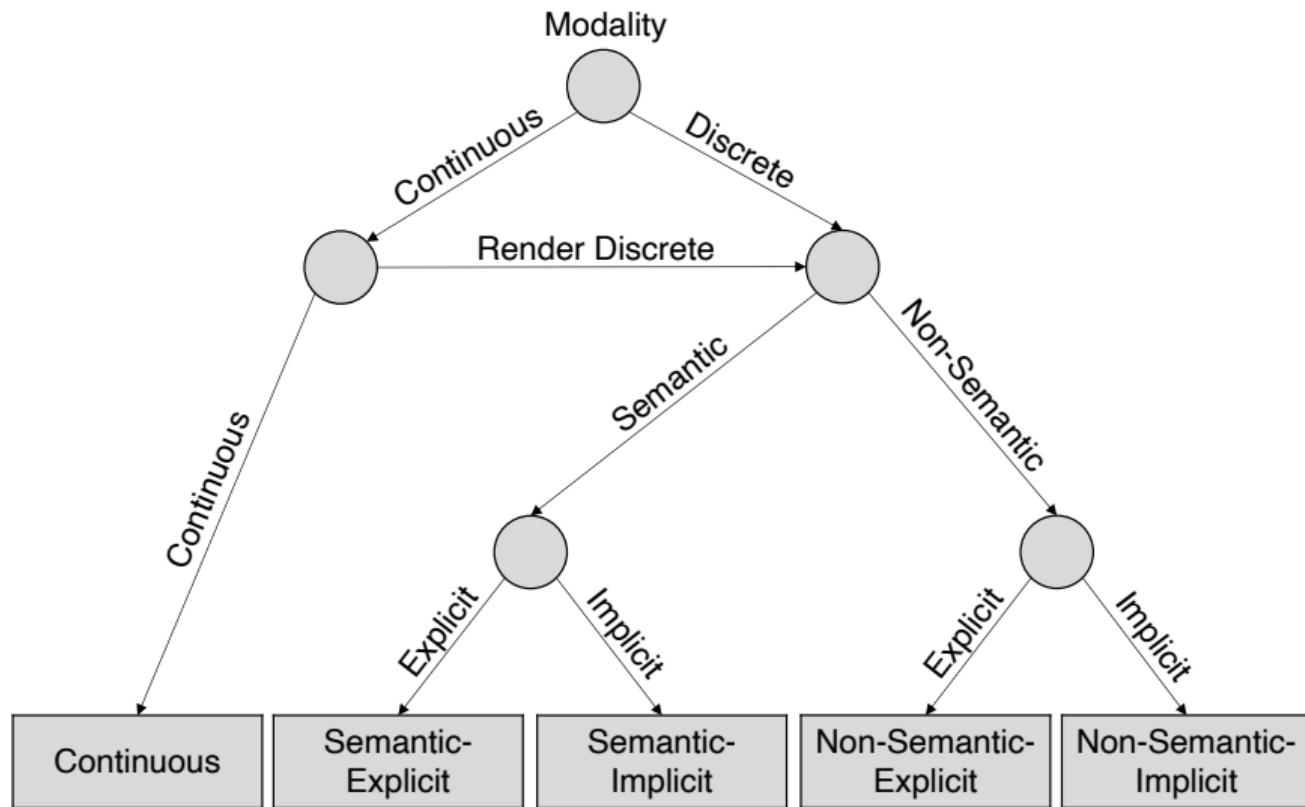


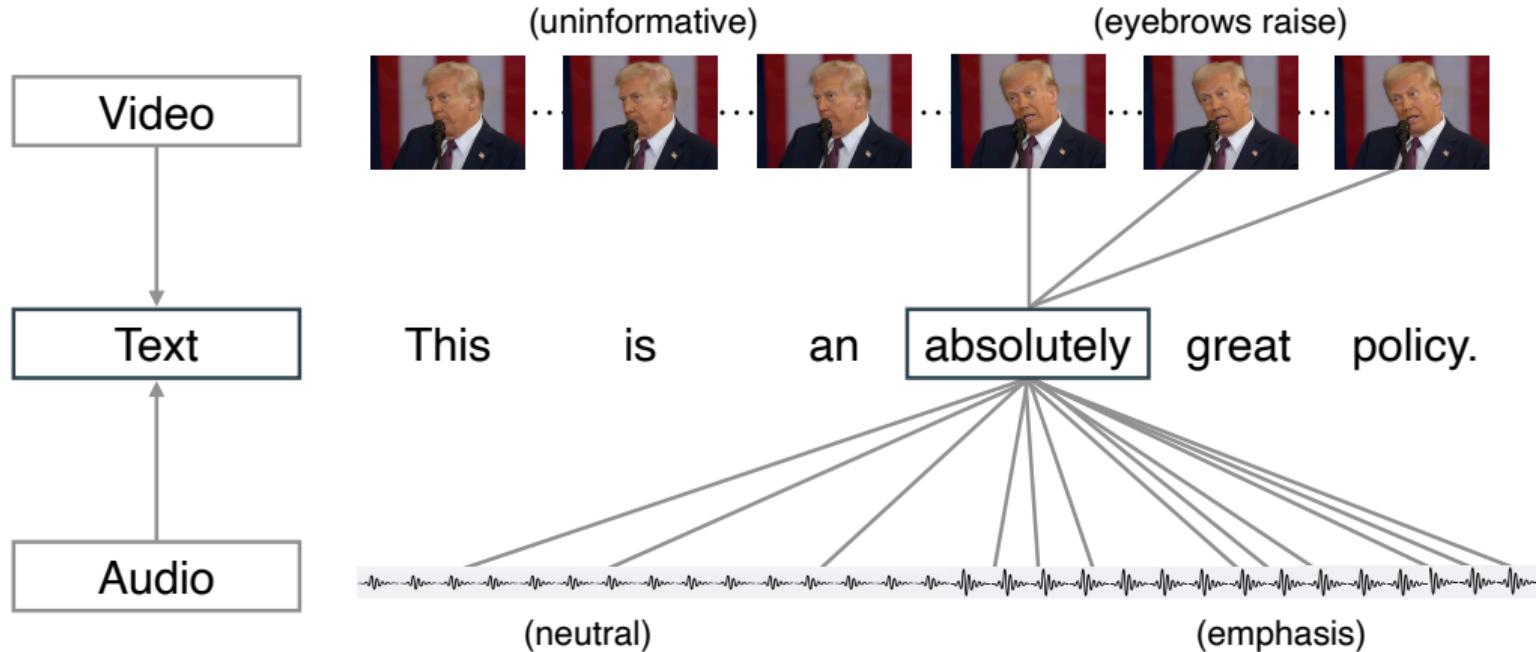
Independence

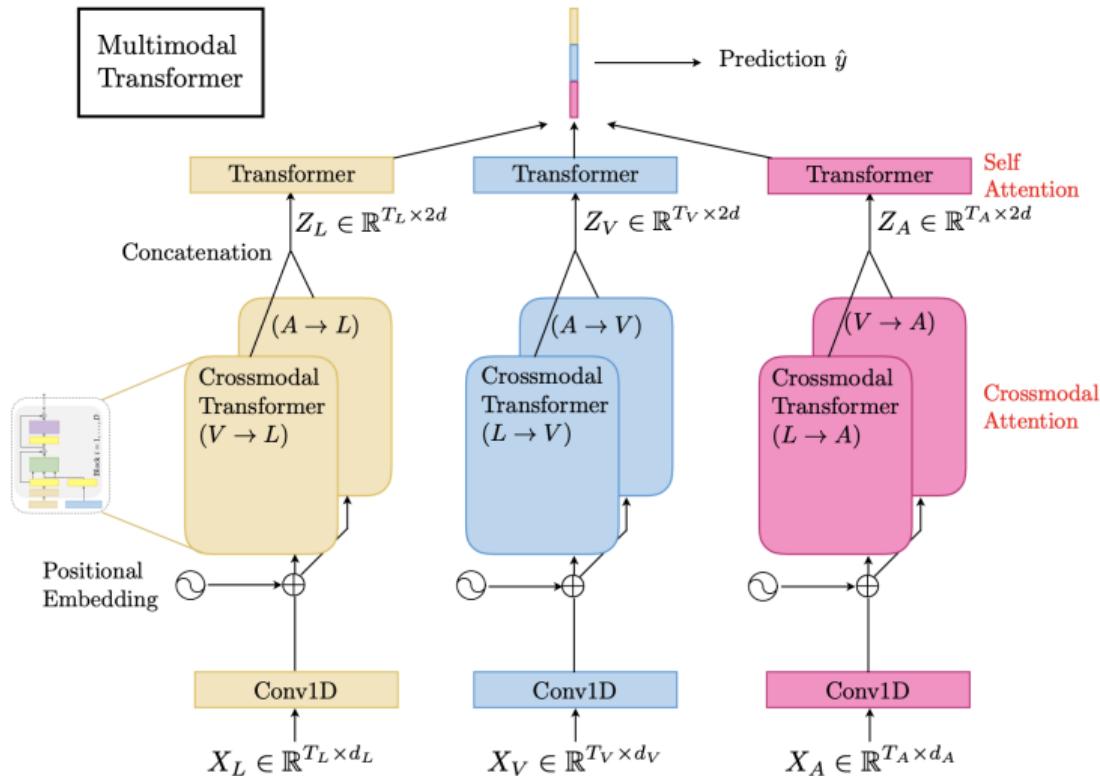
Dominance

Modulation

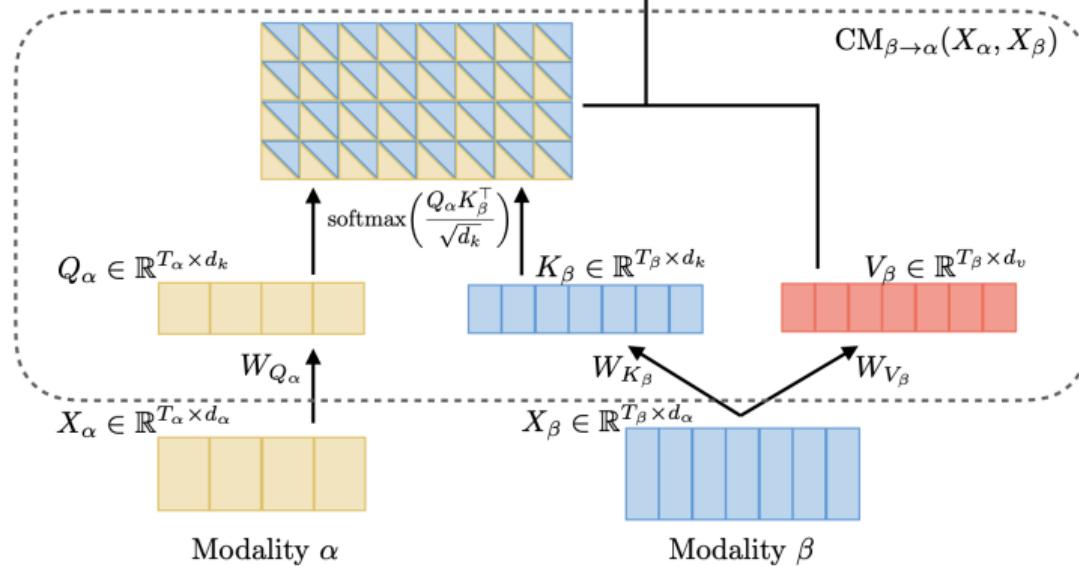
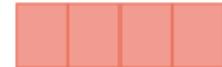
Emergence

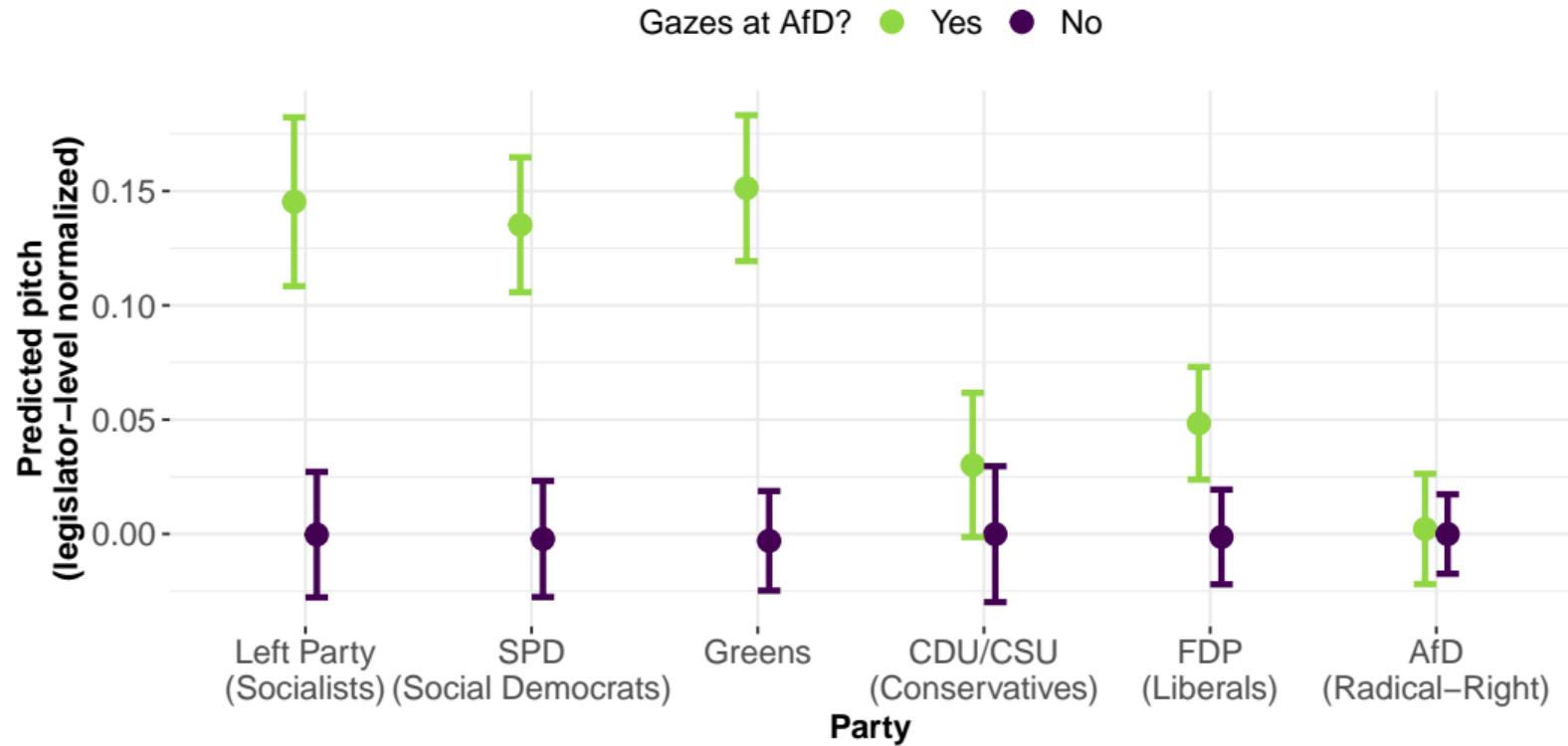






$$\text{softmax}\left(\frac{Q_\alpha K_\beta^\top}{\sqrt{d_k}}\right)V_\beta \in \mathbb{R}^{T_\alpha \times d_v}$$





