Codebook bundeslaendeR

Robert Stelzle

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Contents

Introduction

Most election results data are provided by the Bundeswahlleiter. A machine-readable version of the Bundeswahlleiter's compiled data contained in the -periodically published- pdf available here (https://www.bundeswahlleiter.de/service/landtagswahlen.html) was kindly provided to me. Election data outside the timeframe covered by Bundeswahlleiter's data provided to me was collected from the states' local election authorities' (Landeswahlleiter) websites. More information on parties and the continuity of parties under different labels was collected by me.

The Bundeswahlleiter's election data in many cases contains differing names for the same party. Both between states (eg. "Christlich Demokratische Union Deutschlands" vs. "Christlich Demokratische Union Deutschlands in Niedersachsen") as well as within states between elections -in many cases due to parties being renamed- ("BÜNDNIS 90/DIE GRÜNEN, Landesverband Hamburg, Grün-Alternative Liste" vs. "BÜNDNIS 90/DIE GRÜNEN, Landesverband Hamburg"). Efforts were made to reconcile both of these inconsistencies by adding two new, harmonized variables identifying parties (`partyname_short` and `partyname`). This harmonized party identifier also covers merging of parties. The partyname given to the resulting party (eg. "Linke", "Grüne") is given to the largest of the preceding parties contesting an election unless a smaller party joined a government following the election. The original names provided by the Bundeswahlleiter (and Landeswahlleiters in elections after June 2021) are still available (`partyname_short_bundeswahlleiter` and `partyname_bundeswahlleiter`).

Information on governments is mainly taken from replication data from Linhart, Pappi, and Schmitt (2008) which can be found online here: https://www.tu-chemnitz.de/phil/politik/pspi/forschung/daten.php. Information outside the timeframe of Linhart et al. as well as information on the names and party affiliations of the Ministerpräsidenten was collected by me, mainly from German Wikipedia.

All datasets can be accessed through the `R` Package `bundeslaendeR`. [1] This package further includes one function -`bundeslaendeR::de_states_geofacet_grid_4x4()`- that is documented below. Alternatively all datasets can be downloaded in a single `.zip` file including all six datasets as `.csv`, `.rds` and `.dta` files.

[1] Calling `bundeslaender::ltw_elections`, `bundeslaender::ltw_governments` , `bundeslaender::ltw_combined`, `bundeslaender::ltw_elections_meta`, `bundeslaender::link_manifestos` and `bundeslaender::link_coalitionagreements`.

Table 1: Structure of `ltw_elections`

State Variables Name, Abbreviation, NUTS1 Code			**Election Variables** Election date, Size Electorate, Turnout, ...			**Party Variables** Names, Abbreviations, several IDs			**Party-Election Variables** Vote Count, -Share, Seat Count, -Share, ...		
state	nuts1	...	election_date	turnout	...	partyname_short	ches_id	...	party_vshare	party_seat_count	...
BE	DE3	...	2015-09-18	0.765	...	Party A	001	...	0.45	46	...
BE	DE3	...	2015-09-18	0.765	...	Party B	002	...	0.30	12	...
BE	DE3	...	2015-09-18	0.765	...	Party C	003	...	0.25	18	...
NI	DE9	...	2012-12-16	0.560	...	Party A	001	...	0.17	12	...
NI	DE9	...	2012-12-16	0.560	...	Party B	002	...	0.33	27	...
NI	DE9	...	2012-12-16	0.560	...	Party D	004	...	0.50	46	...

`ltw_elections`

`ltw_elections` is a long-form dataset containing one row per contesting party per election. For a schematic version of `ltw_elections`'s structure see table 1. The data can be accessed in `R` using `bundeslaendeR::ltw_elections`.

`ltw_elections` Variable Information

`state`

State Abbreviation
ISO 3166-2:DE-code of the state; including BA for the former state of Baden, WH for the former state of Württemberg-Hohenzollern and WB for the former state of Württemberg-Baden.

`nuts1`

NUTS1 Code of State
NUTS1 code of state. NA for former states Baden, Württemberg-Baden, Württemberg-Hohenzollern.

`state_name_de`

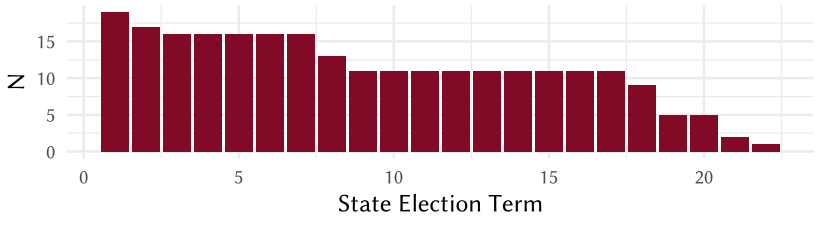
German Name of State
German name of the state.

`state_name_en`

English Name of State.
English name of the state.

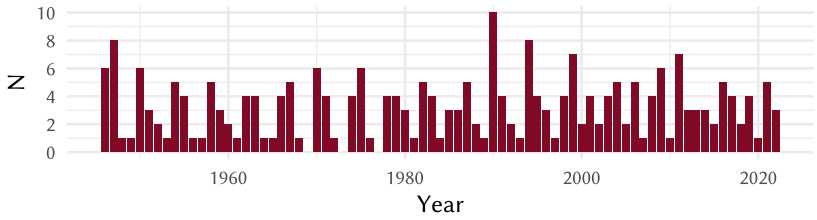
`state_election_term`

Election Term of State
Election term in the state. Counts up from 1.



`election_date`

Election Date
Date of the election. ISO 8601 or R-Date format.



`election_id_bundeswahlleiter`

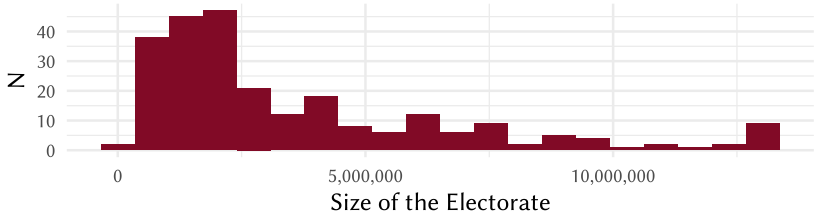
Election ID Bundeswahlleiter
Specific election_id as denoted by the Bundeswahlleiter. Note that BA, WH and WH are named as BW and the number counts down. NA for cases taken from Landeswahlleiters (i.e. elections after ST 2021).

`election_remarks_wahlleiter`

Election Remarks Bundeswahlleiter
Remarks on the election as given by the Bundeswahlleiter.

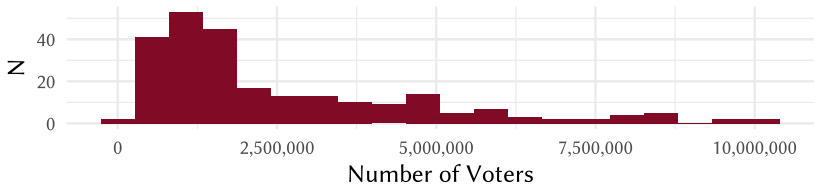
`electorate`

Size of the Electorate
Number of eligible voters. For more totals also see the last six columns.



`number_of_voters`

Number of Voters
Number of voters turning out. For more totals also see the last six columns.

