Wolf Attacks Predict Far-Right Voting

REPLICATION GUIDE & SUPPLEMENTARY MATERIALS (CORRECTED VERSION)

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Preamble

This document was updated to reflect the correction issued with the publication. The previous version can be found in the Harvard Dataverse history.

1 Data collection

1.1 Vote shares

The municipality-level data on voting behavior were provided by federal and state-level election officials. For each election, we collected all available municipality-level results from archives and websites. Since municipalities are regularly reshaped—leading to both mergers and splits—we harmonized all data at 2021 geometries. In case of mergers and splits, votes were apportioned proportional to the geometric shapes. We have data on all federal elections since 1990, all state elections since 1990 and all municipal elections since 1990 (save the municipal election of 1990 in Schleswig-Holstein). The data for federal elections can be found in `/data/votes/btw_merge.csv`, for state elections in `/data/votes/ltw_merge.csv` and for local elections in `/data/votes/kw_merge.csv`. Each contains the vote shares of AfD and Green Party per election and municipality.

1.2 Wolf attacks

Since we were given some of the data by state authorities under the condition of confidentiality, we can share the attack-level data only at the aggregated level. Table 1 gives an overview of where and how we collected the data, some of which are public.

For Figure 1 in the paper, the repository contains two files that aggregate the data at the municipality level, and the year level, respectively: `/data/covariates/wolves_by_municipality.csv` and `/data/covariates/wolves_by_year.csv`. Note that for the yearly aggregation, we also integrated data for states that did not provide municipality-level data, i.e., Schleswig-Holstein after 2020, Mecklenburg-Vorpommern and Rheinland-Pfalz.

For the municipality-level analyses, shown in Figure 2, and on survey data detailed in Section 3.1, we provide data sets that have aggregated wolf attacks per election period and integrated these aggregates into the voting data sets `/data/votes/btw_merge.csv`, `/data/votes/ltw_merge.csv` and `/data/votes/kw_merge.csv`.

1.3 Covariates

We obtained yearly municipality-level statistics on population, employment and land use starting in 2008 from Germany's office for regional statistics (Regionaldatenbank). Numbers of unemployed per municipality and year were sourced from here; population statistics per municipality and year from here; land use areas per municipality and year from here. These numbers were recoded to have a (1) proportion of unemployed per municipality per year (2) proportion of land used for agriculture and (3) proportion of land used as heathen, again harmonizing municipalities at the 2021 borders. The variables can be reproduced through `/code/covariates.R`, the resulting data set is in `/data/covariates/covariates_empl_land.csv`. Numbers of refugees per municipality and year (`/data/covariates/covariates_`

`refugees.csv`) were provided by the IAB institute. All covariates are joined to the votes and wolf data in `/code/recoding-main.R`.

1.4 Civey survey data

We obtained 29,045 survey responses from an existing survey question fielded by Civey to its online river sample. The question was: "Denken Sie, dass ein stetiges Wirtschaftswachstum mit ökologischer Nachhaltigkeit vereinbar ist?" (in English: Do you think that constant economic growth and environmental sustainability are compatible?).

1.5 Manifesto data

The AfD's election manifestos were accessed via `https://manifesto-project.wzb.eu/`.

1.6 Facebook ad data

The entirety of Facebook ads by the AfD since 2018 were obtained by a colleague (data from before are not available). We cannot share them here.

1.7 Twitter data

We obtained a data set of all tweets by members of the German Bundestag since 2008, a total of 3,556,004 tweets. We cannot share the full data set since we were granted access by the courtesy of a colleague. We extracted tweets about wolves using keywords and manually filtered out false positives (e.g., tweets about people named "Wolf"). The resulting data set can be found in `data/twitter/tweets_wolf.csv`.