Article	Journal	1 (1.1)	2 (2.1)	3 (3.1/3.2)
Dietrich (2021)	PA	✓ (Video/Video)	✓ (Video frames that (do not) show overhead shot)	✓ (Overhead shot clip/Explicit)
Dietrich, Enos, and Sen (2019)	PA	✓ (Text/Audio)	✓ (Text dictionary/Audio utterance-segments)	✗
Kaufman and Klevs (2022)	PA	✓ (Text/Text)	✓ (Letters)	✗
Licht (2023)	PA	✓ (Text/Text)	✓ (Sentence embeddings)	✓ (Self-attention/Implicit)
Mozer et al. (2020)	PA	✓ (Text/Text)	✓ (Words)	✗
Tarr, Hwang, and Imai (2022)	PA	✓ (Text/Video)	✓ (Text and video OCR mentions of issue keywords)	✗
Boussalis et al. (2021)	APSR	✓ (Text/Audio/Video)	✓ (Text on statement-level/Audio in one-second-segments/Video each face in each frame)	✗
Dietrich, Hayes, and O'Brien (2019)	APSR	✓ (Text/Audio)	✓ (Words related to 'female issues'/Audio high levels of pitch)	✗
Fowler et al. (2021)	APSR	✓ (Text/Audio/Video)	✓ (Text and audio word-level/Video one frame every 15 seconds)	✗

Article	Journal	1 (1.1)	2 (2.1)	3 (3.1/3.2)
Rittmann (2024)	BJPS	✓ (Text/Audio)	✓ (Words related to 'female issues'/Audio high levels of pitch)	✗
Boussalis and Coan (2021)	PolCom	✓ (Text/Video)	✓ (Text words aggregated to sentences/Video frames happy and unhappy expression)	✗
Fox (2023)	PolCom	✓ (Text/Image)	✓ (Implicit annotation of objects that stand for ethnicities)	✗
Sang Jung Kim and Chen (2023)	PolCom	✓ (Text/Video)	✓ (Video faces/Text dictionary)	✗

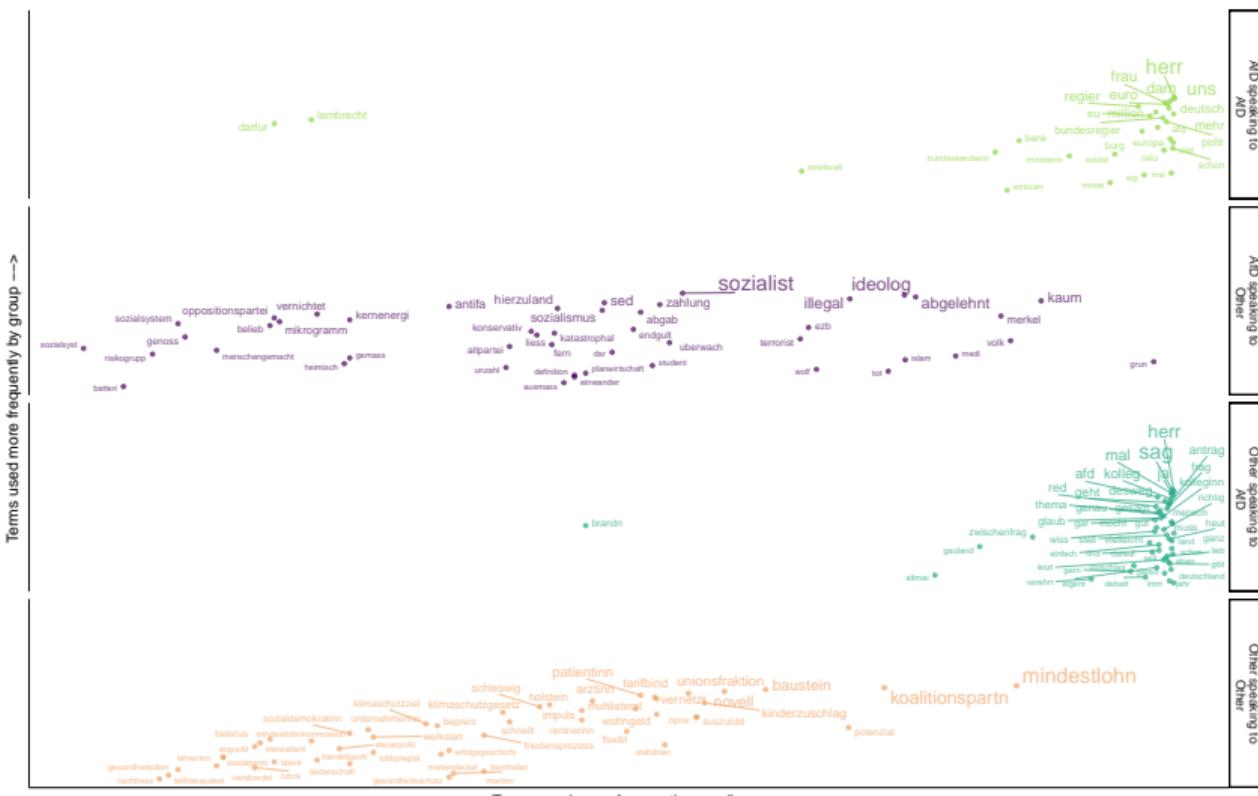
Hyperparameter	Values
Number of Epochs	{20, 30}
Number of Attention Heads	{5, 10}
Number of Kernels (Language)	{1, 3, 5}
Number of Kernels (Vision)	{1, 3, 5}
Number of Kernels (Audio)	{1, 3, 5}
Dropout (Attention)	{0.1, 0.3}
Clip	{0.8, 1}

Multimodal F1 (SD)		Unimodal F1 (SD)		
Cross-modal Attention	No cross-modal Attention	Text	Audio	Visual
0.945 (0.012)	0.920 (0.019)	0.931 (0.006)	0.851 (0.000)	0.856 (0.002)

Seed	Multimodal F1				Unimodal F1		
	Cross-modal tention	At-	No Attention	cross-modal	Text	Audio	Video
20230701	0.955		0.940		0.932	0.849	0.853
20230702	0.934		0.908		0.934	0.849	0.855
20230703	0.934		0.905		0.923	0.847	0.857
20230704	0.965		0.936		0.946	0.862	0.877
20230705	0.935		0.911		0.917	0.850	0.836

	Fixed Effects GLM
Looks at AfD	0.00 (0.02)
Party: CDU/CSU (Conservatives) x Looks at AfD	0.03 (0.04)
Party: Left (Socialists) x Looks at AfD	0.14 (0.05)
Party: FDP (Liberals) x Looks at AfD	0.05 (0.04)
Party: Greens x Looks at AfD	0.15 (0.05)
Party: SPD (Social Democrats) x Looks at AfD	0.14 (0.04)
Num. obs.	6723156
Num. groups: MP ID	695
Deviance	6721773.29
Log Likelihood	-9539054.69
Pseudo R ²	-0.00

Comparison of Terms by Groups



Group-specific terms are ordered by Fightin' Words statistic (Monroe, et al. 2008)

Look Who's Confronting: Opposition Status, Gender, and the Far Right



Socialists (Left)



Greens



Liberals (FDP)



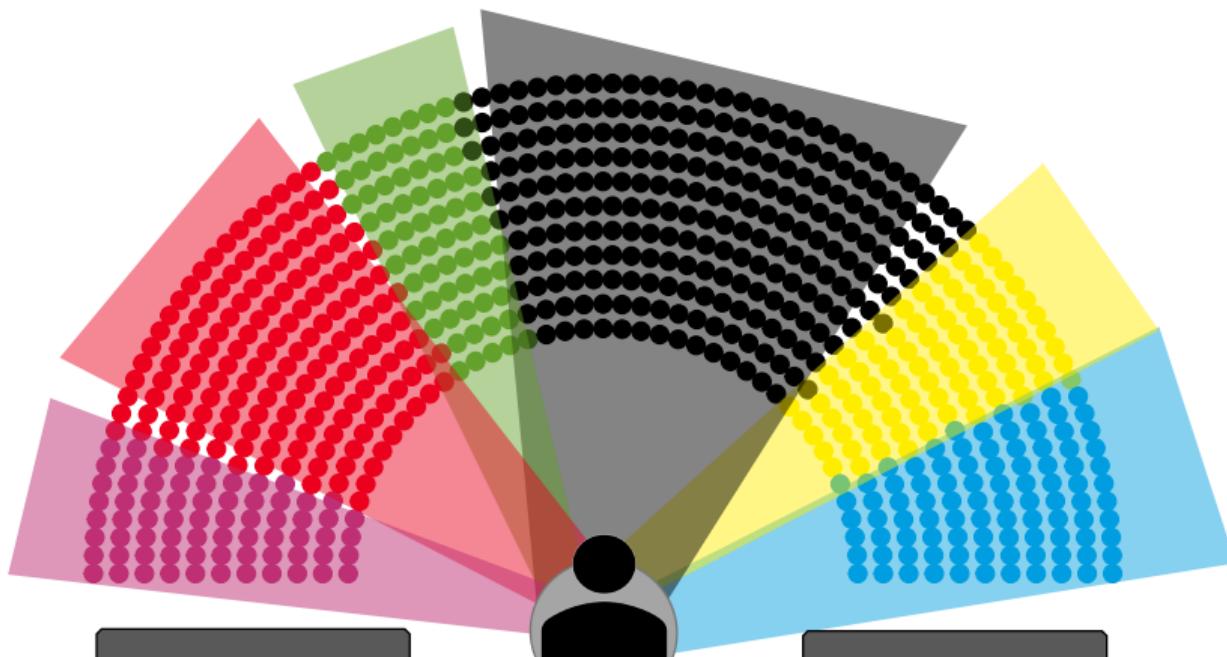
Social Democrats (SPD)

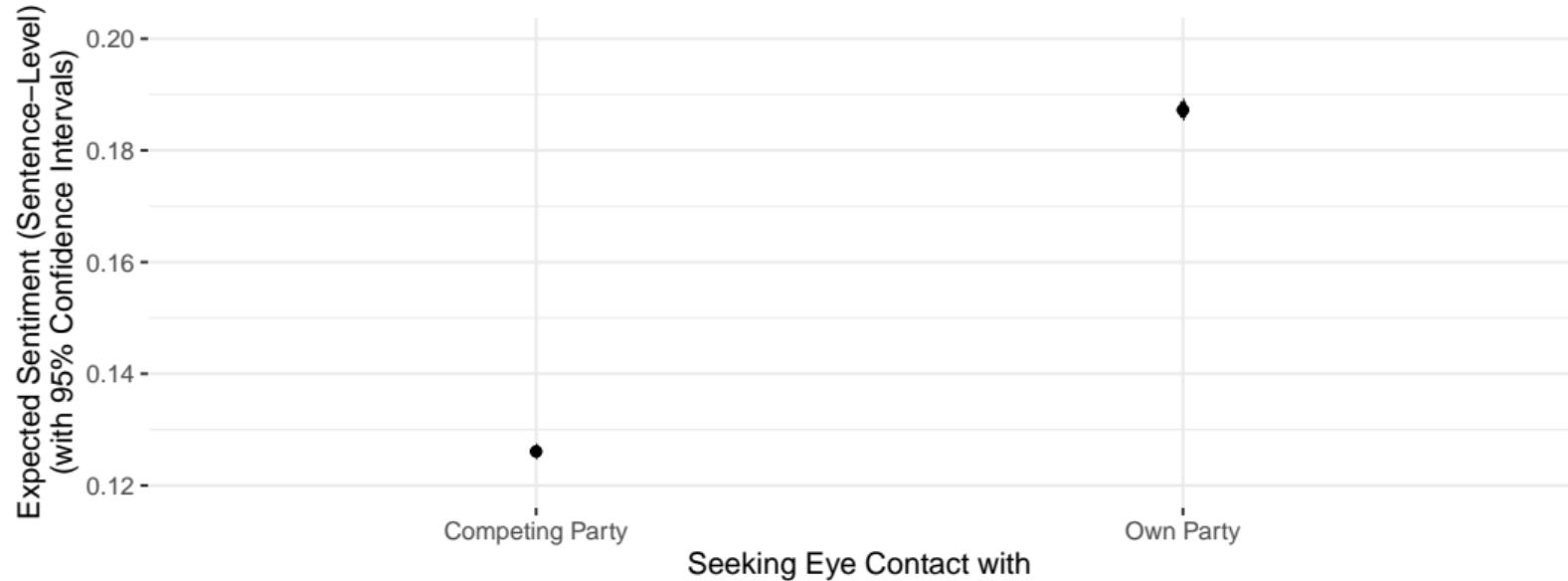


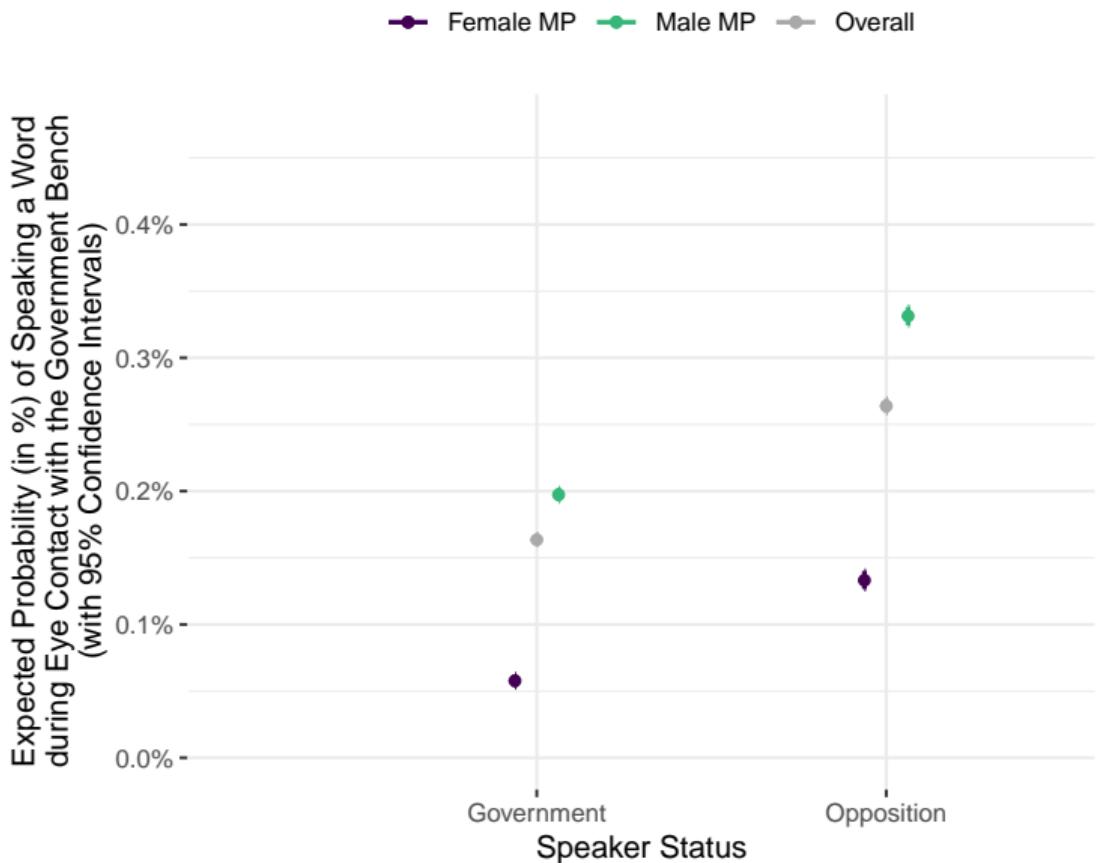
Christian Democrats (CDU/CSU)