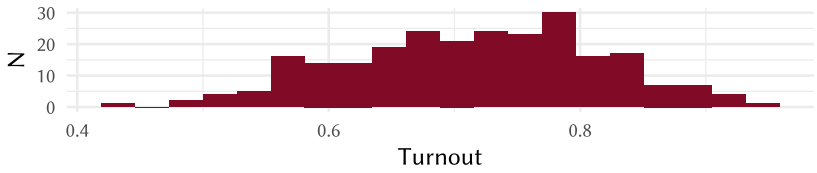


One missing observation: 1946 HB election.

turnout

Turnout

Turnout. Share of eligible voters turning out.

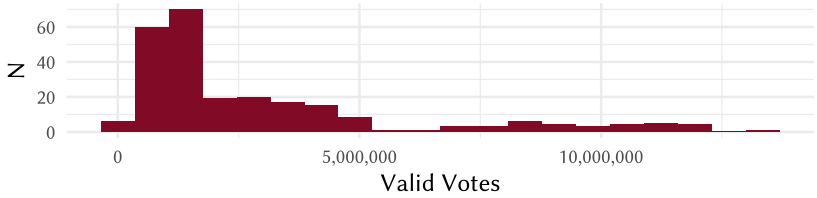


One missing observation: 1946 HB election.

valid_votes

Valid Votes

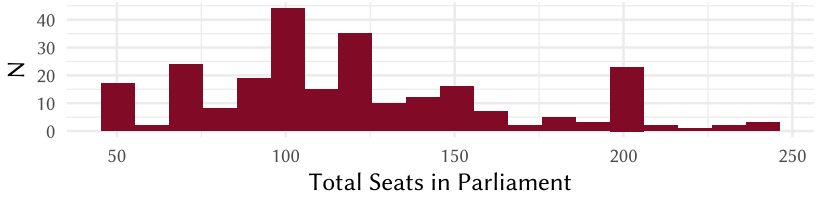
Number of valid votes. Does not have to be equal to the number of ballots cast, as sometimes a ballot contains multiple votes! For more totals also see the last six columns.



total_seats_parliament

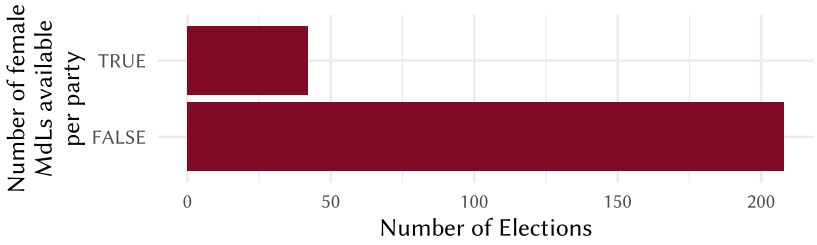
Total Seats in Parliament

Total number of members of the newly elected Landtag.



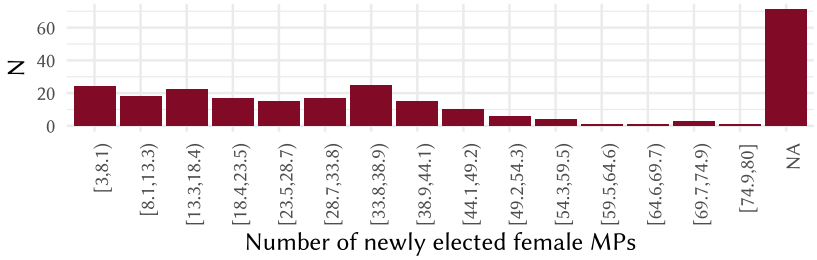
`female_party_seats_available`

Number of female MdLs available per party
Denotes whether information on the no. of female members of the Landtag per party is available for this election. Note that for parties not elected to the new Landtag party_female_mps always is marked as missing.



`total_female_mps_parliament`

Number of Female MPs in Parliament
Number of newly elected female MPs.



`partyname_short`

Abbreviated Party Name
Harmonized abbreviation of the party's name. 379 unique parties.

`partyname`

Party Name
Harmonized name of the party. 379 unique parties.

`partyname_short_bundeswahlleiter`

Party Name Abbreviation from Bundeswahlleiter
Partyname abbreviation as documented by the Bundeswahlleiter. 467 different abbreviations.

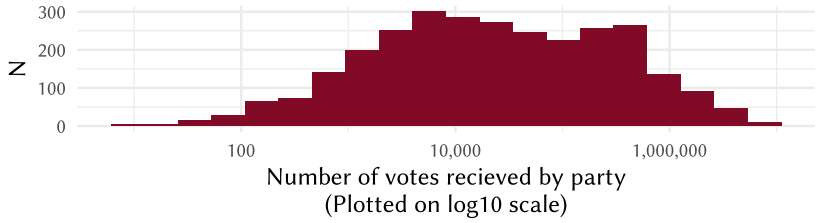
`partyname_bundeswahlleiter`

Party Name from Bundeswahlleiter
Partyname as documented by the Bundeswahlleiter. 508 different names.

party_vote_count

Party Vote Count

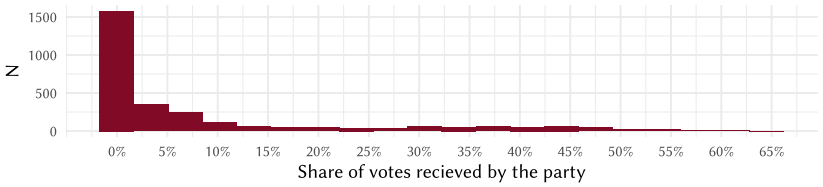
Number of votes recieved by the party.



party_vshare

Party Vote Share

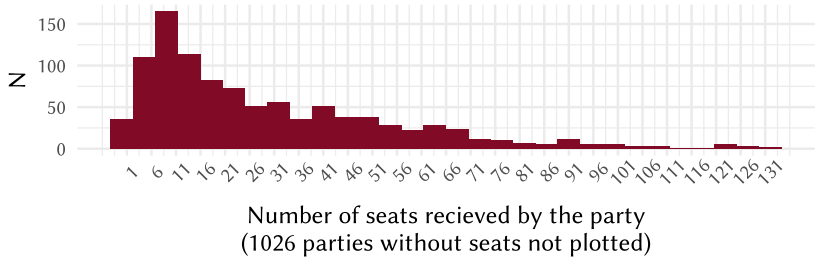
Share of votes recieved by the party.



party_seat_count

Party Seat Count

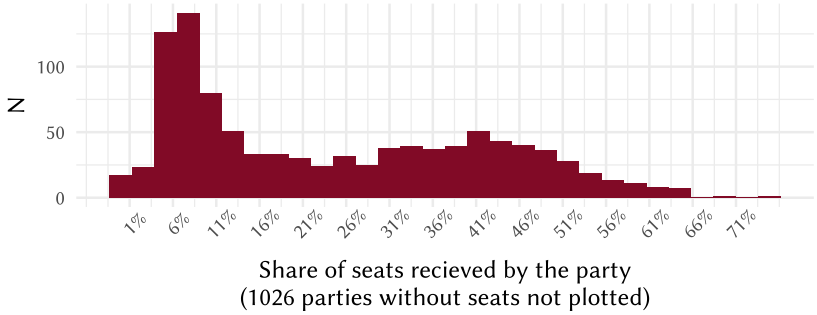
Number of seats recieved by the party.