Table 1: Overview of data on wolf attacks

State	Time span of records	Values included as attacks	Source
Berlin	No attacks recorded		Direct request
Bremen	Only two attacks in 2018 and 2020	only attacks reported	Direct request
Hamburg	Only one attack in 2018		Direct request
Hessen	01/2008 - 12/2021	containing "Ziege", "Kalb" oder "Schaf"	https://www.hlnug.de/themen/naturschutz/tiere-und-pflanzen/arten-melden/wolfszentrum
Saarland	No attacks recorded		Direct request
Schleswig-Holstein	01/2007 - 04/2020	Does not contain "Hund", "Baummarder", "Fuchs", "in Untersuchung", "kein Ergebnis", "steht aus", "nicht analysierbar"	https://www.schleswig-holstein.de/DE/Fachinhalte/A/artenschutz/Wolf_Tabelle.html#doc7f8b4c8f-b511-4a1b-beb7-be0fc50078c4bodyText1
Thüringen	01/2015 - 12/2021	"Wolf", "Wolf und/ oder Wolfshybrid"e, "Wolfshybride"	https://umwelt.thueringen.de/themen/natur-artenschutz/kompetenzzentrum/schadensbegutachtung
Bayern	01/2006 - 12/2021		https://www.lfu.bayern.de/natur/wildtiermanagement_grosse_beutegreifer/wolf/monitoring/index.htm
Brandenburg	01/2015 - 09/2021	Wolf, "Wolf n.a.", "Wolf w.", "wolf"	https://lfu.brandenburg.de/lfu/de/aufgaben/natur/tiere-und-pflanzen/saeugetiere/woelfe-in-brandenburg/schadensmanagement/gemeldete-nutztierschaeden-und-rissstatistik/#
Baden-Württemberg	01/2015 - 12/2021	"Genetischer Nachweis, Nutztierriss"	https://um.baden-wuerttemberg.de/de/umwelt-natur/naturschutz/biologische-vielfalt/artenschutz/wolf/nachweise/
Niedersachsen	2008 - 2021	"Wolf"	https://www.umweltkarten-niedersachsen.de/Umweltkarten/?topic=Natur&lang=de&bgLayer=TopographieGrau&layers=alle_Nutztierschaeden_alle_Jahre
Nordrhein-Westfalen	2009 - 2021	"bestätigter Hinweis", "eindeutiger Nachweis", "unbestätigter Hinweis, Wolf wahrscheinlich"	https://www.wolf.nrw/wolf/de/management/nutztierrisse
Sachsen	1998 - 2021	"Wolf", "Wolf bzw. Wolf nicht ausgeschlossen", "Wolf hinreichend", "Wolf hinreichendsicher", "Wolf hinreichend sicher", "Wolf nicht auszuschließen", "Wolf nicht auszuschließen", "Wolf ODER Hund", "Wolf oder Hund", "Wolf ODER Hund oder Luch"	https://www.wolf.sachsen.de/schadensstatistik-4169.html and direct request
Sachsen-Anhalt	2008 - 2021	"Wolf", "Wolf (DNA- individ.)", "Wolf nicht auszuschließen", "Wolf (DNA)"	https://lau.sachsen-anhalt.de/naturschutz/das-wolfskompetenzzentrum-wzi/nutztierrisse/rissstatistik-st/ and direct request
Rheinland-Pfalz	no data on municipality level		For aggregate data: https://fawf.wald.rlp.de/de/forschung-und-monitoring-unsere-aufgaben/koordinationszentrum-luchs-und-wolf/wolf/wolfsnachweise-rheinland-pfalz/
Mecklenburg-Vorpommern	no data on municipality level		For aggregate data: https://wolf-mv.de/kompensation/