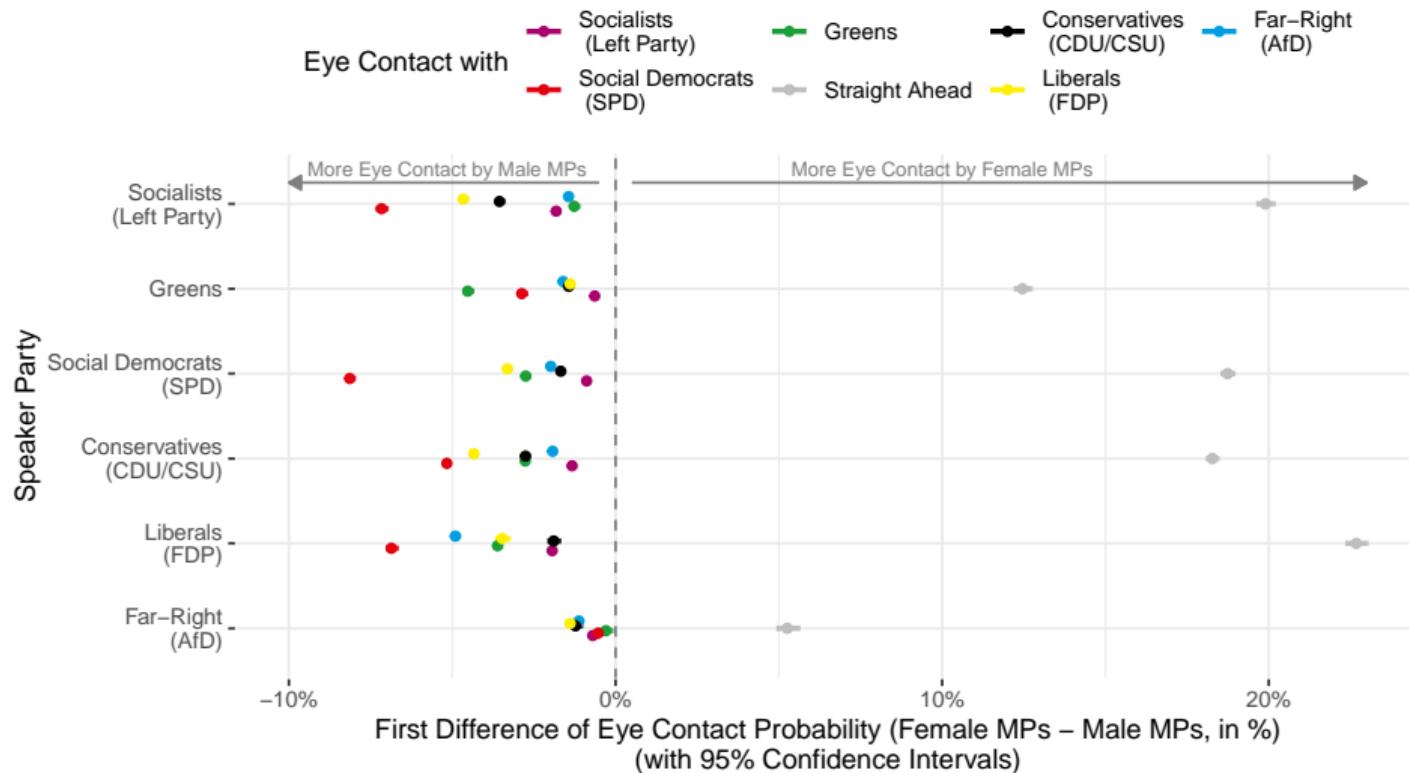


Far Right (AfD)

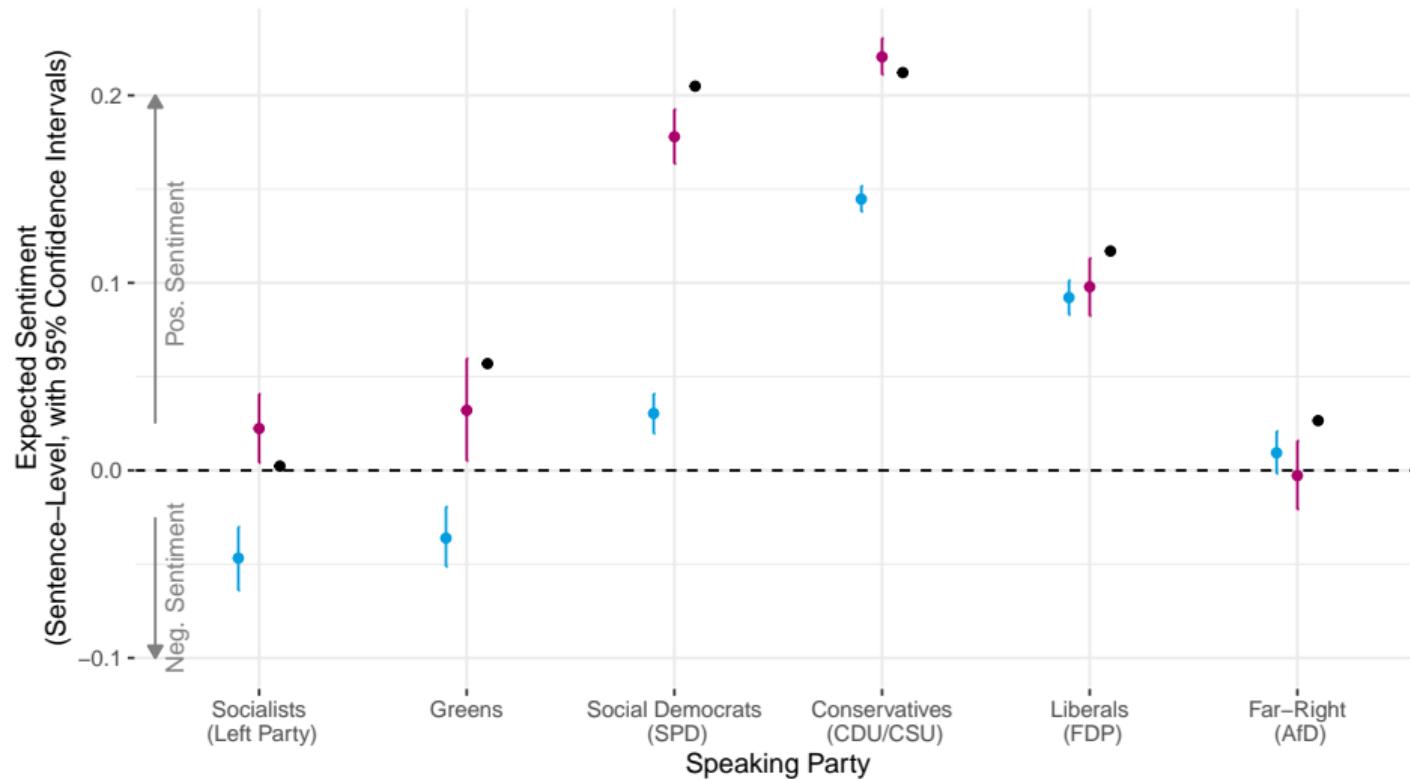


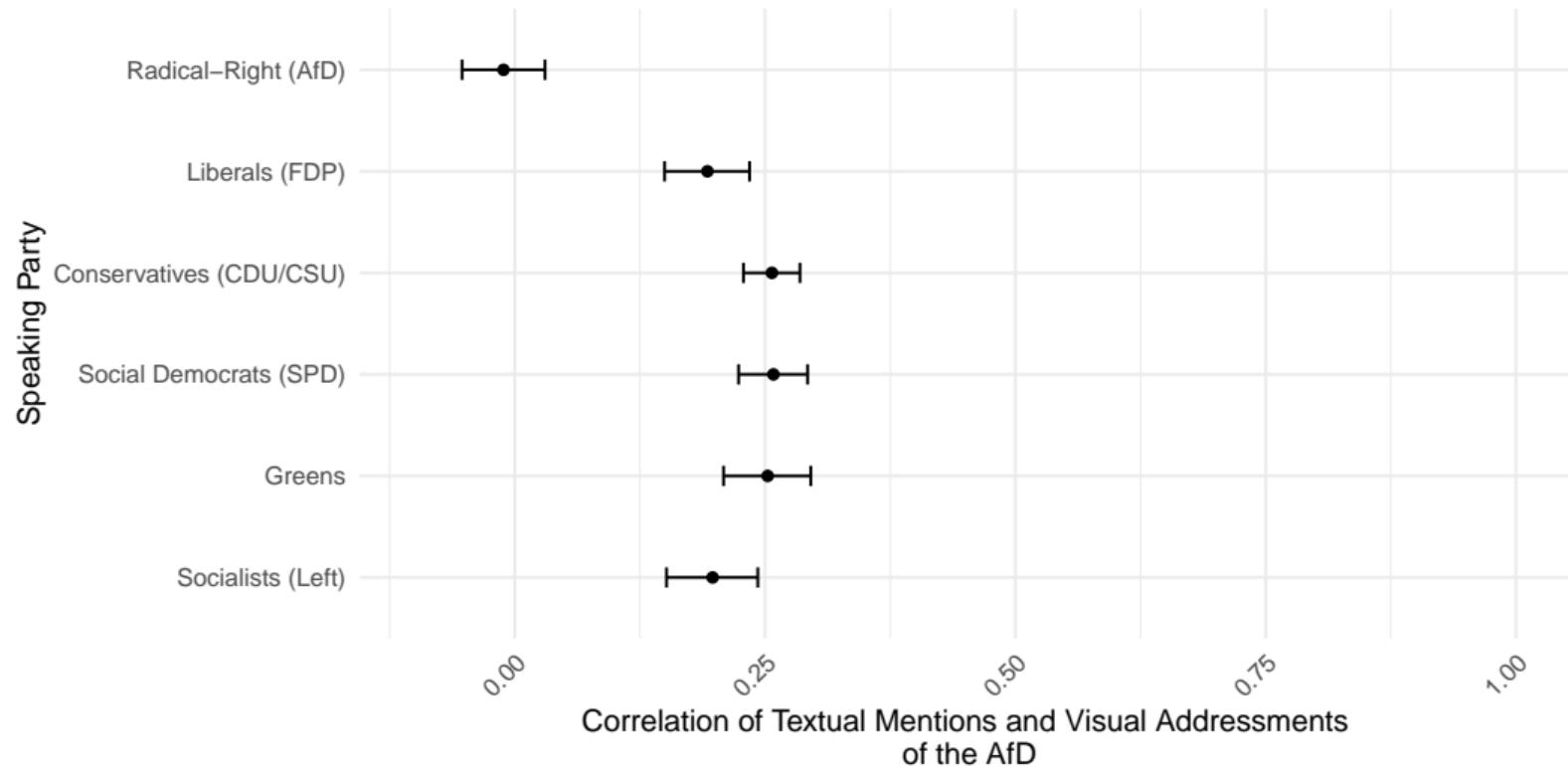


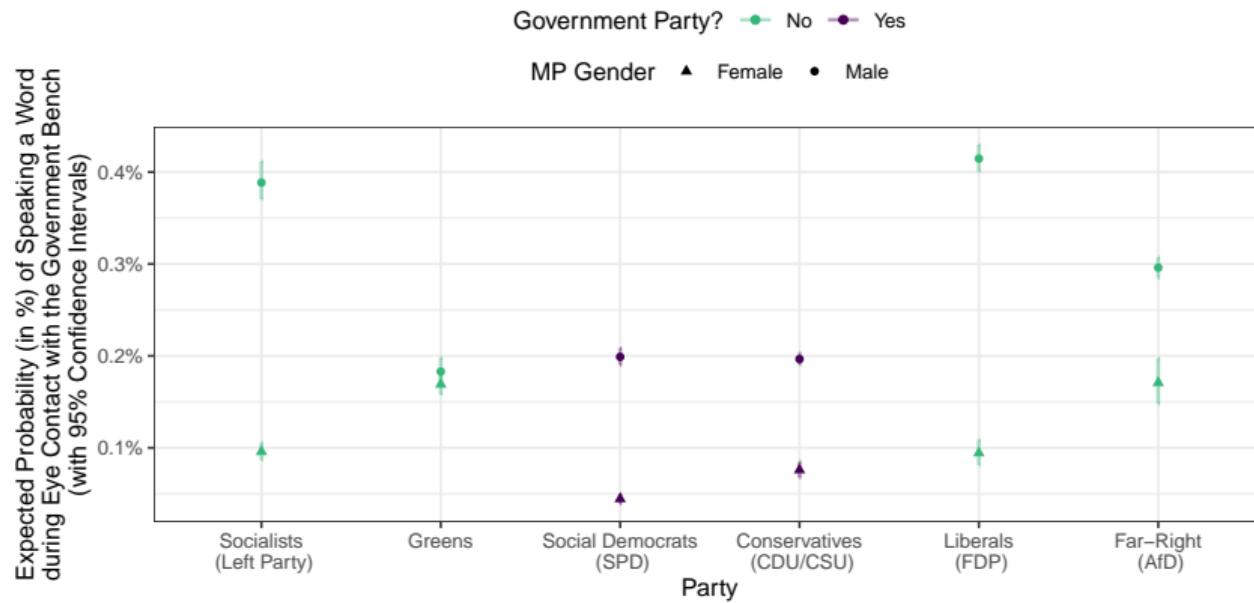




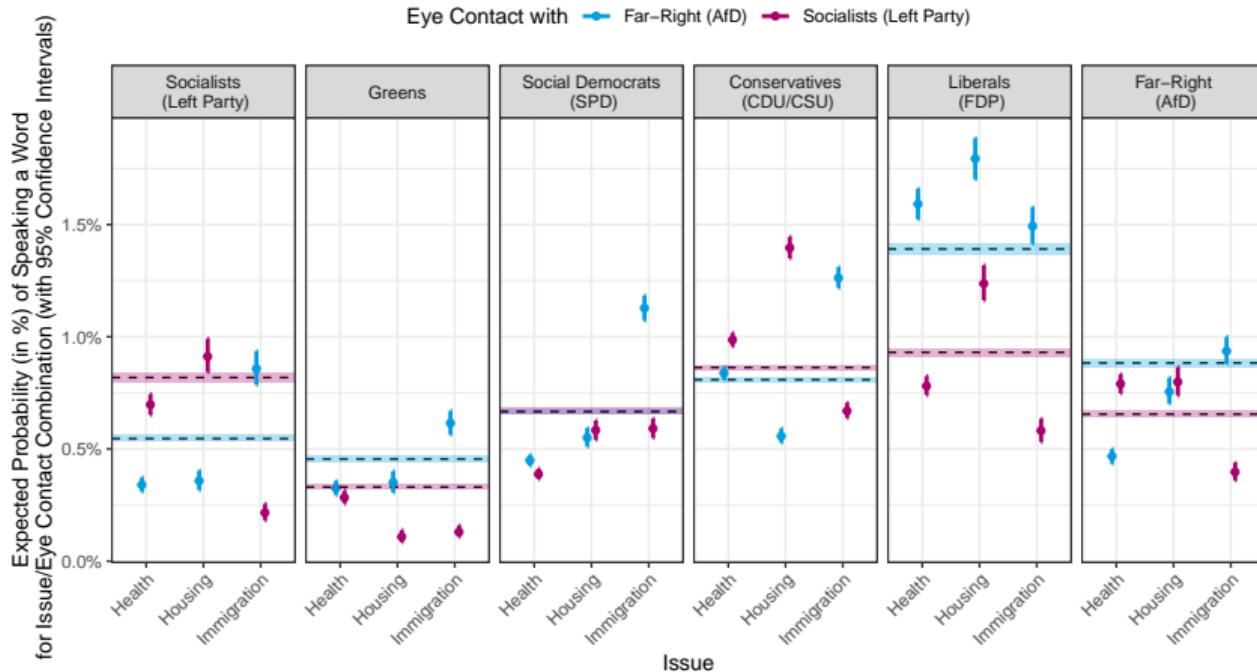
Eye Contact with Far-Right (AfD) Socialists (Left Party) Baseline (Other Parties)