party_sshare

Party Seat Share

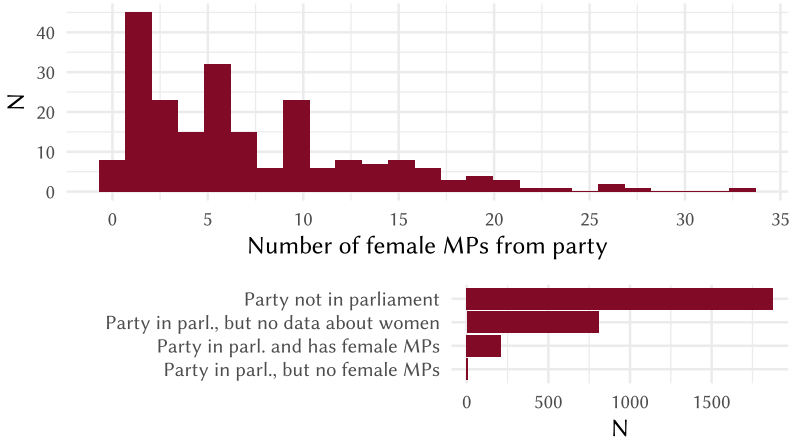
Share of seats recieved by the party.



party_female_mps

Number of female MPs from party

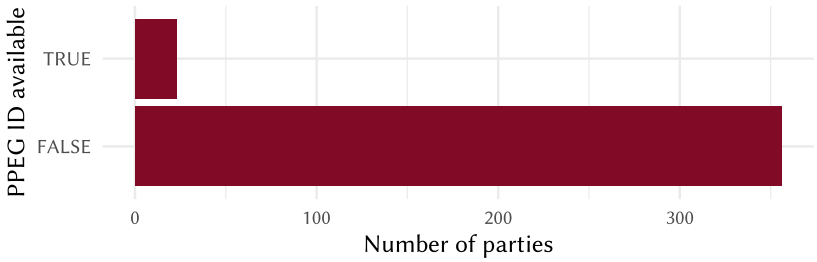
Number of female MPs elected for the party. Note that for parties not elected to the new Landtag party_female_mps always is marked as missing.



ppeg_id

PPEG ID

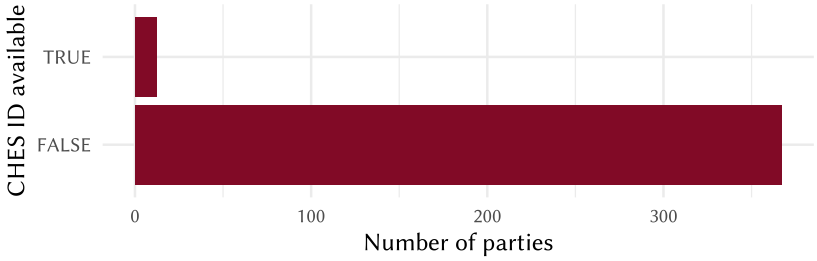
If available, party id of the party in the PPEG database (PPEG 2022). These party IDs are chiefly based on party IDs from Mackie and Rose (1991).



ches_id

CHES ID

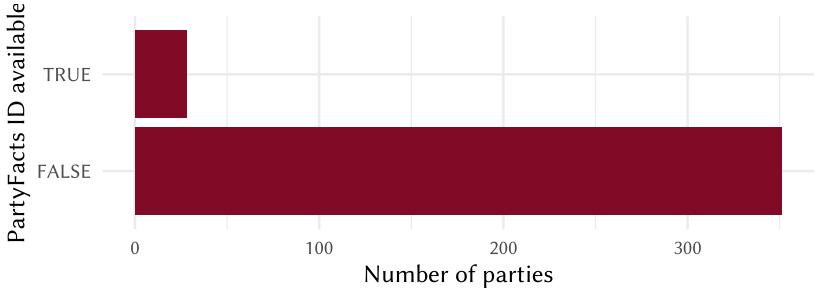
If available, ID of the party in the Chapel-Hill Expert Survey (Jolly et al. 2022).



partyfacts_id

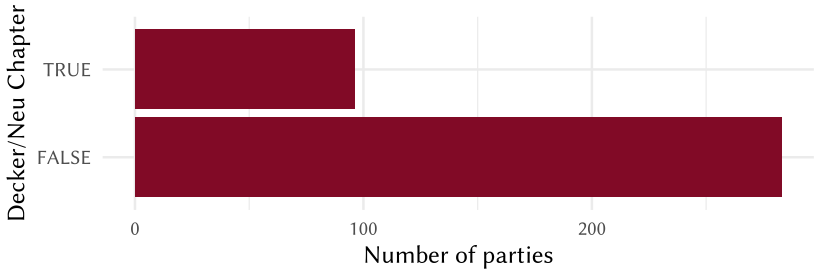
PartyFacts ID

If available, ID of the party in the partyfacts database (Döring and Regel 2019).



decker_neu

Chapter Parteienhandbuch
Denotes, wether the Handbuch der deutschen Parteien (3. ed.) by Decker and Neu (Decker and Neu 2018) has a chapter on the party.



url_info

URL with additional info on the party
URL to informaton on the party on the web. Can contain multiple URLs!

party_remarks_stelzle

Party remarks Stelzle
Remarks on the party by me.

party_remarks_bundeswahlleiter

Party remarks Bundeswahlleiter
Remarks on the party as listed by the Bundeswahlleiter.

gueltige_stimm-zettel_hh_hb

Gültige Stimmzettel HH and HB
Messy totals.

gesamtstimmen_by

Gesamtstimmen BY
Messy totals.

ausgefallene_stimmen_be

Ausgefallene Stimmen BE
Messy totals.

abgegebene_stimmen_hh

Abgegebene Stimmen HH
Messy totals.

ungueltige_stimmen_except_hh_hb

Ungültige Stimmen except in HH and HB
Messy totals.

ungueltige_ stimmzettel_hh_hb	**Ungültige Stimmzettel in HH and HB** Messy totals.

ltw_governments

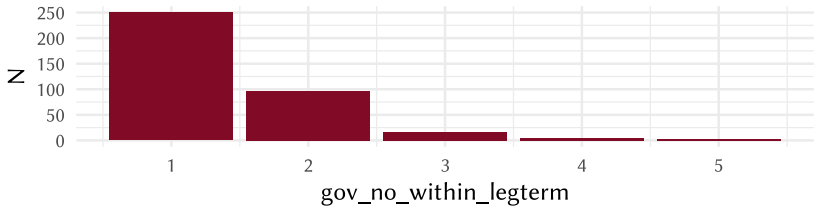
This section of the codebook only concerns variables specific to the ltw_governments dataset. For further variables please refer to the ltw_elections section.

ltw_governments is a long-form dataset containing information on governments in the German states. Each row contains information on one state government. The data can be accessed in R using bundeslaendeR::ltw_governments.

ltw_governments Variable Information

gov_no_within_legterm

Number of cabinet within legislative term
Number of cabinet within legislative term (e.g. First/Second/Third/... cabinet in the 1990-1994 legislative term of state X).