2 Main Analysis

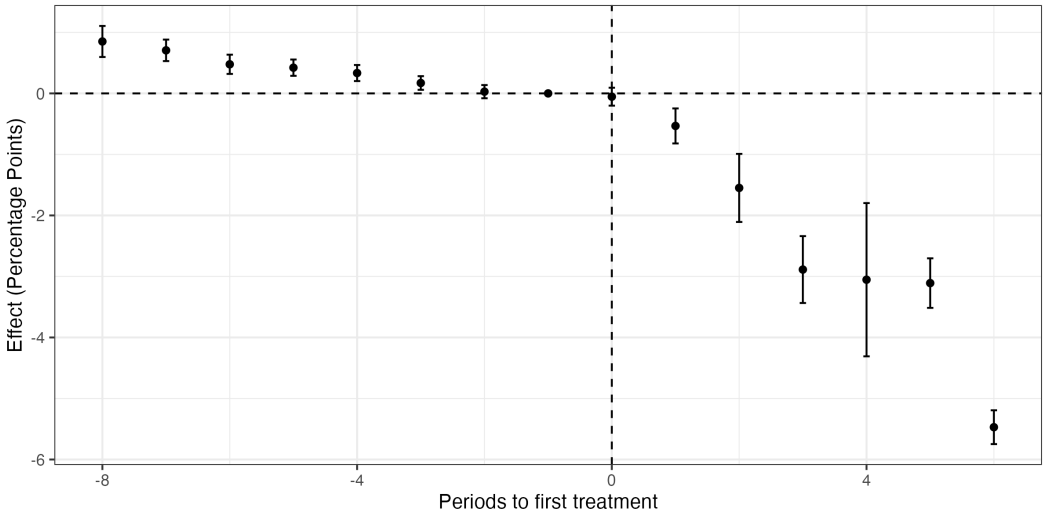
The analyses underlying Figure 1 in the paper are replicable with `/code/analysis-main.R`.

2.1 Event studies

The parallel-trends assumption is key to causal identification in difference-in-difference designs. Typically, this assumption is bolstered by evaluating trends in treated and control units before treatment. Unfortunately, for our main outcome (vote share for the Alternative für Deutschland), we cannot offer solid pre-treatment evidence as the party only exists since 2013 (when wolf predation had already set in). For municipalities exposed to wolf attacks later, pre-treatment elections are too few to examine pre-trends meaningfully. As we mention in our discussion, readers should be aware of this when interpreting our results causally.

Here, we therefore focus on pre-trends in our secondary outcome (vote share for the Green Party). To account for the fact that municipalities were treated at different points in time, we resort to event studies, which test placebo effects of wolf attacks at $l = 1, 2, 3...$ election periods before attacks a municipality was first treated. The figures below can be replicated with file `/code/analysis-pretrends.R`. Figures 1 through 3 show event studies for Green votes in federal, state and local elections. We note that while especially the plots for federal elections gives some confidence for assuming parallel trends, Figure 2 suggests that at the state level, a trend is visible before treatment. As we mention in the paper, findings on state level elections thus warrant more caution.

Figure 1: Placebo effects on Green vote (federal elections)



2.2 Robustness checks

All the following analyses can be replicated with the file `/code/analysis-robustness.R`. First, we re-estimate our two-way fixed effects model models with a continuous treatment

Figure 2: Placebo effects on Green vote (state elections)