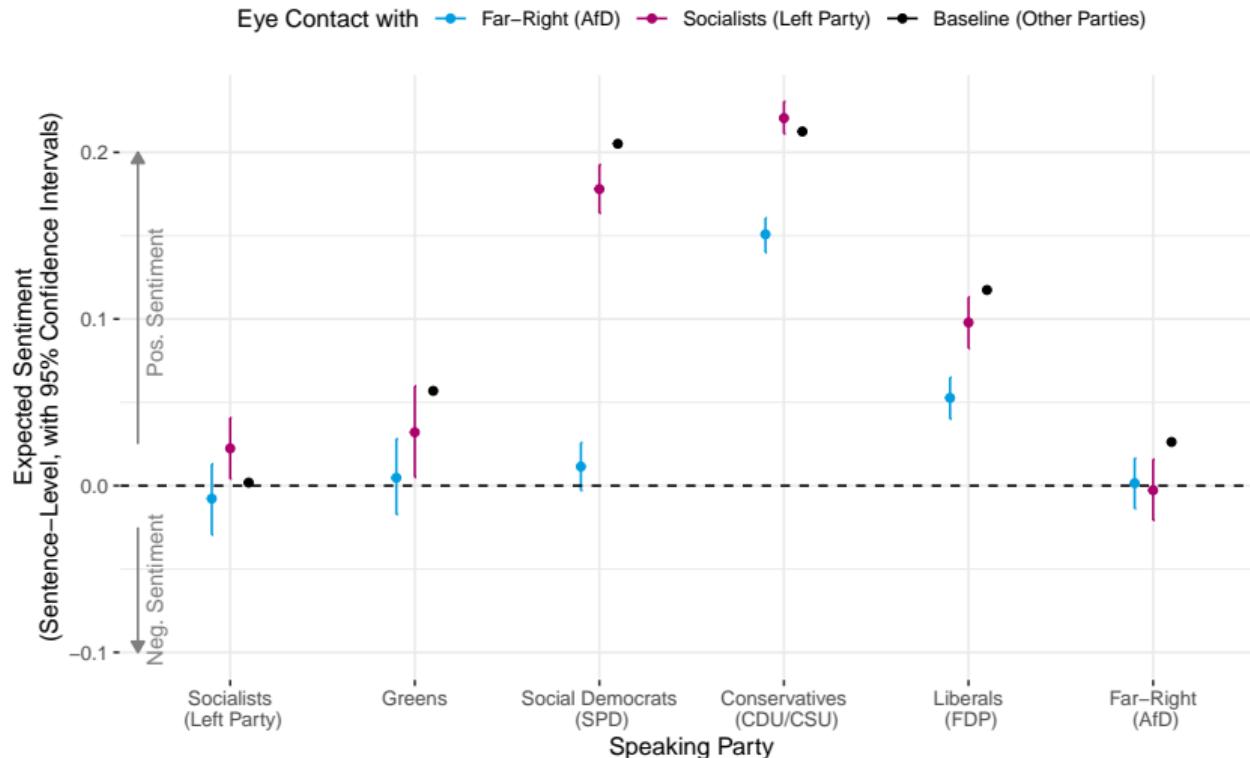


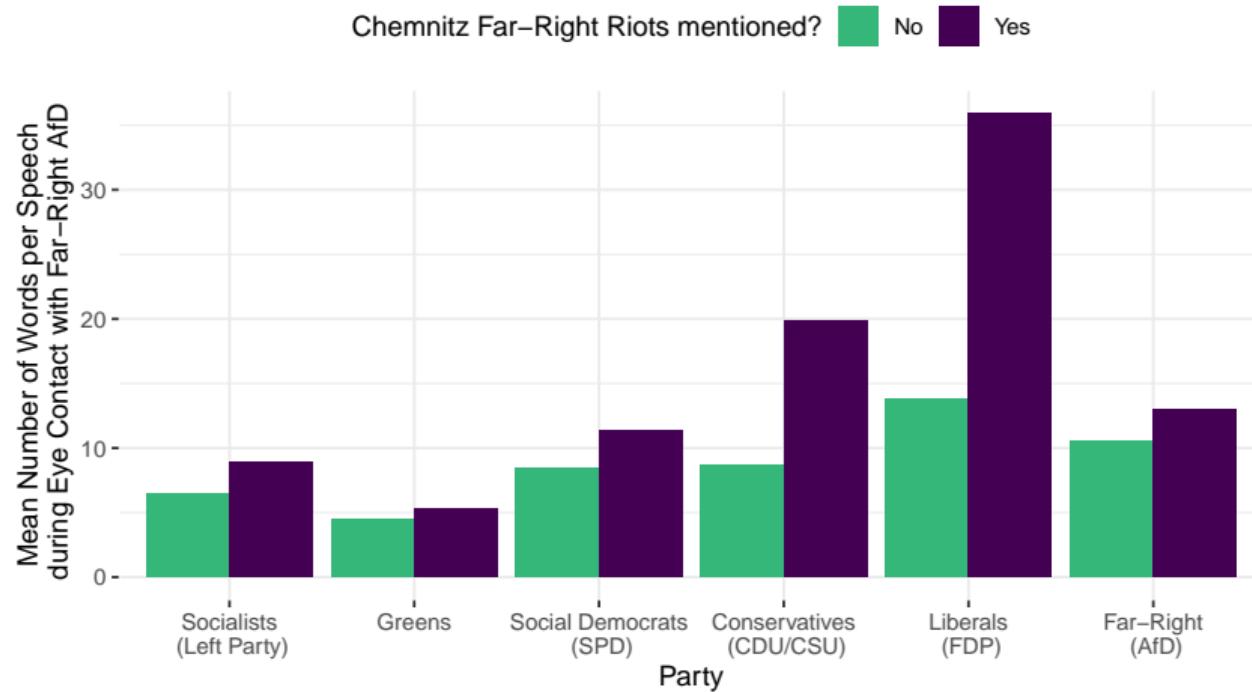


Robustness Check (Narrowed AfD Angle)

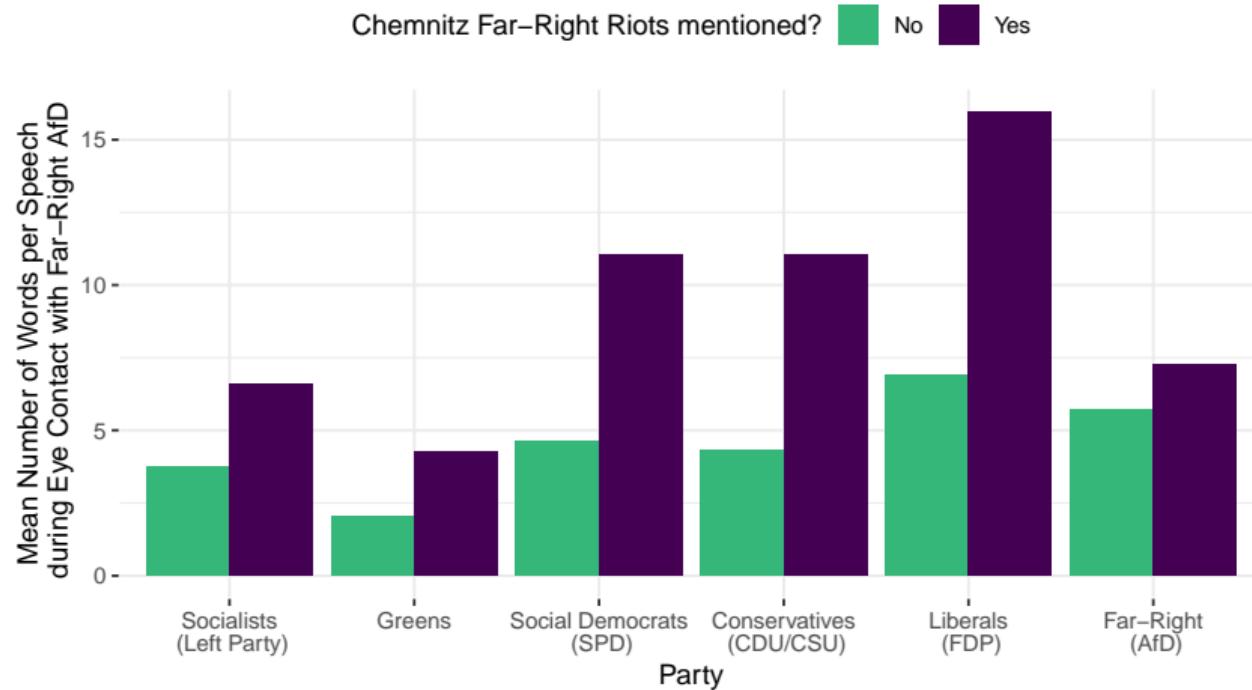


Robustness Check (Narrowed AfD Angle)

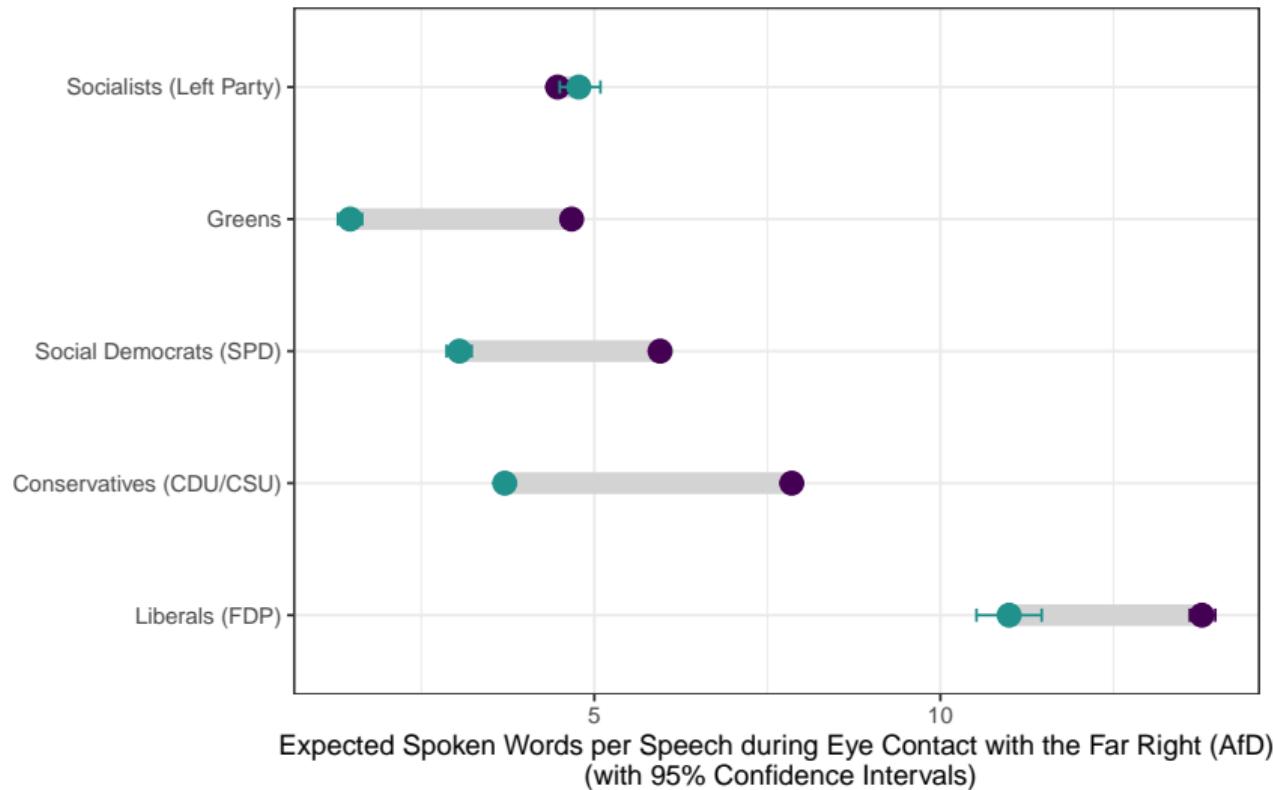




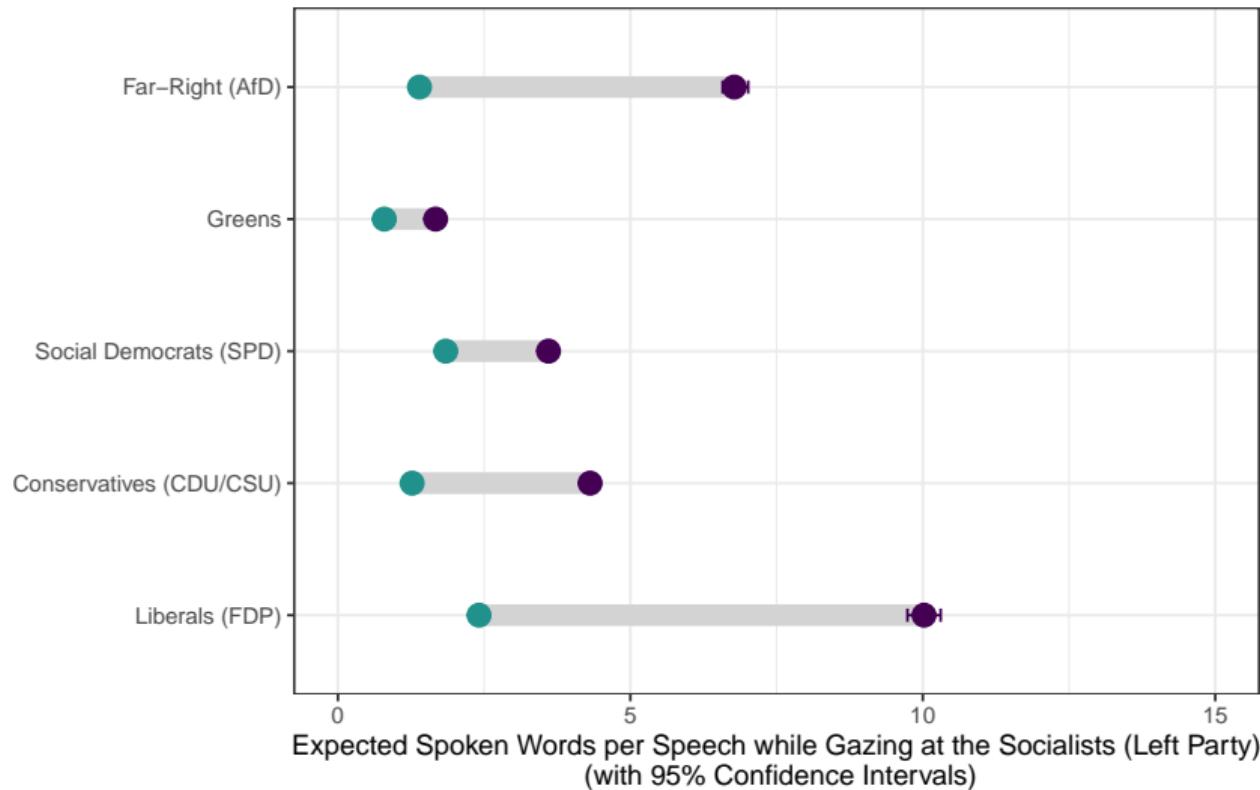
Robustness Check (Narrowed AfD Angle)