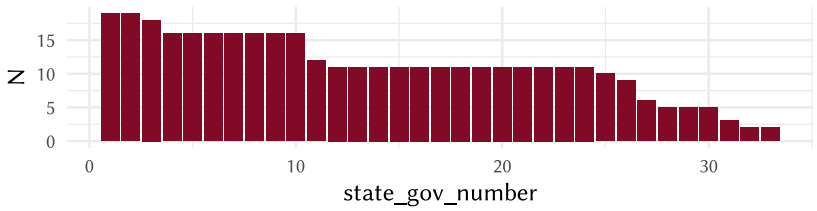


gov_id

Government ID
Unique ID of government. Taken from Linhart et al. However, this ID is not counting up within state by time. In cases where Governments were missing from Linhart et al. before the timeframe covered by Linhart et al. (eg. in Berlin) these earlyer governments have a higher ID than later cabinets contained in Linhart et al. data.

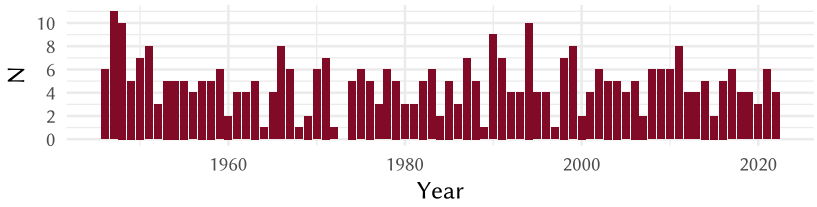
state_gov_number

Number of government in state.
Number of government in state.



`gov_start_date`

Government Starting Date
Starting date of the government. ISO 8601 or R-Date format.



`gov_source`

Government Source
Source of the information on the government. Either Linhart et al. or the URL of the German Wikipedia Page containing information on the cabinet.

`gov_remarks_ stelzle`

Governments remarks Stelzle
My remarks on governments.

`minister_president`

Name of minister president
Name of minister president.

`mp_party`

Minister President's Party
Party of the minister president. partyname_short format used. Note: There is a single cabinet with an independent minister president: Heinrich Welsch's caretaker government in the Saarland (at the time not yet a member of the FRG) in 1955.

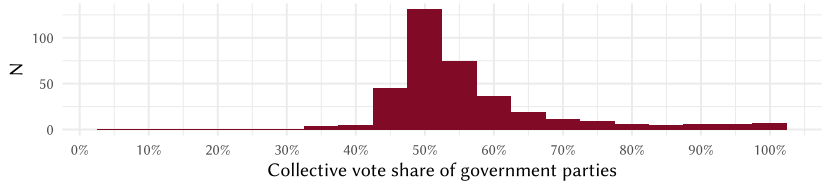
`gov_parties`

Names of Government Parties
String containing the names (partyname_short format) of all government parties separated by ' ~ '. The MP's party first, followed by other government parties in the order of their seatshare.

gov_vshare

Government Vote Share

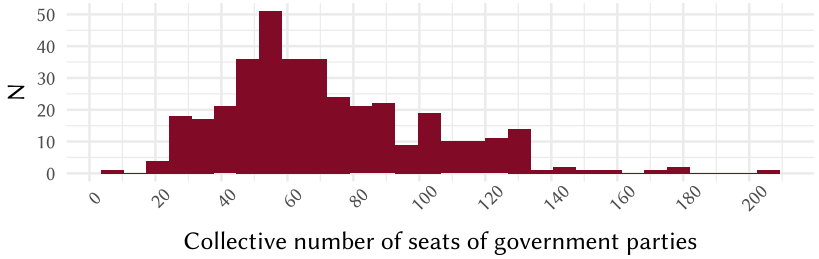
Collective vote share of government parties.



gov_seat_count

Government Seat Count

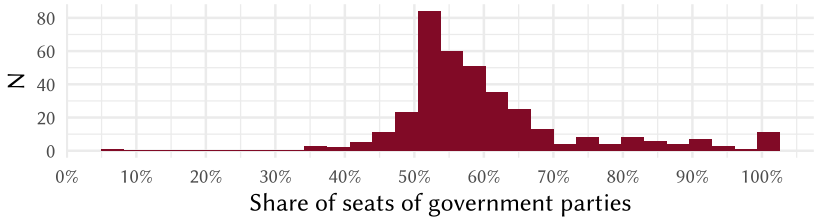
Collective number of seats of government parties.



gov_sshare

Government Seat Share

Share of seats of government parties.



gov_tog	**Type of Government** Type of Government: • Single Party Majority • Oversized Coalition • Minimal Winning Coalition • Single Party Minority • Multi Party Majority • Caretaker. Note that this classification is done automatically based on the number of seats of each governing party *at the beginning of the legislative term*. MPs defecting between parties and thus potentially changing the majority status of governments can thus not be incorporated!

ltw_combined

This section of the codebook only concerns variables specific to the ltw_combined dataset. For further variables please refer to the sections on ltw_elections and ltw_governments.

ltw_combined is a long-form dataset containing both election results as well as linked information on governments in the German states. Each row contains information on one party during the time in office of one cabinet. For a schematic version of ltw_combined's structure see table 2. The data can be accessed in R using bundeslaendeR::ltw_combined.

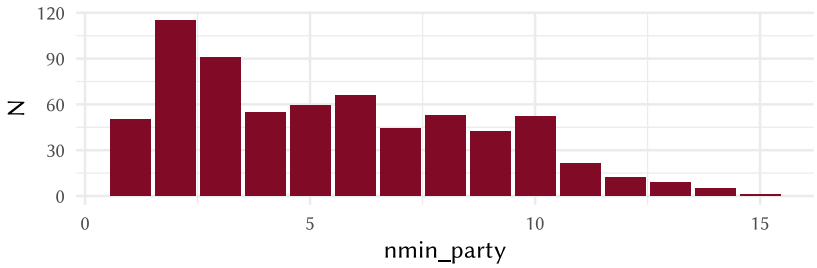
ltw_combined Variable Information

gov_party

Government Party
Boolean wether the party was a cabinet party. Note: There is a single cabinet where no party is marked as part of the cabinet: Heinrich Welsch's caretaker government in the Saarland (at the time not yet a member of the FRG) in 1955.

nmin_party

Number of Ministers of Party
Number of ministers of party. Note that the number of party-independent ministers is not collected. Thus, the sum of the number of ministers of all government parties can not reliably be understood as the size of the cabinet.



is_mp_party

Is MP Party?
Is the governments minister president from this party? Note: There is a single cabinet where the minister president is not part of any party: Heinrich Welsch's caretaker government in the Saarland (at the time not yet a member of the FRG) in 1955.