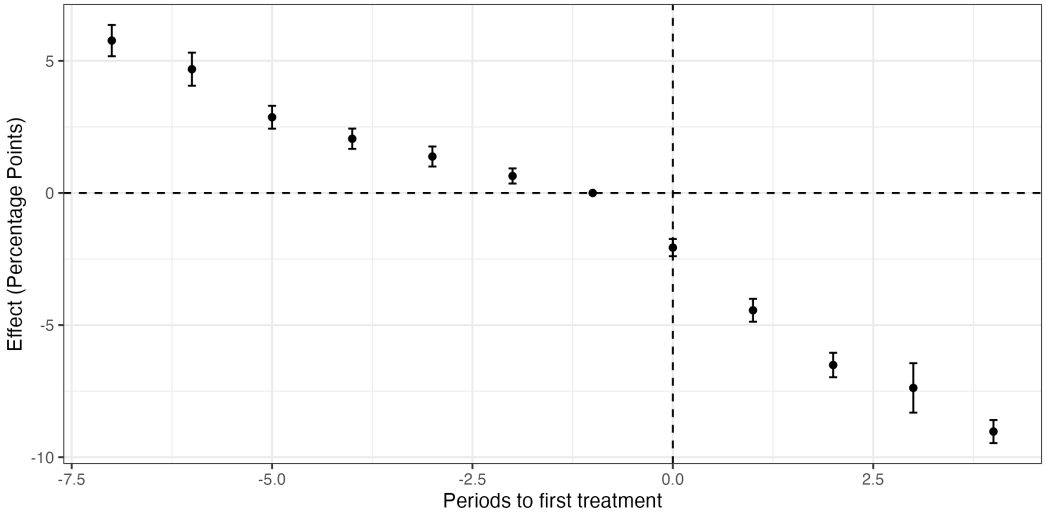
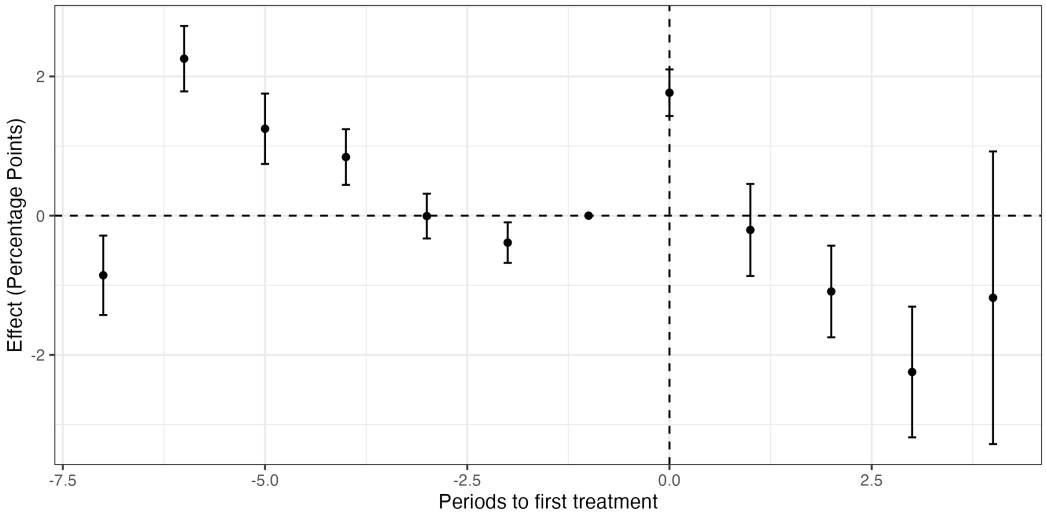