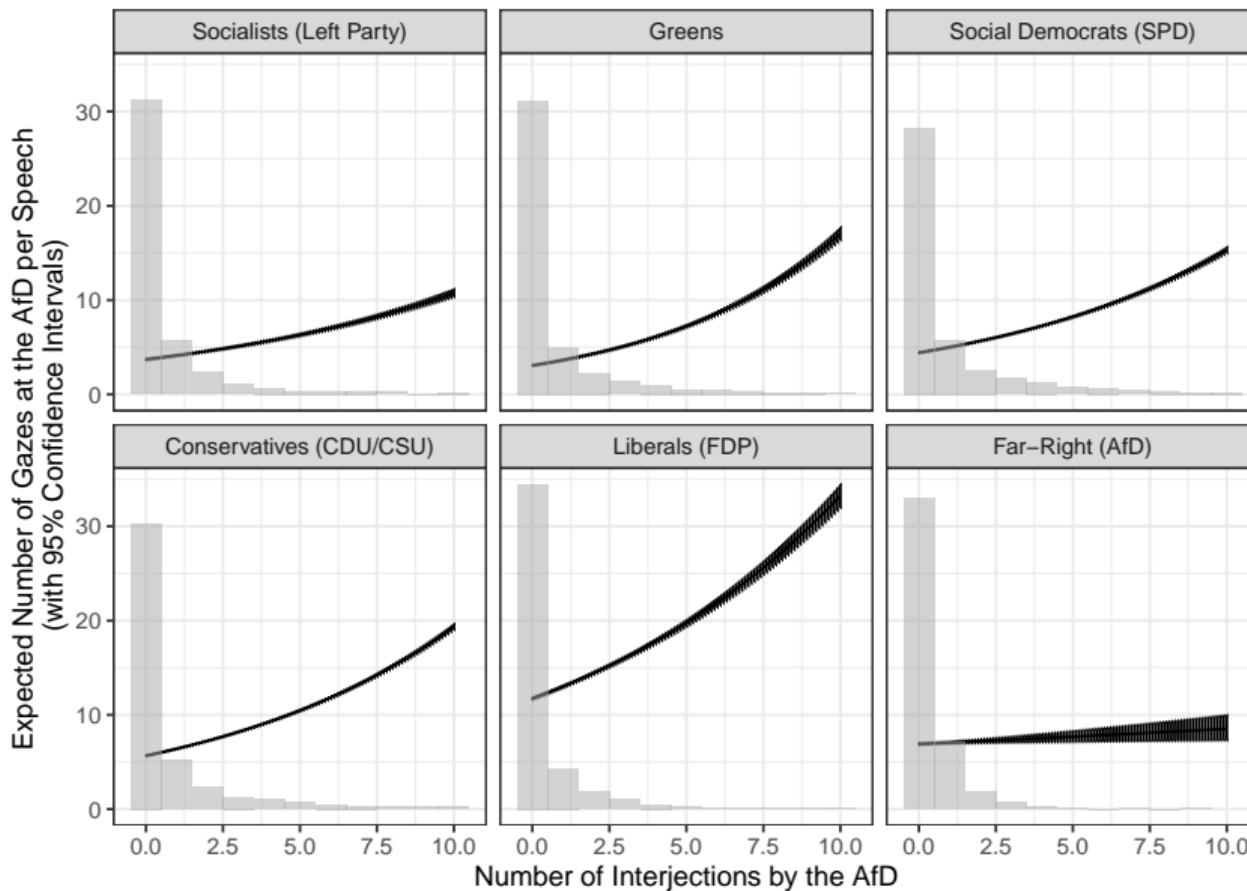


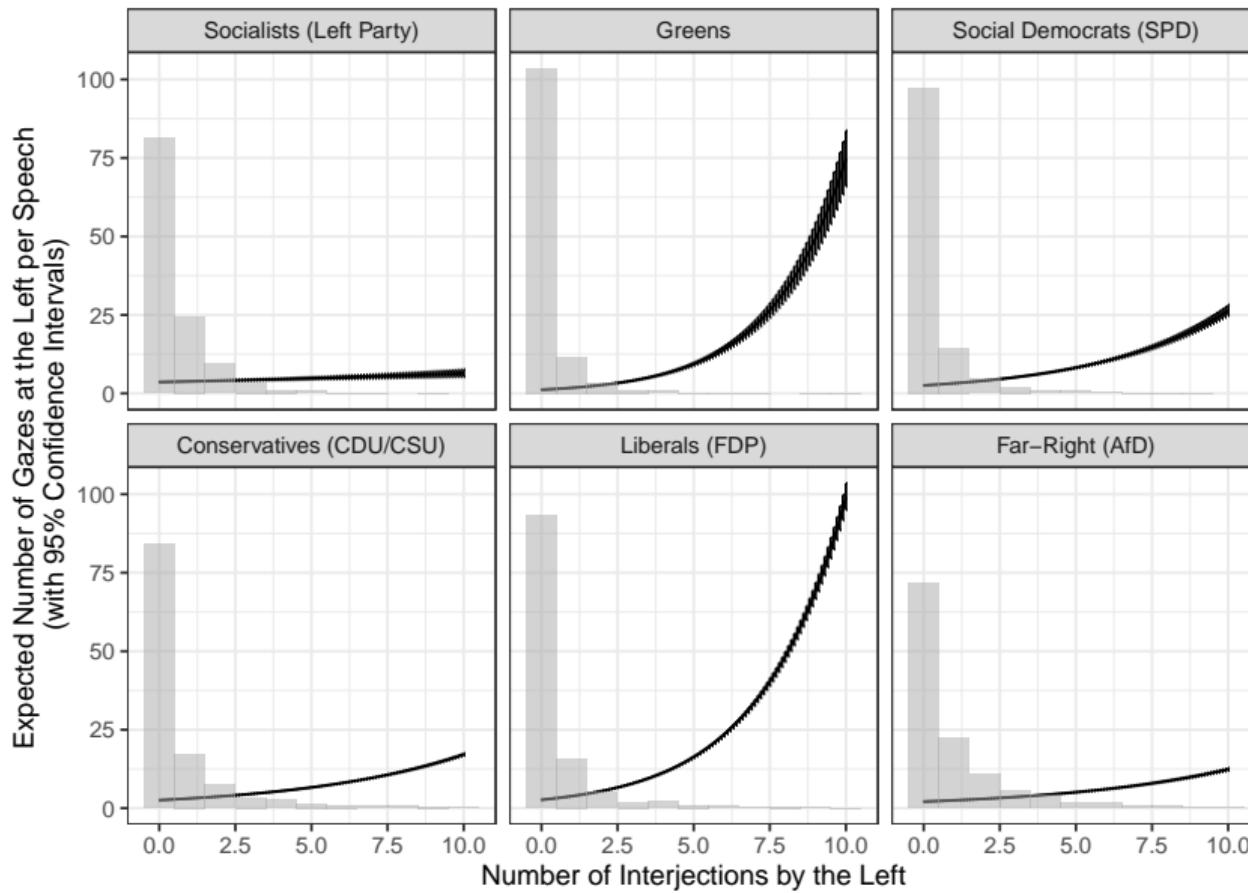
Speech held... ● ...after Far Right (AfD)? ● ...before Far Right (AfD)?



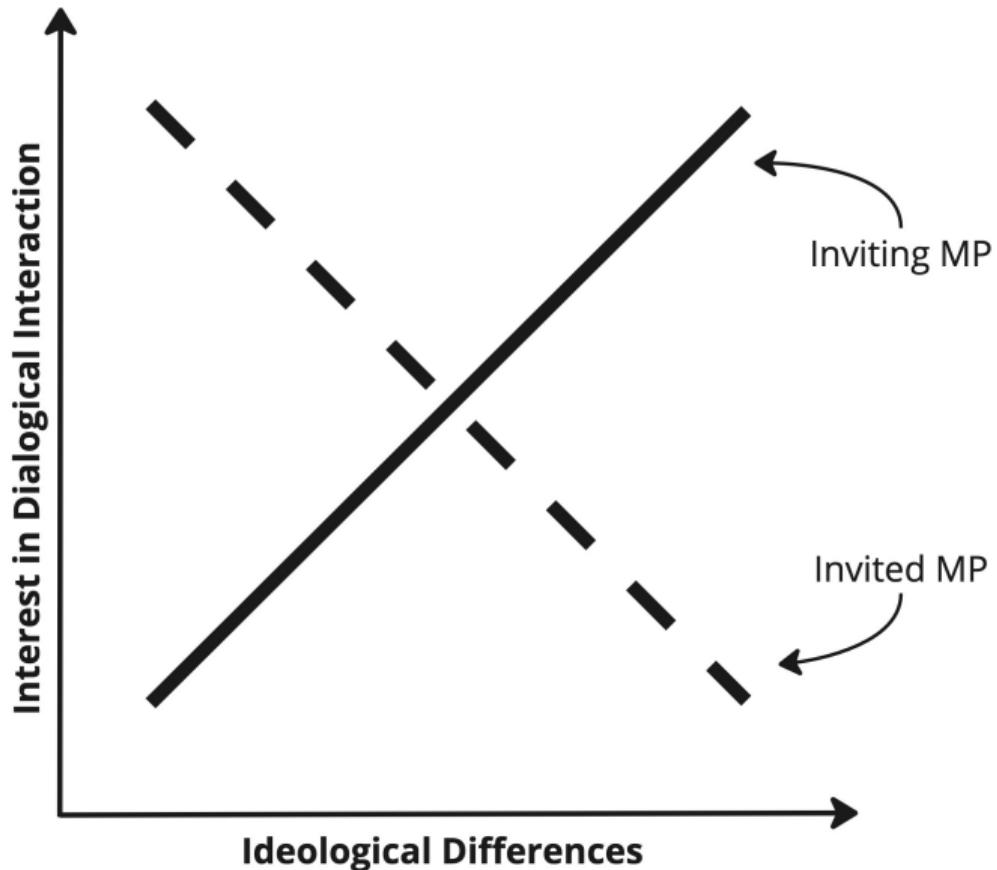
Speech held... ● ...after Socialists (Left Party)? ● ...before Socialists (Left Party)?

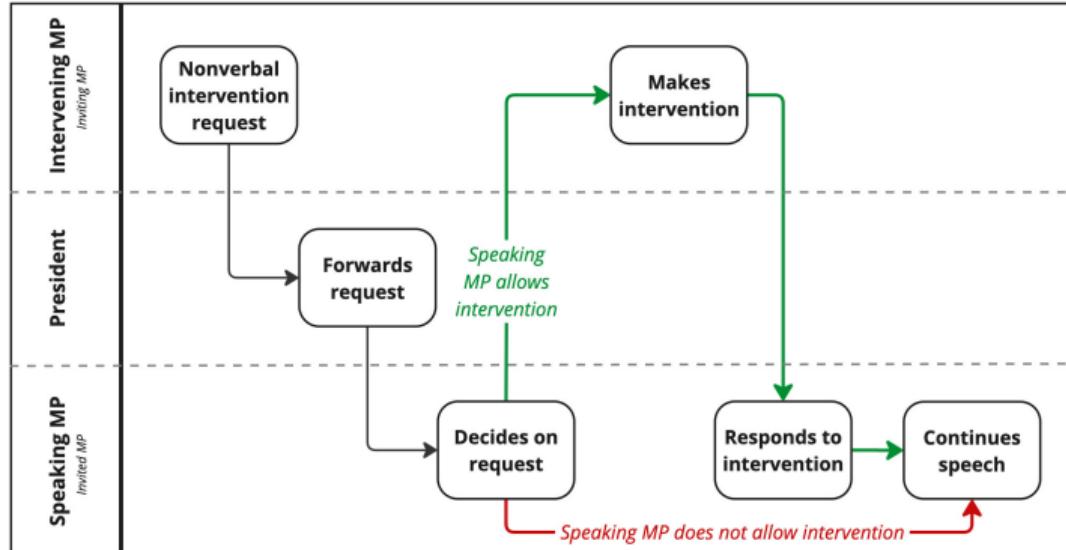


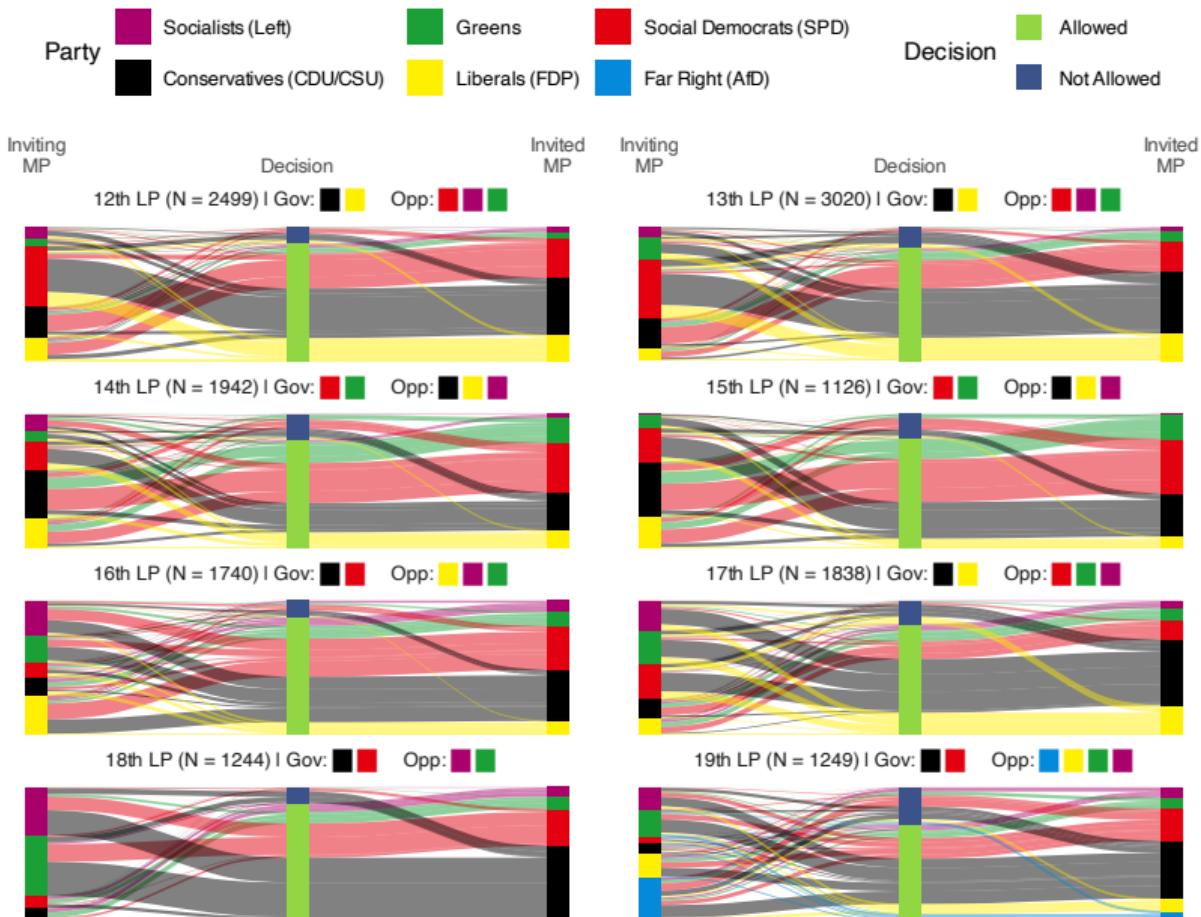




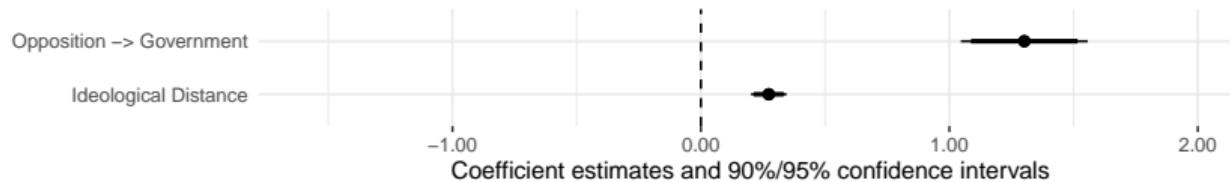
The Politics of Seeking and Avoiding Discourse in Parliament