Table 2: Structure of `ltw_combined`

State Variables Name, Abbreviation, NUTS1 Code			**Election Variables** Election date, Size Electorate, Turnout, ...			**Party Variables** Names, Abbreviations, several IDs several IDs			**Party-Election Variables** Vote Count, -Share, Seat Count, -Share, ...			**Government Variables** Inauguration date, PM Name, gov. numbering, gov_id, ...			**Government-Party Variables** Status in government, number of party ministers, ...		
state	nuts1	...	election_date	turnout	...	partyname_short	ches_id	...	party_vshare	party_seat_count	...	gov_start_date	minister_president	...	gov_party	nmin_party	...
BE	DE3	...	2015-09-18	0.765	...	Party A	001	...	0.45	46	...	2015-10-07	Mustermann, Max	...	TRUE	7	...
BE	DE3	...	2015-09-18	0.765	...	Party B	002	...	0.30	12	...	2015-10-07	Mustermann, Max	...	TRUE	4	...
BE	DE3	...	2015-09-18	0.765	...	Party C	003	...	0.25	18	...	2015-10-07	Mustermann, Max	...	FALSE	NA	...
BE	DE3	...	2015-09-18	0.765	...	Party A	001	...	0.45	46	...	2017-02-28	Mustermann, Max	...	TRUE	11	...
BE	DE3	...	2015-09-18	0.765	...	Party B	002	...	0.30	12	...	2017-02-28	Mustermann, Max	...	FALSE	NA	...
BE	DE3	...	2015-09-18	0.765	...	Party C	003	...	0.25	18	...	2017-02-28	Mustermann, Max	...	FALSE	NA	...
NI	DE9	...	2012-12-16	0.560	...	Party A	001	...	0.17	12	...	2013-01-07	Musterfrau, Erika	...	FALSE	NA	...
NI	DE9	...	2012-12-16	0.560	...	Party B	002	...	0.33	27	...	2013-01-07	Musterfrau, Erika	...	FALSE	NA	...
NI	DE9	...	2012-12-16	0.560	...	Party D	004	...	0.50	46	...	2013-01-07	Musterfrau, Erika	...	TRUE	13	...

ltw_elections_meta

This section of the codebook only concerns variables specific to the ltw_elections_meta dataset. For further variables please refer to the sections on ltw_elections.

ltw_elections_meta is a long-format dataset containing meta information on election results. Each row contains information on one election. The data can be accessed in R using bundeslaendeR::ltw_elections_meta.

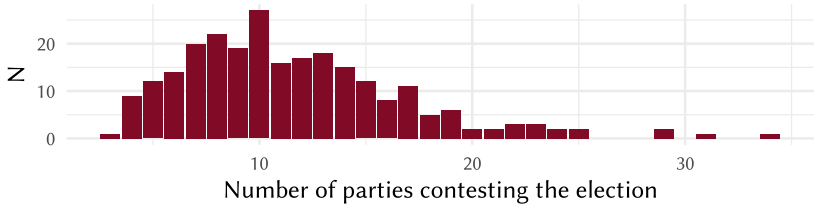
For a discussion of the various measures quantifying party system properties see Niedermayer (2013). For descriptions of the various measures of electoral disproportionality see Karpov (2008).

ltw_elections_meta Variable Information

Unless specified otherwise, in the following section v_i refers to party i's vote share, s_i to party i's seat share and n refers to the number of parties contesting a given election.

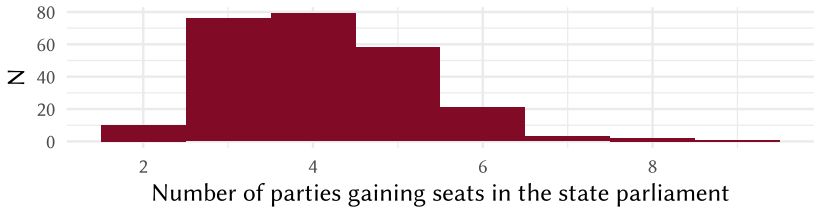
number_parties

Number of parties contesting the election
Number of parties n contesting the election.



number_parties_parliament

Number of parties gaining seats in the state parliament
Number of parties gaining seats in the state parliament.

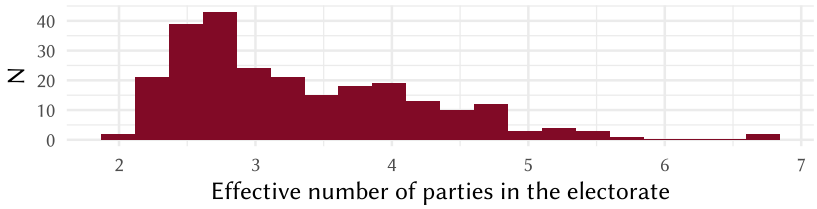


fragmentation_enep

Effective number of parties in the electorate

Effective number of parties in the electorate $N_{2\text{ electorate}}$ (Laakso and Taagepera 1979):

$$N_{2\text{ electorate}} = \frac{1}{\sum_{i=1}^{n} v_i^2}. \tag{1}$$

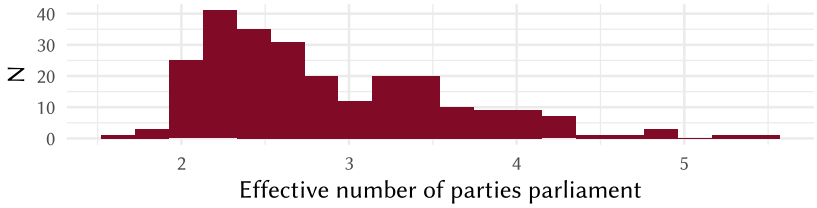


fragmentation_enpp

Effective number of parties in parliament

Effective number of parties in parliament $N_{2\text{ parliament}}$ (Laakso and Taagepera 1979):

$$N_{2\text{ parliament}} = \frac{1}{\sum_{i=1}^{n} s_i^2}. \tag{2}$$

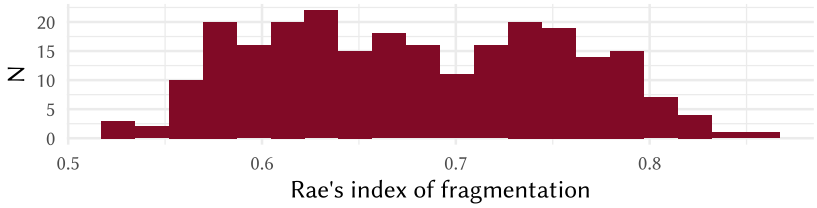


fragmentation_rae

Rae's index of fragmentation

Rae's index of fragmentation (Rae 1968):

$$F = 1 - \sum_{i=1}^{n} v_i^2. \tag{3}$$

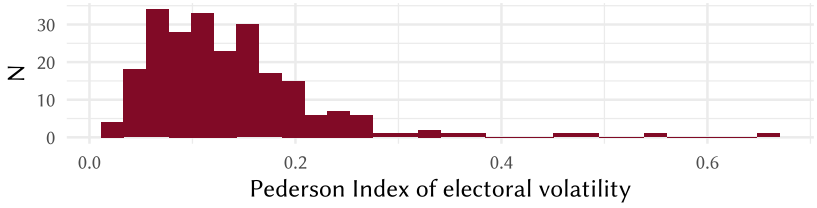


volatility_pedersen

Pederson Index of electoral volatility
Pederson Index of electoral volatility (Pedersen 1979):

$$V_t = \sum_{i=1}^{n_t \wedge n_{t-1}} |v_{i,t} - v_{i,t-1}|. \tag{4}$$

If a party did not contest an election t or $t-1$ it's voteshare for the respective election v_t or v_{t-1} is 0. Attention: These figures probably slightly overestimate the real extent of electoral volatility, as party splits/mergers are not considered: If parties A (7% at $t-1$) and B (4% at $t-1$) contest election $t-1$ separately but merge before contesting election t and gaining 15% under the label of party A, they really only contribute $|(7\% + 4\%) - 15\%| = 4\%$ to the calculation of the Pedersen Index. Here, they would contribute $|7\% - 15\%| + |4\% - 0\%| = 12\%$ to the calculation as the merger is not properly accounted for.