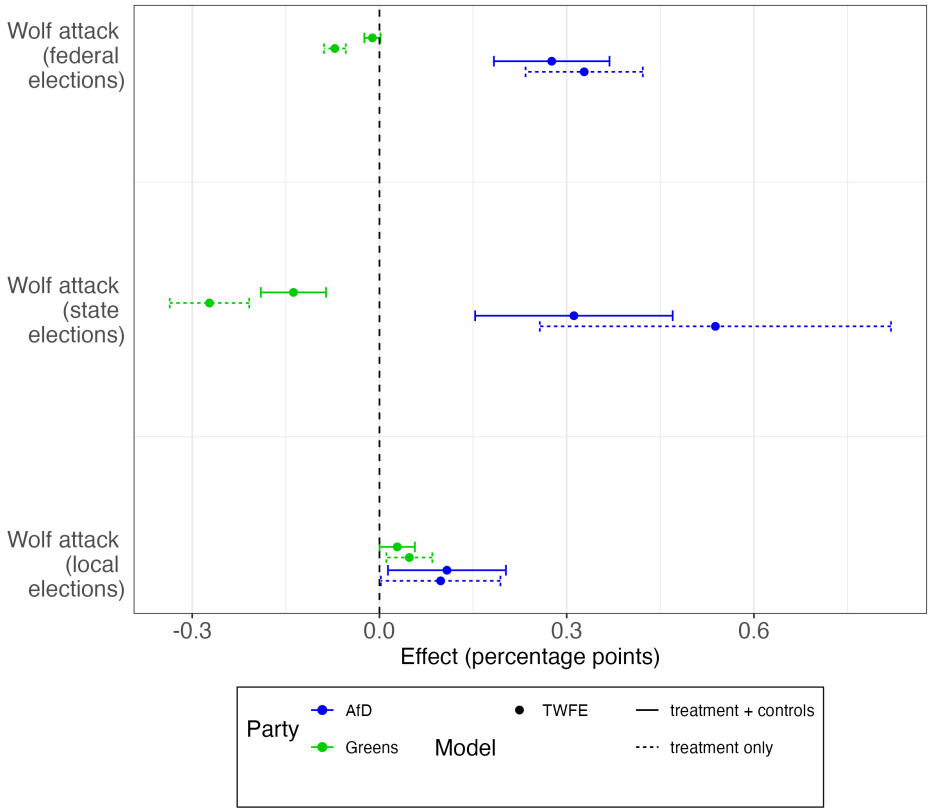
Figure 3: Placebo effects on Green vote (local elections)



indicator, taking into account the number of attacks per election period. Like in the main two-way fixed effects models, there is no treatment reversal, i.e. the treatment variable reflects the cumulative number of attacks at any time point. Figure 4 shows that the results are robust against this specification. The effect sizes are smaller because among municipalities witnessing attacks, the typical cumulative number of attacks is high (mean = 4.15, max = 74).

Second, to rule out that any time-variant and unit-variant factors that differ between rural and urban areas, we also re-estimated our models using only municipalities with population density lower than defined as those with a population density of less then 300 inhabitants per

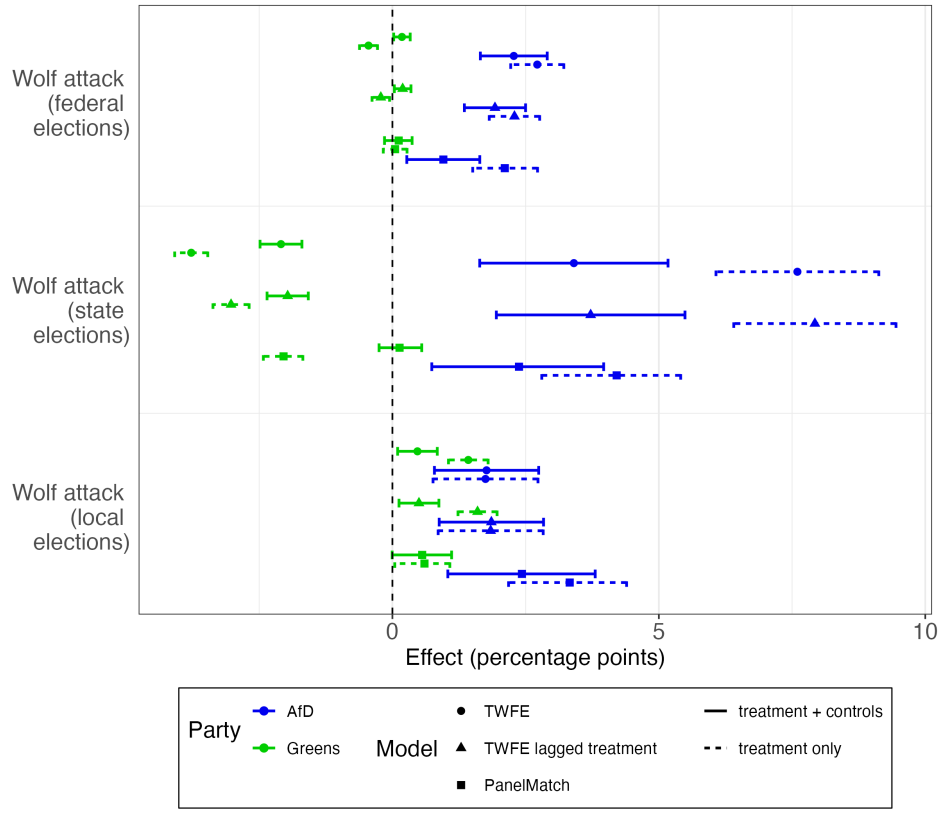
Figure 4: TWFE with continuous specification