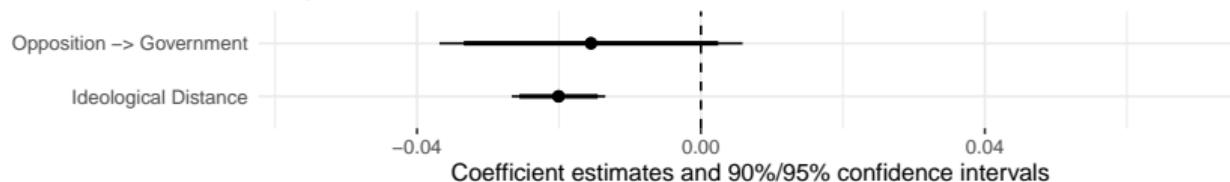




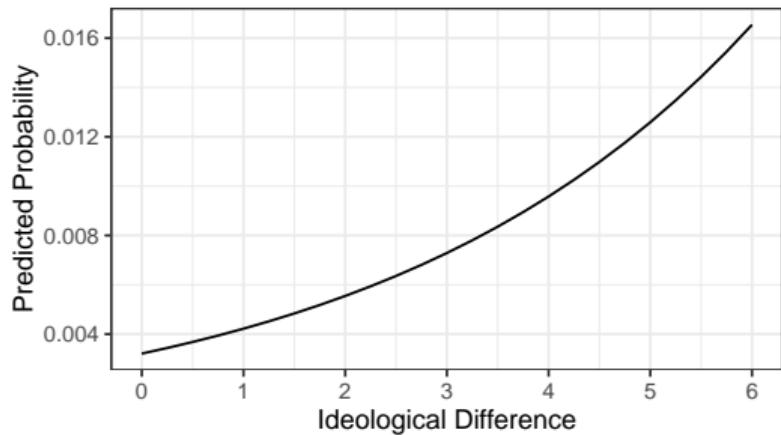
Stage 1 Model: Who tries to debate whom? (Inviting MP)



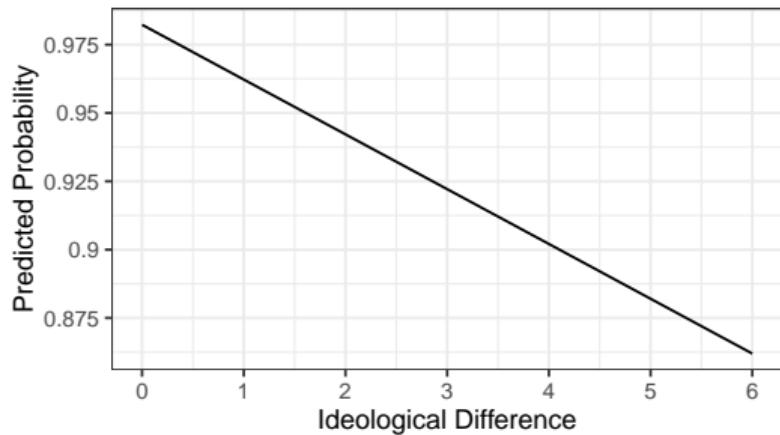
Stage 2 Model: Which intervention attempts do speakers accept? (Invited MP)



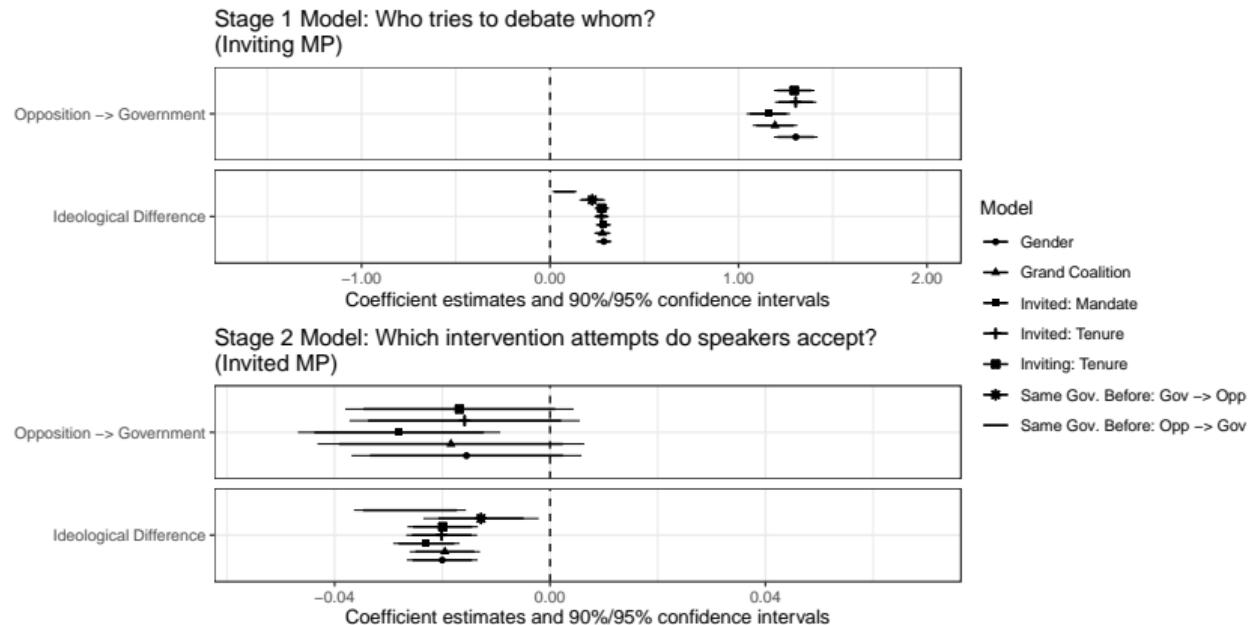
Stage 1 Model: Who tries to debate whom?
(Inviting MP)

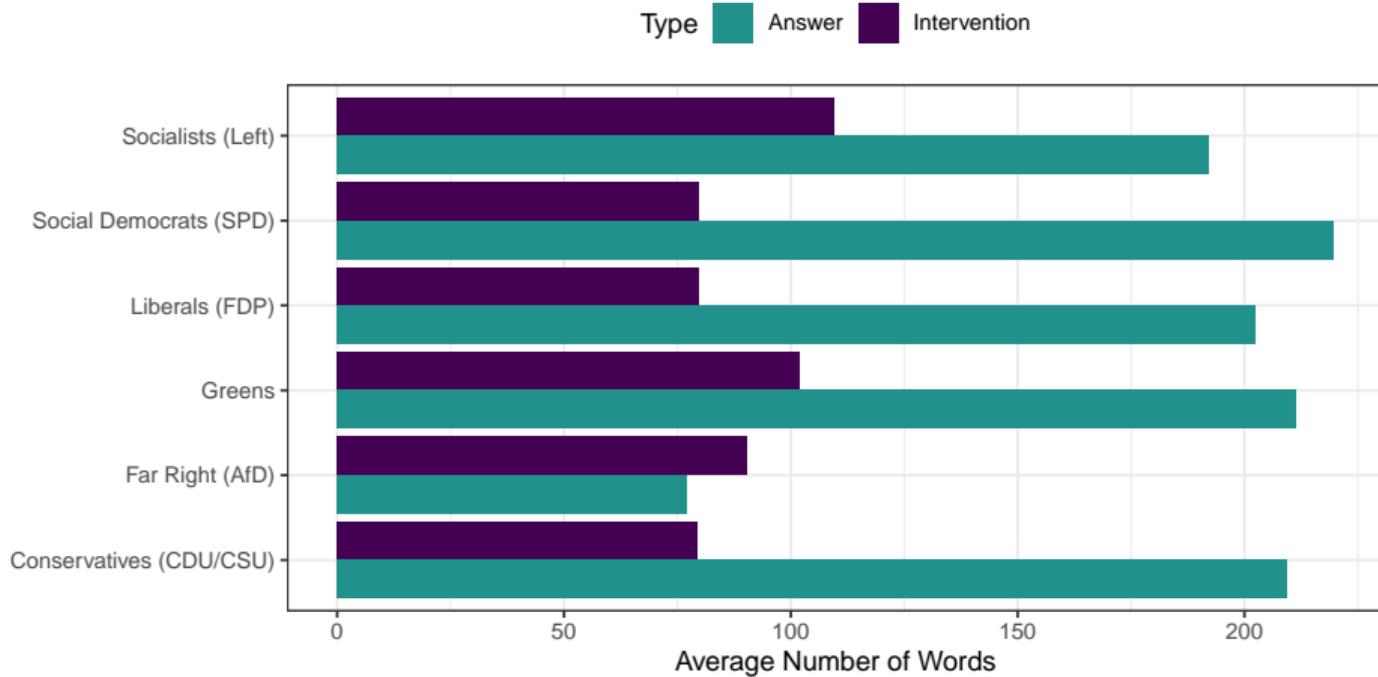


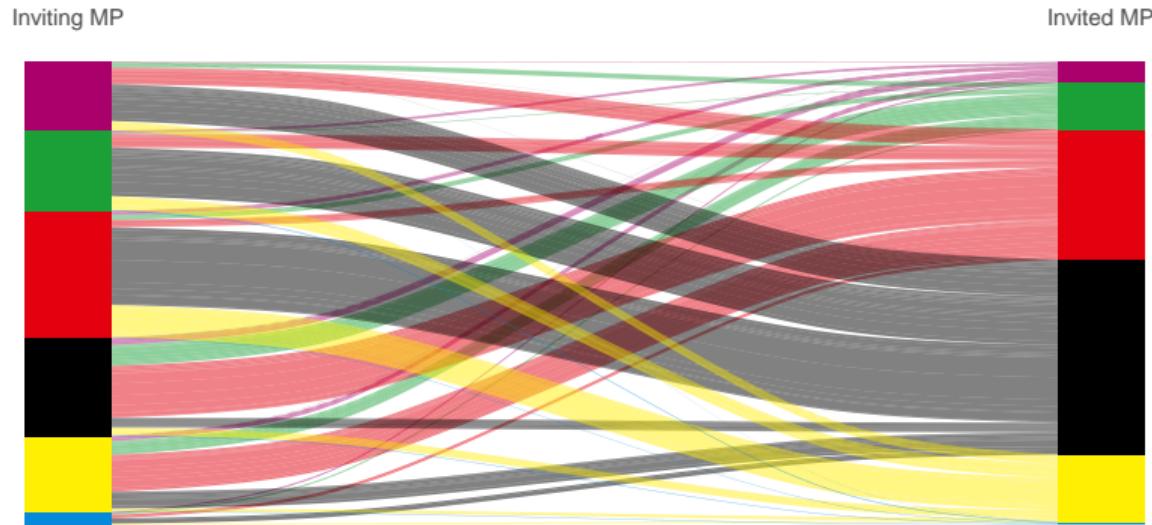
Stage 2 Model: Which intervention
attempts do speakers accept? (Invited MP)



Robustness Check







Decision



Allowed



Not Allowed

In Government?