All of the disproportionality measures presented here, their calculation and properties are presented and discussed in Karpov (2008). The distributions of these measures are presented in figure 1 below.

disprop_ max_deviation

Maximum deviation index of electoral disproportionality
Maximum deviation index of electoral disproportionality:

$$MD = \max_{i=\overline{1,n}} |s_i - v_i|. \tag{5}$$

disprop_rae

Rae's index of electoral disproportionality
Rae's index of electoral disproportionality (Rae 1971):

$$I_{\text{Rae}} = \frac{1}{n} \sum_{i=1}^{n} |s_i - v_i|. \tag{6}$$

disprop_loosmore_hanby

Loosemore-Hanby index of electoral disproportionality
Loosemore-Hanby index of electoral disproportionality (Loosemore and Hanby 1971):

$$I_{\text{LH}} = \frac{1}{2} \sum_{i=1}^{n} |s_i - v_i|. \tag{7}$$

disprop_grofman

Grofman index of electoral disproportionality
Grofman index of electoral disproportionality:

$$I_{\text{G}} = \frac{1}{N_{2\ \text{electorate}}} \sum_{i=1}^{n} |s_i - v_i|. \tag{8}$$

disprop_lijphart

Lijphart index of electoral disproportionality
Lijphart index of electoral disproportionality:

$$I_{\text{L}} = \frac{|s_i - v_i| + |s_i - v_i|}{2} \tag{9}$$

where only the two largest parties are considered.

disprop_gallagher

Gallagher index of electoral disproportionality
Gallagher index of electoral disproportionality / least squares index (Lsq):

$$Lsq = \sqrt{\frac{1}{2} \sum_{i=1}^{n} (s_i - v_i)}. \tag{10}$$

disprop_monroe

Monroe index of electoral disproportionality
Monroe index of electoral disproportionality:

$$I_{\text{Monroe}} = \sqrt{\frac{\sum_{i=1}^{n} (s_i - v_i)^2}{1 + \sum_{i=1}^{n} v_i^2}}. \tag{11}$$

disprop_gatev

Gatev index of electoral disproportionality
Gatev index of electoral disproportionality:

$$I_{\text{Gatev}} = \sqrt{\frac{\sum_{i=1}^{n} (s_i - v_i)^2}{\sum_{i=1}^{n} (s_i^2 + v_i^2)}} \tag{12}$$

disprop_ryabtsev

Ryabtsev index of electoral disproportionality
Ryabtsev index of electoral disproportionality:

$$I_{\text{Ryabtsev}} = \sqrt{\frac{\sum_{i=1}^{n} (s_i - v_i)^2}{\sum_{i=1}^{n} (s_i + v_i)^2}}. \tag{13}$$

disprop_szalai

Szalai index of electoral disproportionality
Szalai index of electoral disproportionality:

$$I_{\text{Szalai}} = \sqrt{\frac{\sum_{i=1}^{n} \left(\frac{s_i - v_i}{s_i + v_i}\right)^2}{n}}. \tag{14}$$

disprop_
szalai_weighted

Weighted Szalai index of electoral disproportionality
Weighted Szalai index of electoral disproportionality:

$$\tilde{I}_{\text{Szalai}} = \sqrt{\frac{1}{2} \sum_{i=1}^{n} \frac{(s_i - v_i)^2}{s_i + v_i}}. \tag{15}$$

disprop_
aleskerov_platonov

Aleskerov-Platonov index of electoral disproportionality
Aleskerov-Platonov index of electoral disproportionality:

$$R = \frac{1}{k} \sum_{i=1}^{k} \frac{s_i}{v_i} \tag{16}$$

where only overrepresented parties are considered.

disprop_dhondt

D'Hondt index of electoral disproportionality

D'Hondt index of electoral disproportionality:

$$H = \max_{i=\overline{1,n}} \frac{s_i}{v_i}. \tag{17}$$

disprop_sainte_lague

Sainte-Lague index of electoral disproportionality

Sainte-Lague index of electoral disproportionality:

$$SL = \sum_{i=1}^{n} v_i \left(\frac{s_i}{v_i} - 1 \right)^2. \tag{18}$$

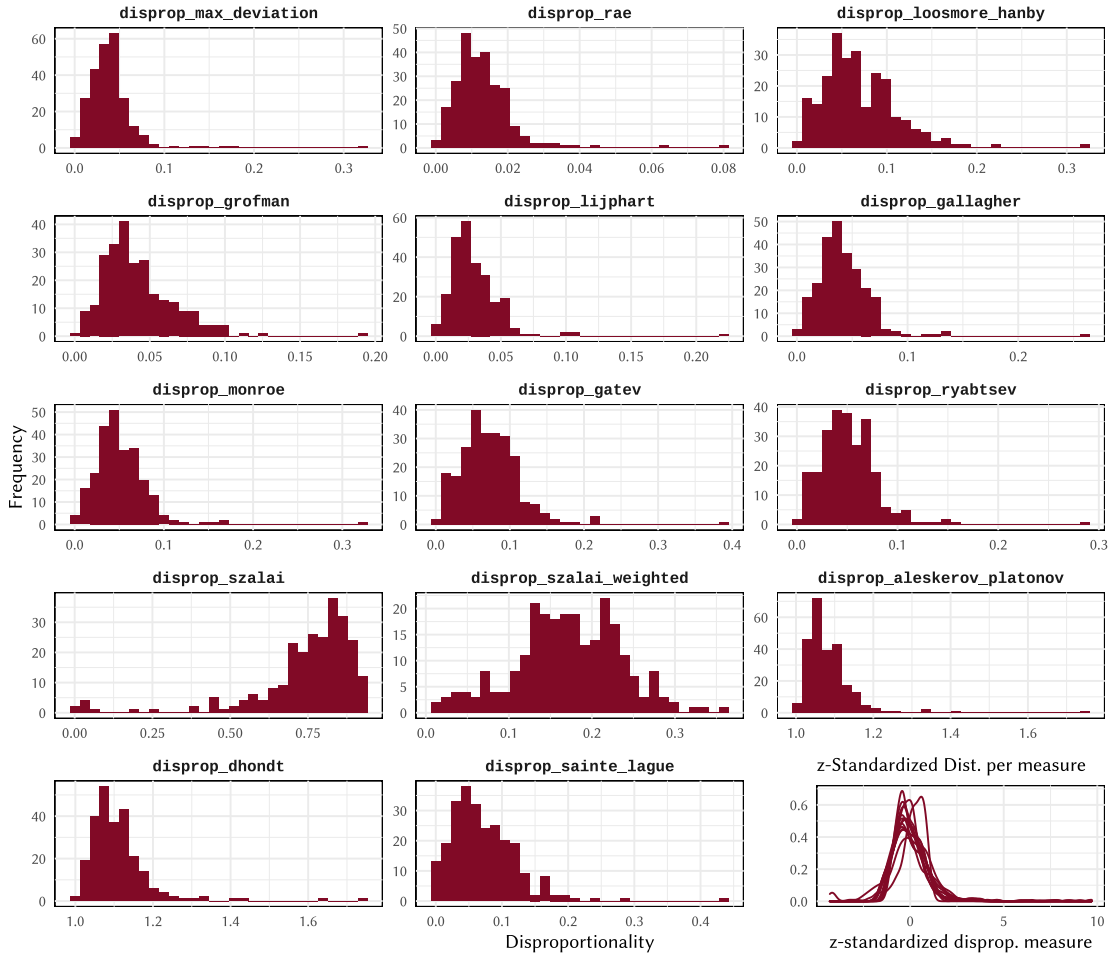


Figure 1: Distribution of Disproportionality Measures

link_manifestos and link_coalitionagreements

link_manifestos and link_coalitionagreements provide easy links of bundeslaendeR data with party manifestos and coalition agreements made available from polidoc.net - The Political Documents Archive (Benoit, Bräuninger, and Debus 2009; Gross and Debus 2018; Pappi and Seher 2014, 2009; for the codebook see Bräuninger et al. 2018) and party manifestos from abgeordnetenwatch.de. While file names from polidoc.net follow a naming pattern (partyID.stateID.year.1.number of party manifesto for election) and abgeordnetenwatch.de provides unique IDs through its API, the provided links make joining the data easier.

Note that polidoc.net provides a manifesto for the Neue Liberale in the HB 2015 election (41441.005.2015.1.1). Since the party withdrew it's candidacy before the election and is thus not included in the election results in ltw_elections, the manifesto id is not included in link_manifestos. Several party manifestos made available through abgeordnetenwatch.de's API are also not linked, as the respective parties only contested some nominal districts and not the state-wide list election and thus no election result is included in ltw_elections.

Note that polidoc.net provides a coalition agreement between the SPD and the Greens following the 2008 HE election (41001.006.2008.1.1). Since this potential coalition under leadership of SPD politician Andrea Ypsilanti never came to be due to several SPD MPs opposing the red-green minority cabinet being externally supported by Die Linke the coalition agreement can't be matched with a government in ltw_combined and is thus not included.

Linking-Variables Information

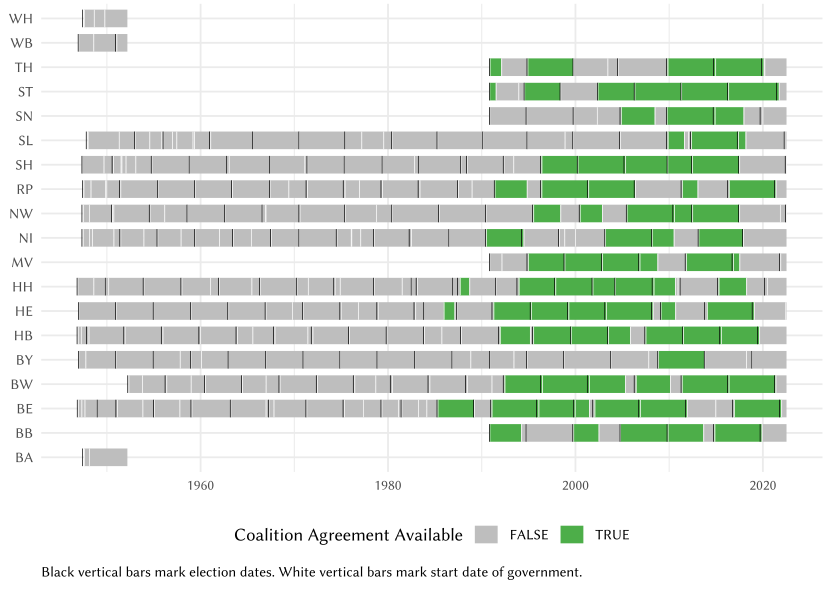
The variables state, election_date, and partyname_short can be used in order to link manifestos to the bundeslaendeR data. How many manifestos are available per election is plotted in figure 2.

state	**State Abbreviation** ISO 3166-2:DE-code of the state.
election_date	**Election Date** Date of the election. ISO 8601 or R-Date format.
partyname_short	**Abbreviated Party Name** Harmonized abbreviation of the party's name. 379 unique parties.
polidoc_filename and polidoc_filename_2 in link_manifestos	**Polidoc File Name of Party Manifesto** File name of state party manifesto (or 2nd manifesto if available) in .txt format available in The Political Documents Archive (polidoc.net).

agwatch_pdf_url in link_manifestos	**URL of Manifesto on abgeordnetenwatch.de** URL of the manifesto in .pdf format on abgeordnetenwatch.de.
agwatch_election_manifesto in link_manifestos	**Is an electoral manifesto not just a general manifesto** TRUE if the linked manifesto is an electoral manifesto. FALSE if it appears to be a more general manifesto of the party (Grundsatzprogramm) independent of any specific state election.

The variable gov_id can be used in order to link manifestos to the bundeslaendeR data.

gov_id	**Government ID** Unique ID of government. Taken from Linhart et al. However, this ID is not counting up within state by time. In cases where Governments were missing from Linhart et al. before the timeframe covered by Linhart et al. (eg. in Berlin) these earlyer governments have a higher ID than later cabinets contained in Linhart et al. data.
polidoc_filename in link_coalitionagreements	**Polidoc File Name of Coalition Agreement** File name of coalition agreement available in The Political Documents Archive (polidoc.net).



Black vertical bars mark election dates. White vertical bars mark start date of government.