square kilometer using the Eurostat typology.[1] Figure 5 shows that effect sizes are robust to this alternative model for federal and state elections.

[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Urban-rural_typology&oldid=78848

Figure 5: Main models for rural municipalities only

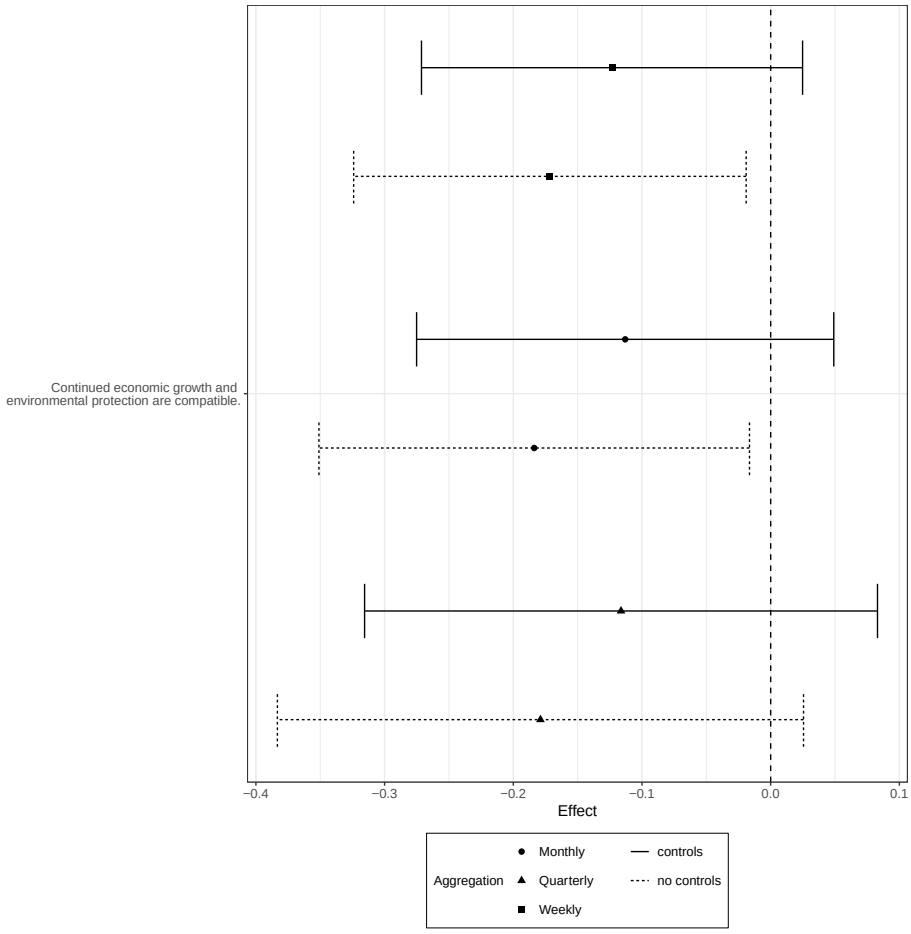


3 Exploratory analyses

3.1 Civey surveys

We cannot share replication material for these analyses, as we aggregate attacks on a *weekly* basis on the municipality level, which would disregard the restrictions by some of the data-providing state agencies to not publish the dates of individual attacks. We therefore describe the analyses verbally. Survey responses are linked to a postcode, so we aggregate them to the higher municipality level. We then average responses on a weekly, monthly and quarterly level, and join these data to the treatment indicator (whether there was an attack in this week, month or quarter in the respective municipality). We then run two-way fixed-effects models, one without and one with controls for each of three levels of aggregation. Figure 6 shows that witnessing a wolf attack in one's municipality in the respective period makes it less likely to agree that "economic growth and environmental sustainability are compatible", though the models become marginally insignificant when introducing controls.

Figure 6: Models estimating effects of wolf attacks on Civey survey responses



3.2 Manifesto data

We analyzed the AfD's election manifestos qualitatively. We find, first, that the AfD specifically mentions the wolf as a campaign topic beginning in 2017. We do not find any mentions of wolves in the previous periods with fewer wolf attacks. Second, we observe that the wolf is framed as an economic threat. For example, the party's 2017 manifesto states: "The wolf is a predator, which leads to livestock loss among farmers."

3.3 Facebook

We analyzed the AfD's Facebook ads since 2018 qualitatively. We find additional examples of ads in which the AfD specifically frames wolf attacks as a negative consequence of conservation efforts and then links these efforts to detrimental effects on the local economy. For instance, one ad read "More Biodiversity? Sure, if it makes sense. But, our farmers are also part of the environment and farmers need space to live and work". Overall, the Facebook ads with the keyword "wolf" generated 1,141,842 unique impressions.