Yes

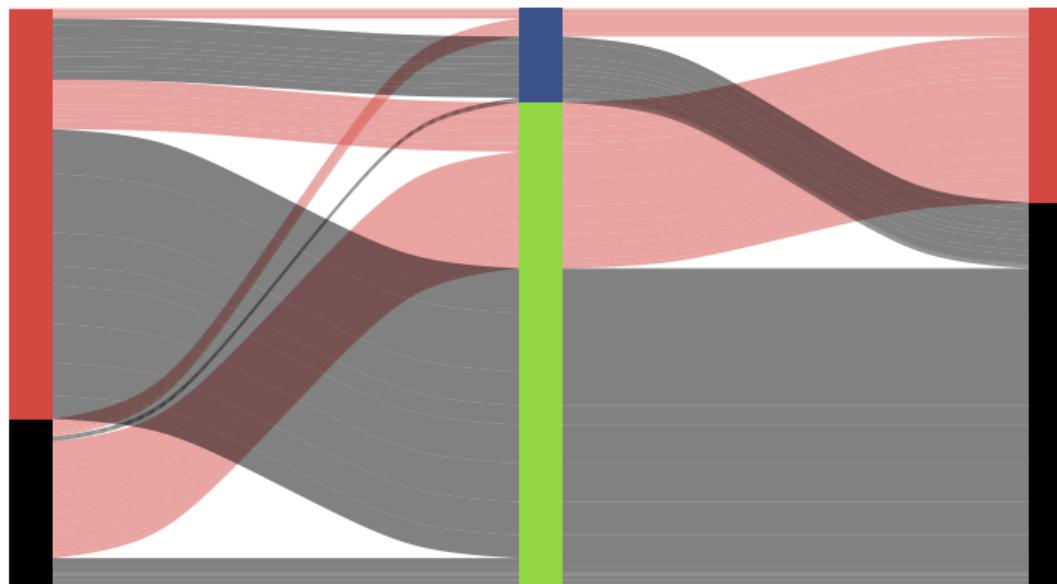


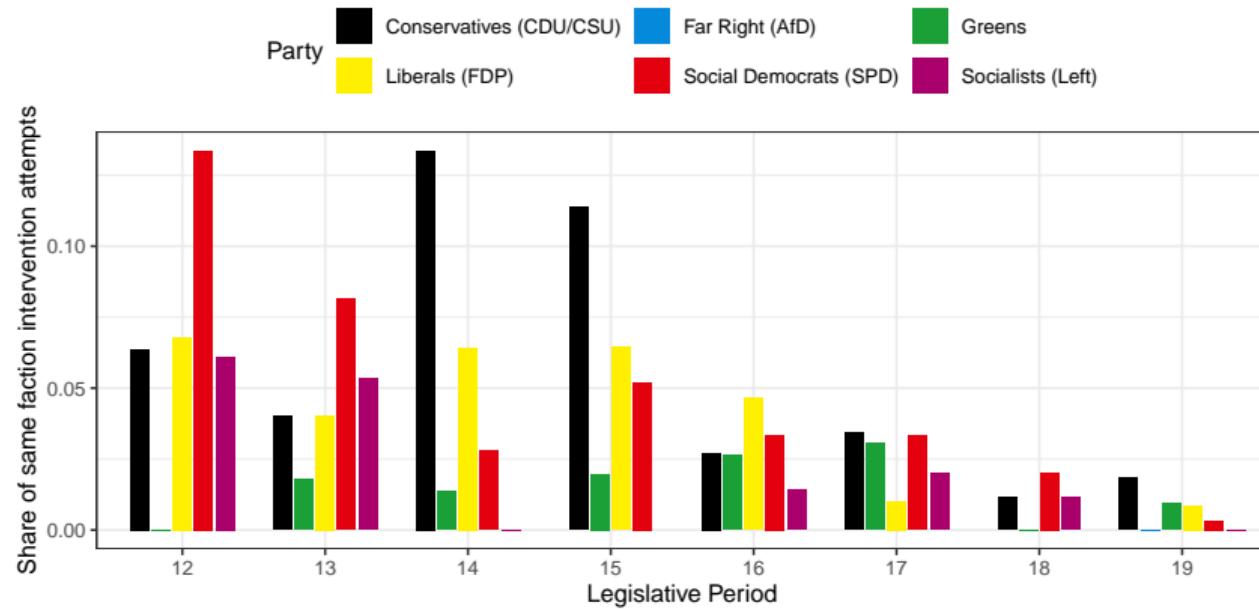
No

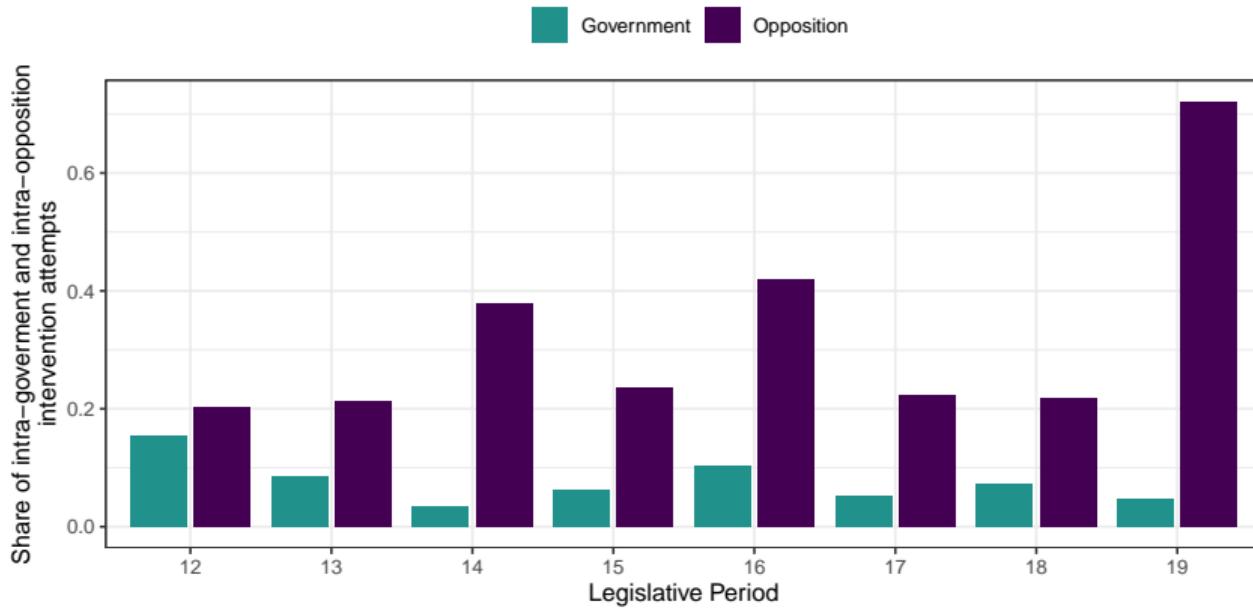
Inviting
MP

Decision

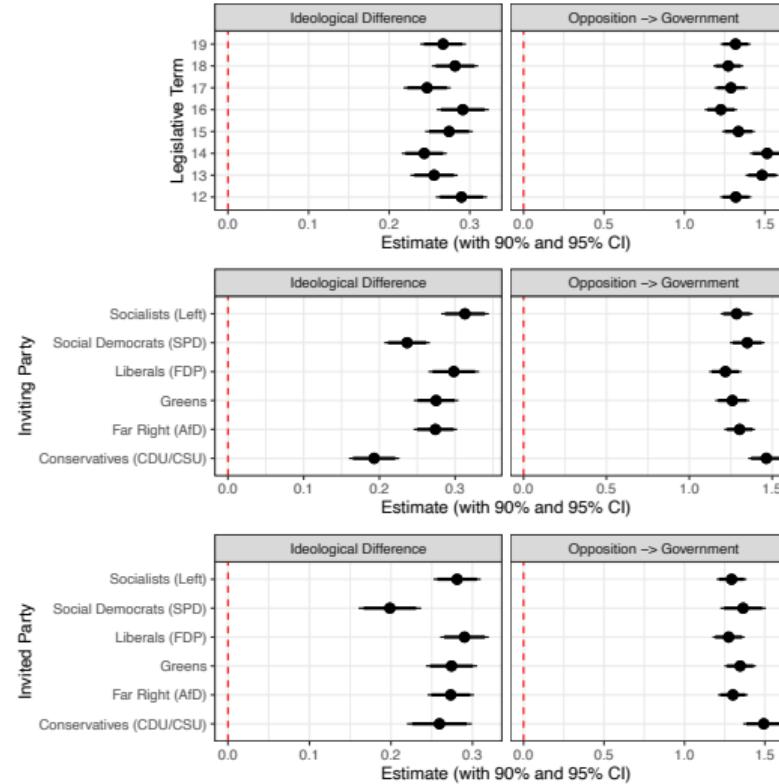
Invited
MP



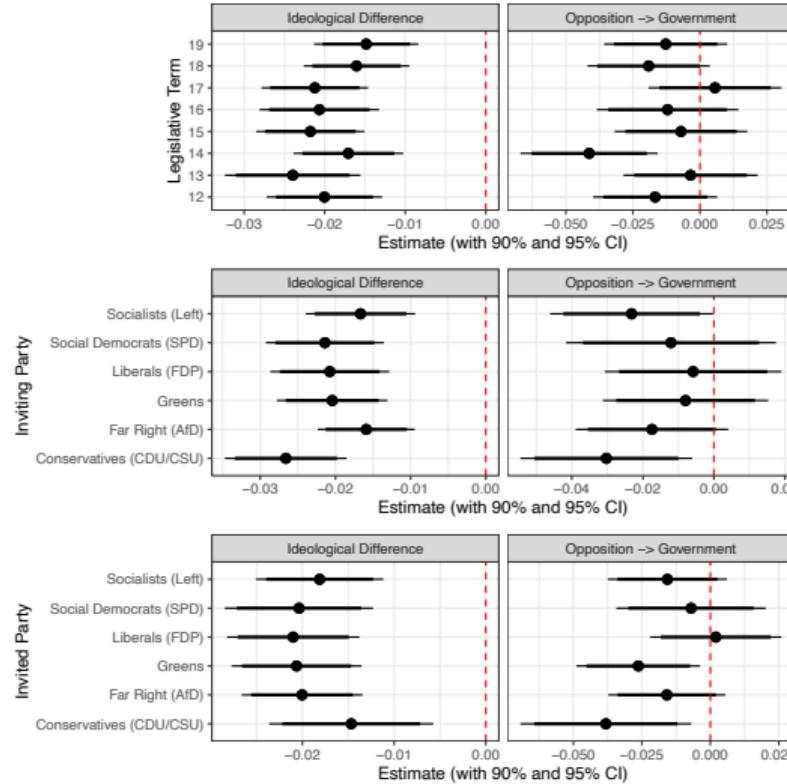




Robustness Check

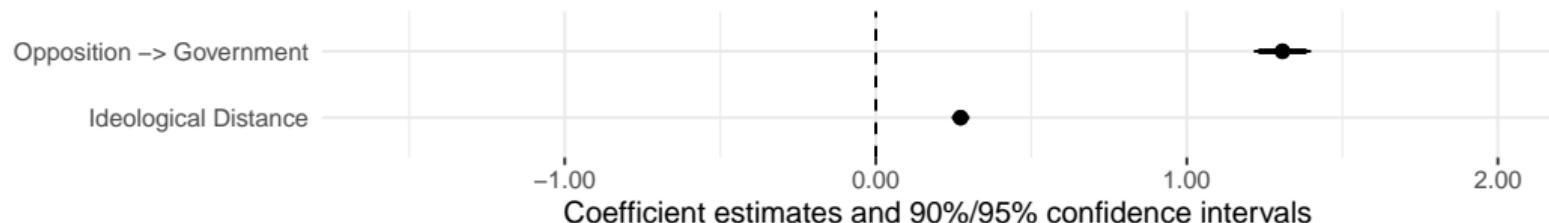


Robustness Check

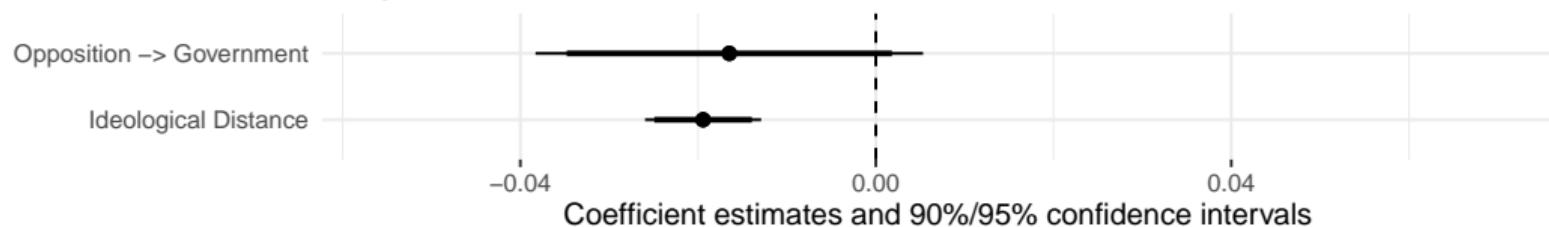


Robustness Check (Committee Membership FEs)

Stage 1 Model: Who tries to debate whom? (Inviting MP)

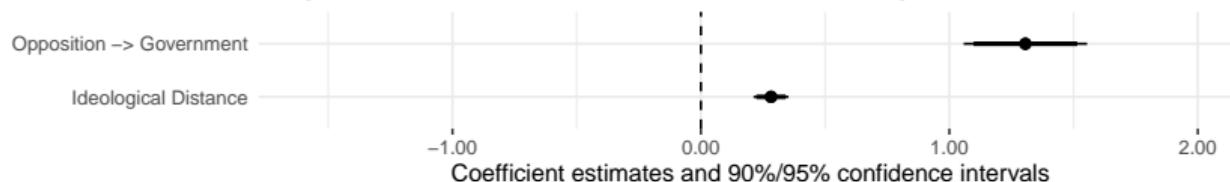


Stage 2 Model: Which intervention attempts do speakers accept? (Invited MP)

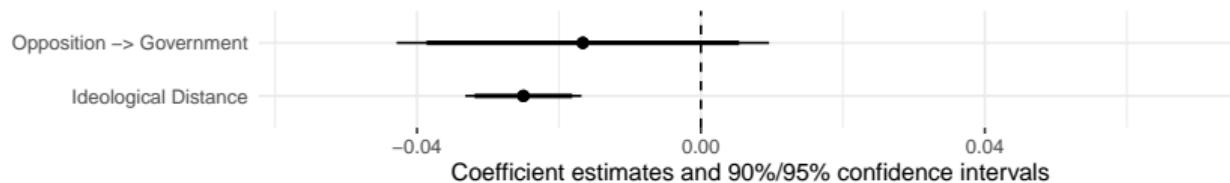


Robustness Check (Negative Binomial Model)

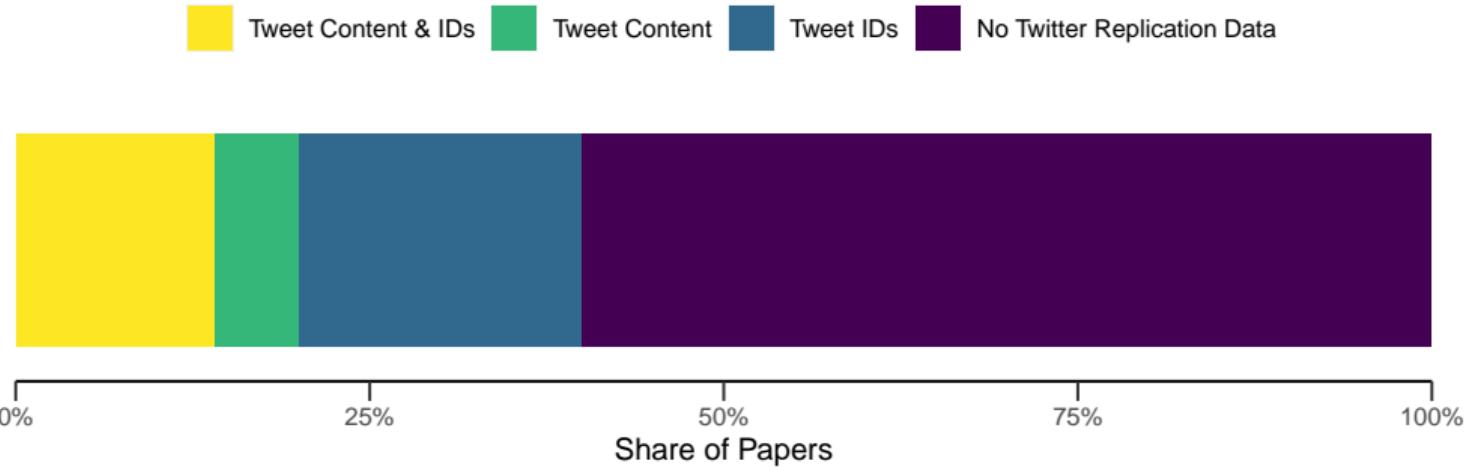
Stage 1 Model: Who tries to debate whom? (Inviting MP)