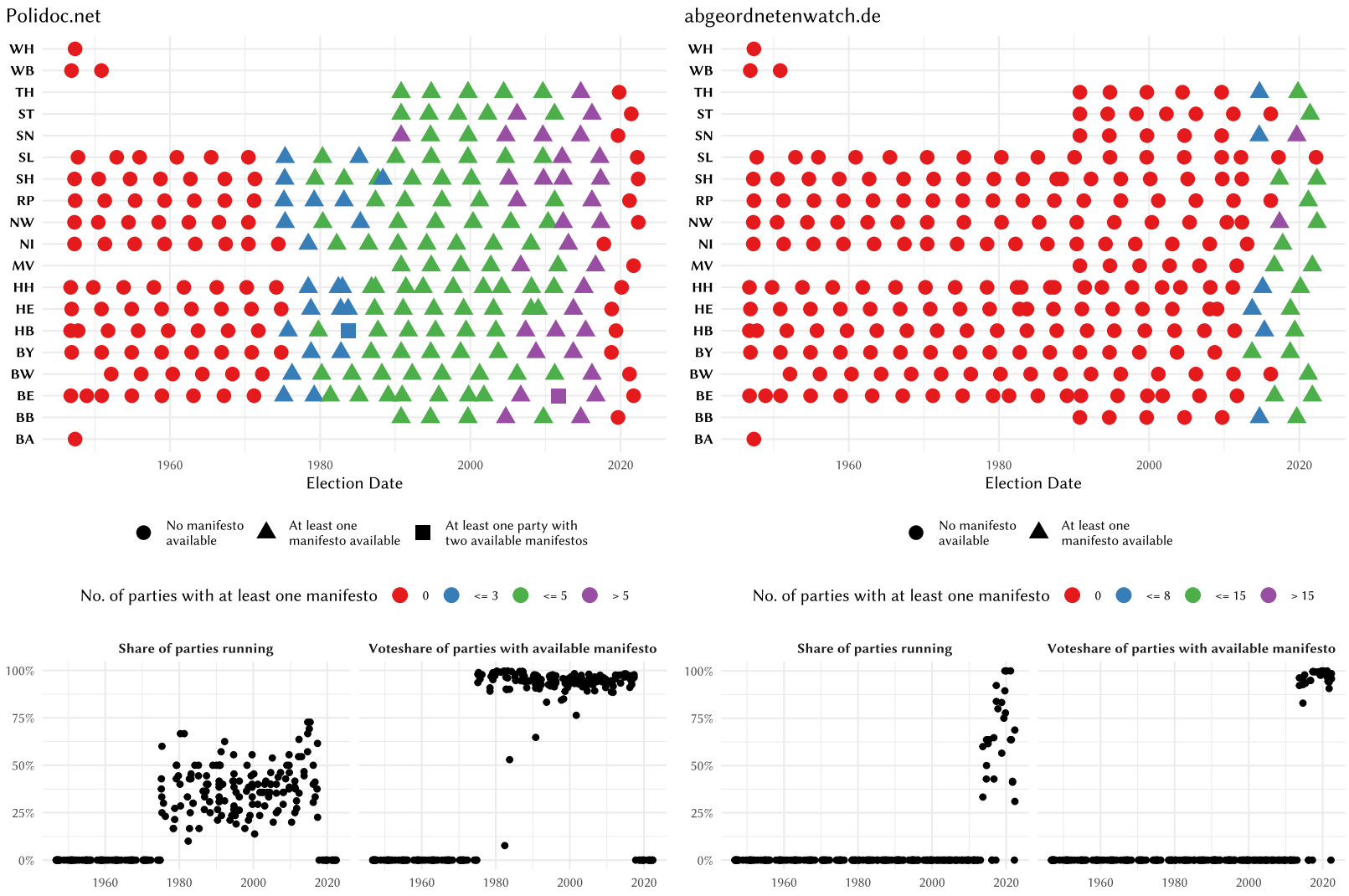


Figure 2: Availability of manifestos from polidoc.net and abgeordnetenwatch.de

de_states_grid_4x4()

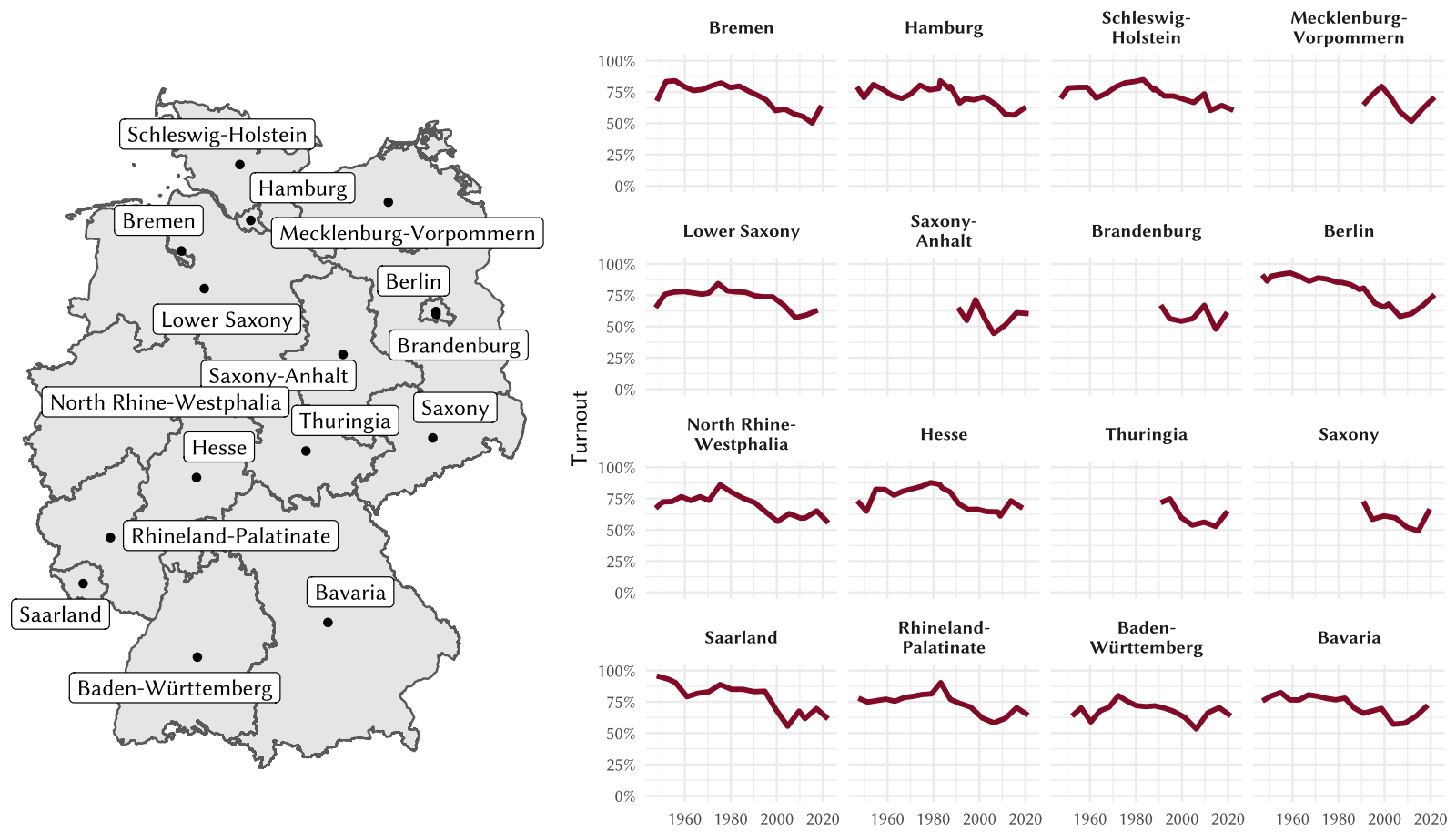
`de_states_grid_4x4()` exports a data frame containing state IDs, German and English state names and approximate state locations on a 4x4 grid. The exported data frame can be used to approximately plot state-facets in their approximate locations using the `ggplot2` extension `geofacet` (Hafen and Schloerke 2020).

Please find a comparison of state locations and the grid layout as well as some example code below.

Example Code:

```
library(bundeslaendeR)
library(tidyverse)
library(geofacet)

turnout_plot <-
ltw_elections %>%
  select(state, election_date, turnout) %>%
  distinct() %>%
  filter(!(state %in% c("WB", "BA", "WH"))) %>%
  filter(!is.na(turnout)) %>%
  ggplot(aes(x = election_date, y = turnout)) +
    geom_line(col = "#810a26", size = 1.2) +
    facet_geo(grid = de_states_geofacet_grid_4x4(linebreak = T),
              facets = ~state, label = "name") +
    scale_y_continuous(limits = c(0,1),
                       labels = scales::percent) +
    theme(strip.text = element_text(face = "bold")) +
    labs(x = NULL, y = "Turnout")
```



Map data from geoBoundaries (Runfola et al. 2020).

Figure 3: Comparison of state location and grid layout

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