3.4 Twitter

The reproducible code `/code/analysis-twitter.R` starts with the filtered tweet set `data/twitter/tweets_wolf.csv`. After pre-processing, we match each word to a sentiment using the SentiWS dictionary (https://wortschatz.uni-leipzig.de/en/download) and computed a tweet-level sentiment by averaging the word sentiments in a tweet. Next, we computed an average party tweet sentiment. Testing the difference of AfD tweet sentiment against the average of non-AfD tweet sentiment with a t-test, we find a difference of 0.15 on a standardized scale ($t = -2.40$, $p = 0.02$). We further matched AfD MPs tweeting about the wolf to the electoral district they stood for (`/code/analysis-twitter-geo.R`). Note that not every German parliamentary candidate stands in an electoral district, but only on the party's "list". Thus, we only considered those standing in a district. Testing the difference in tweet sentiment between MPs whose districts had witnessed wolf attacks and those who did not, we that the former's sentiment is 0.16 points more negative ($t = 2.36$, $p = 0.06$).

4 R session info

The code was run on the following R environment:

```
R version 4.1.2 (2021-11-01)
Platform: x86_64-apple-darwin17.0 (64-bit)
Running under: macOS Big Sur 10.16

Matrix products: default
LAPACK: /Library/Frameworks/R.framework/Versions/4.1/Resources/lib/libRlapack.dylib

locale:
[1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8

attached base packages:
[1] stats     graphics  grDevices utils     datasets  methods   base

other attached packages:
 [1] RColorBrewer_1.1-3  ggpubr_0.4.0        ggmap_3.0.0         stargazer_5.2.2
 [5] foreign_0.8-81      stopwords_2.3       rvest_1.0.2         rstatix_0.7.0
 [9] tidytext_0.3.2      viridis_0.6.2       viridisLite_0.4.0   didimputation_0.1.0
[13] fixest_0.10.3       PanelMatch_2.0.0    broom_0.8.0         sf_1.0-4
[17] readxl_1.3.1        readtext_0.81       readstata13_0.10.0  DRDID_1.0.3
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[29] ggplot2_3.3.6       tidyverse_1.3.1     dplyr_1.0.9

loaded via a namespace (and not attached):
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