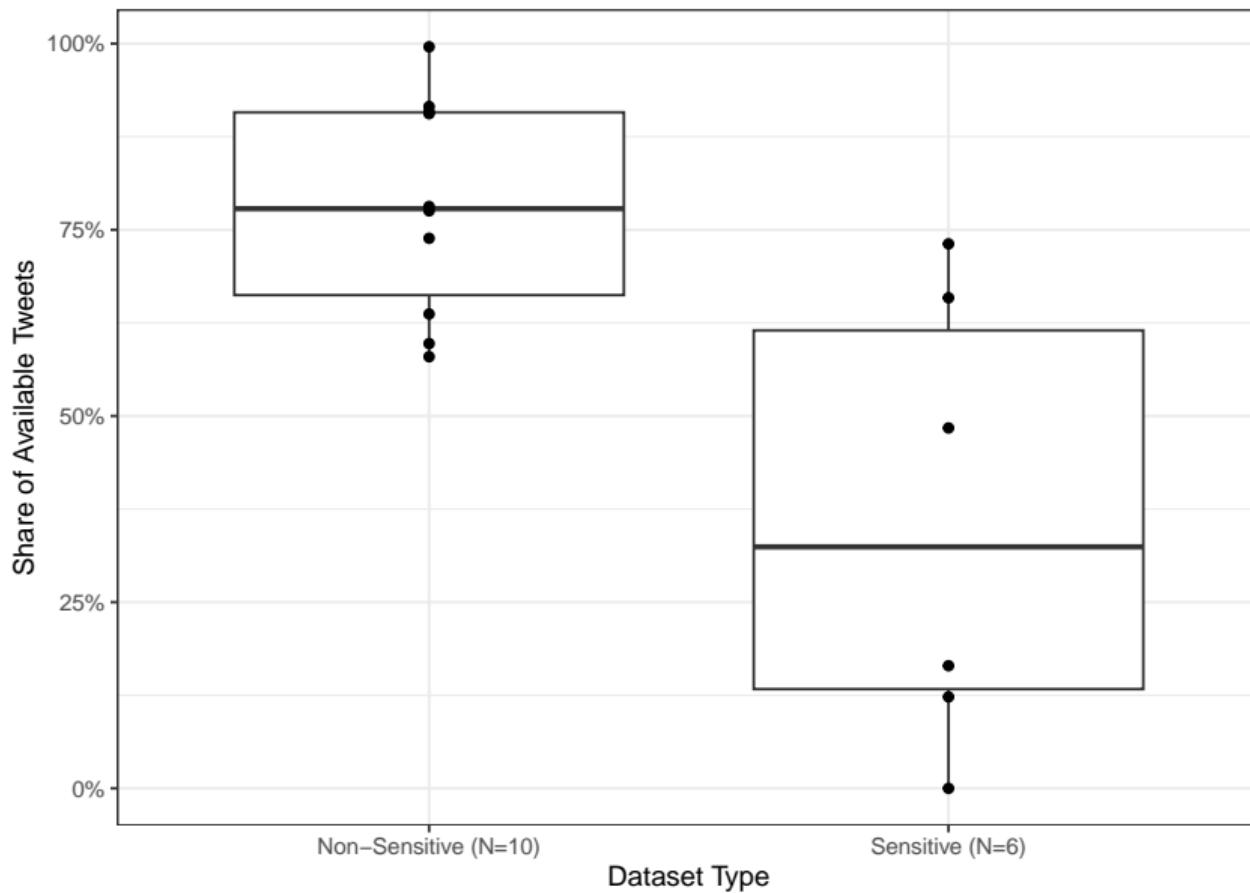


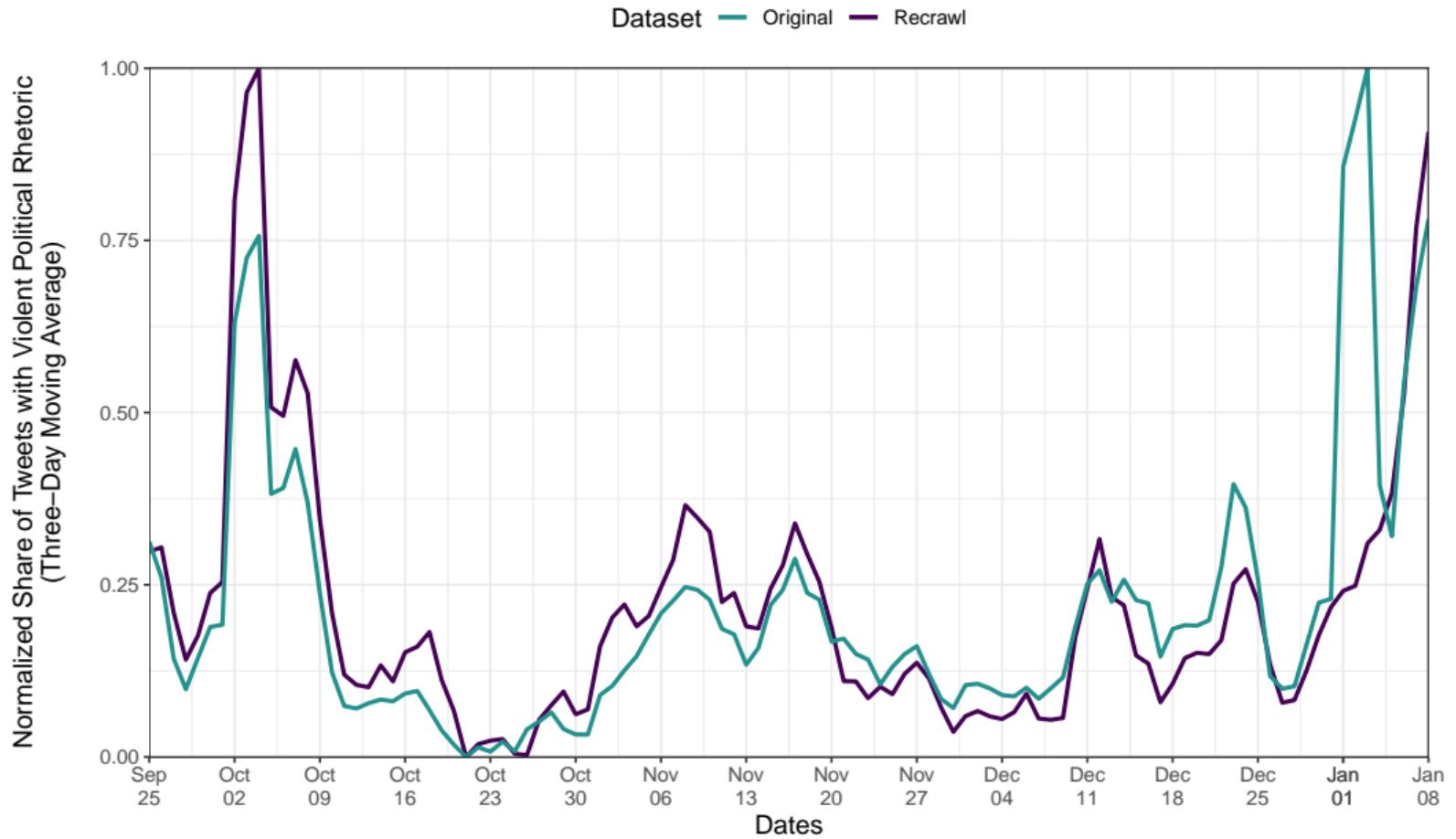
Stage 2 Model: Which intervention attempts do speakers accept? (Invited MP)

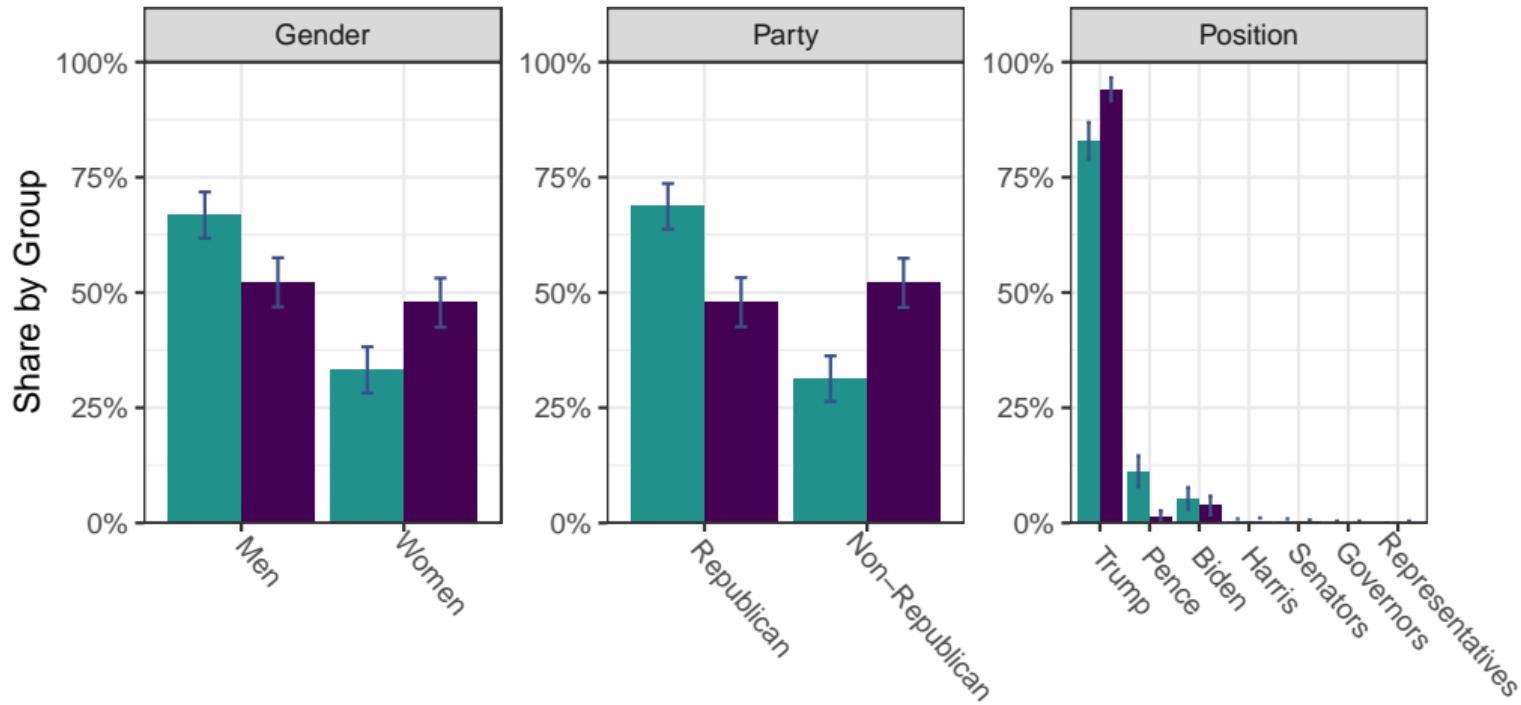


Nonrandom Tweet Mortality and Data Access Restrictions: Compromising the Replication of Sensitive Twitter Studies

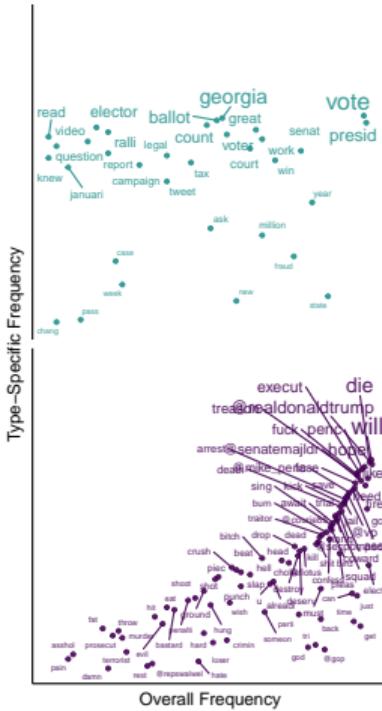




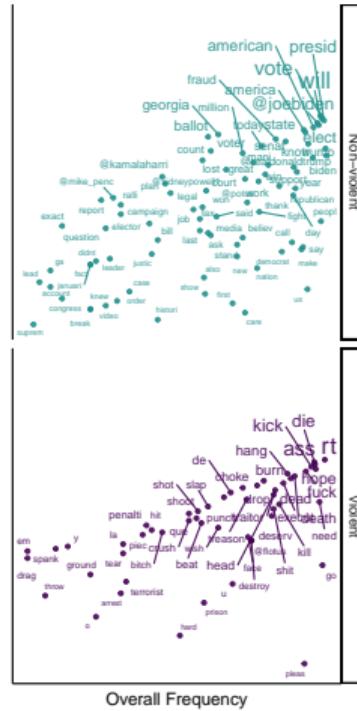


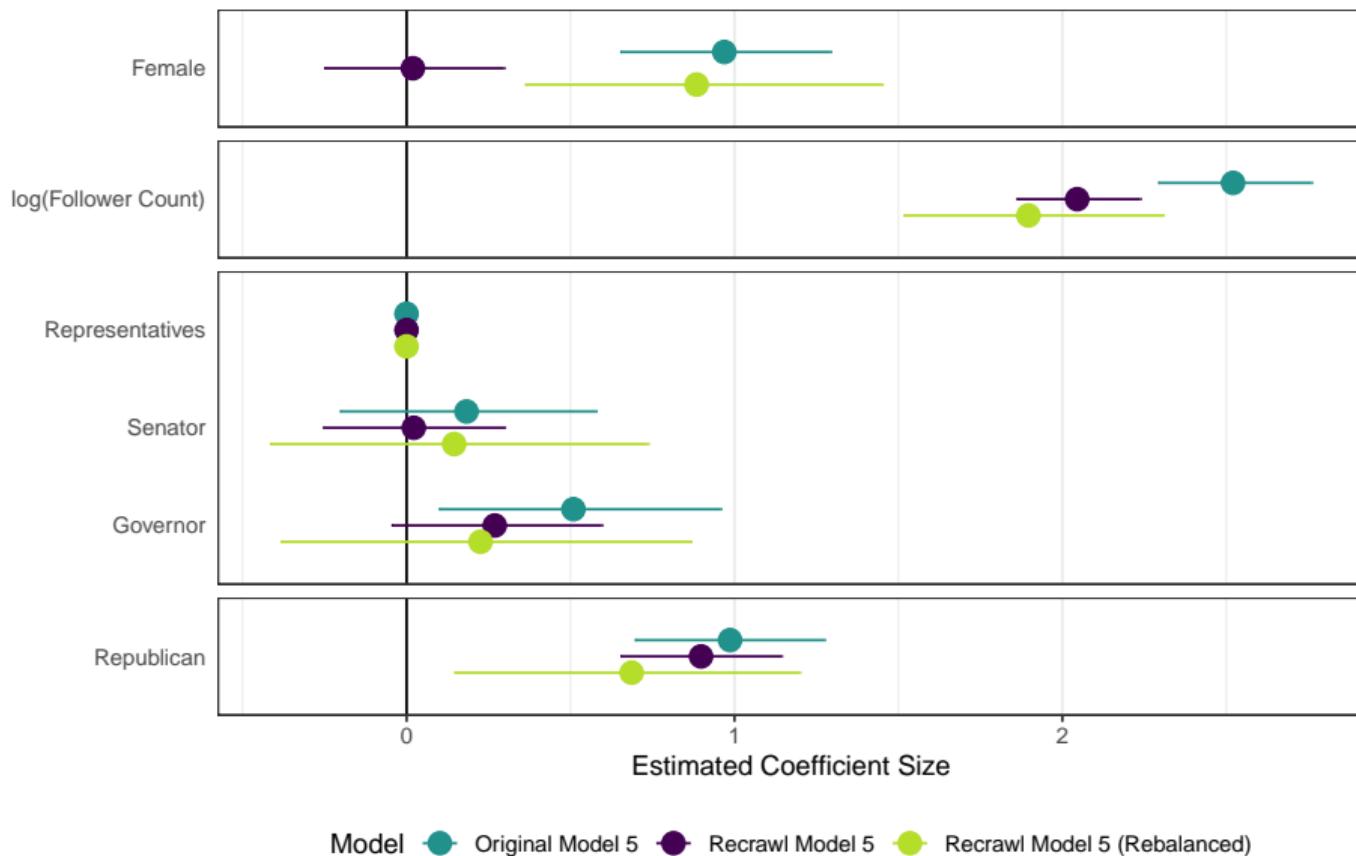


Original Dataset



Recrawled Dataset





Tweet Content & IDs Tweet Content Tweet IDs No Twitter Replication Data

