

# Appendix for “Asymmetric Backlash against Structural Economic Change: The Electoral Consequences of the Coal Phase-Out in Germany”

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## A Data Collection National and Local Election Results

For the analysis using national election results, I use data on election results of all parties represented in the German National Parliament and the turnout rate between 1994 and 2021 (four election years before the first possible treatment in 2007 and four election years after 2007). Federal elections since 2007 took place on September 27 2009, September 22 2013, September 24 2017 and September 26 2021. As the AfD was founded in the beginning of 2013, it competed in three national elections during the time period of observation, compared to only two regional elections in NRW. Moreover, as the most recent national election was in 2021, this excludes one municipality from the treated sample which experienced a coal closure between the 2021 national election and the 2022 regional election in NRW, resulting in a sample of 20 treated municipalities. I collected the data on municipal-level electoral results from the regional statistical office of NRW ([Landesdatenbank NRW 2024a](#)).

Regarding the analysis of local election results, I rely on data on election between 1994 and 2020 (three election years before the first possible treatment in 2007 and three election years after 2007) for all parties that are part of the main analysis except for The Left and the AfD as the number of missing data over the time period under observation is extremely high. Local elections since 2007 took place on August 30 2009, Mai 25 2014 / September 13 2015 (because of a change in the procedural rules regarding local elections in NRW, around half of the elections that were supposed to take place in September 2015 were advanced to May 2014) and September 13 2020. Since the most recent local election took place in 2020, two municipalities that experienced a coal closure between the 2020 local election and the 2022 regional election were dropped from the treated sample, which results in a sample of 19 treated mu-

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municipalities. I collected the data on municipal-level electoral results from the regional statistical office of NRW ([Landesdatenbank NRW 2024b](#)).

## B Matching Diagnostics Main Analyses

The data for these covariates stems from the German Federal Network Agency (**bundesnetzagentur** (on the existence of a CFPP or coal mine in 2006), from *Wegweiser Kommune* (2024) (on population density, as well as on the shares of secondary-sector, tertiary-sector and service-sector employment respectively) and the Federal Institute for Research on Building, Urban Affairs and Spatial Development (**BBSR 2024**) (for the urban rural dummy).

Table B.1: Balance between treated and control municipalities in 2006, regional elections

	Control (N = 371)		Treated (N = 21)		Diff. in Means	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Coal	0.051	0.221	1	0	0.949	0
Urban	0.577	0.495	0.857	0.359	0.280	0.002
Pop. density	4.801	4.972	10.771	8.083	5.971	0.003
Sec. sector empl. (%)	40.916	14.861	37.938	11.955	-2.978	0.285
Tert. sector empl. (%)	57.015	14.602	61.305	12.062	4.290	0.131
Service sector empl. (%)	7.450	5.465	10.938	8.094	3.488	0.065

*Note: The table presents the mean, standard deviation, difference in means and p-values for t-tests of the treated and control municipalities in the last pre-treatment period (2006).*

Table B.2: Balance between treated and control municipalities in 2006, CEM dataset, regional elections

	Control (N = 134)		Treated (N = 21)		Diff. in Means	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Coal	0.067	0.250	1	0	0.933	0
Urban	0.910	0.286	0.857	0.351	-0.053	0.522
Pop. density	8.936	5.826	10.771	7.911	1.836	0.327
Sec. sector empl. (%)	38.948	13.705	37.938	11.702	-1.010	0.727
Tert. sector empl. (%)	59.849	13.680	61.305	11.806	1.456	0.618
Service sector empl. (%)	9.499	5.006	10.938	7.923	1.439	0.437

*Note: The table presents the mean, standard deviation, difference in means and p-values for t-tests of the treated and control municipalities for the dataset based on CEM in the last pre-treatment period (2006).*

Figure B.1: Love plot of the standardized mean differences of the variables used for matching, full sample and CEM sample, regional elections

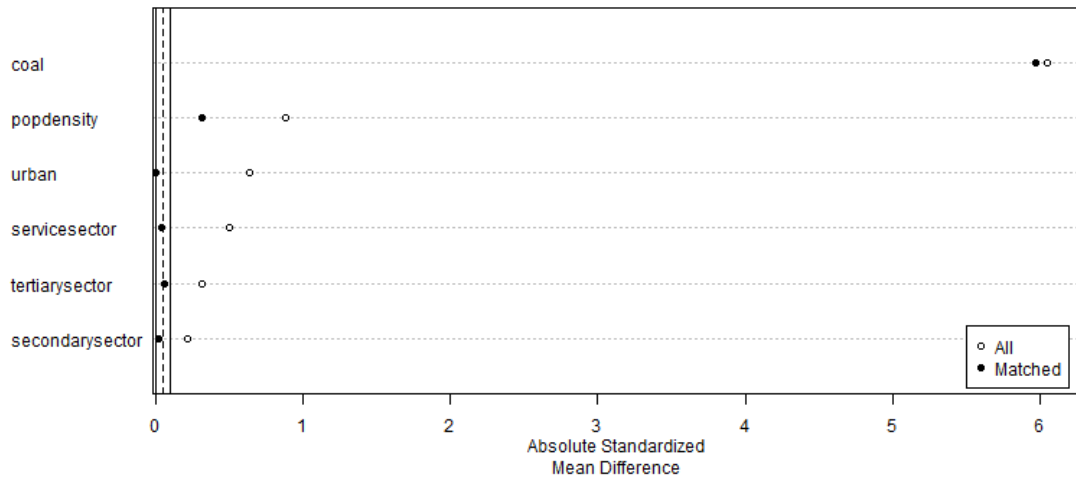


Figure B.2: Love plot of the standardized mean differences of the variables used for matching, full sample and CEM sample, federal elections

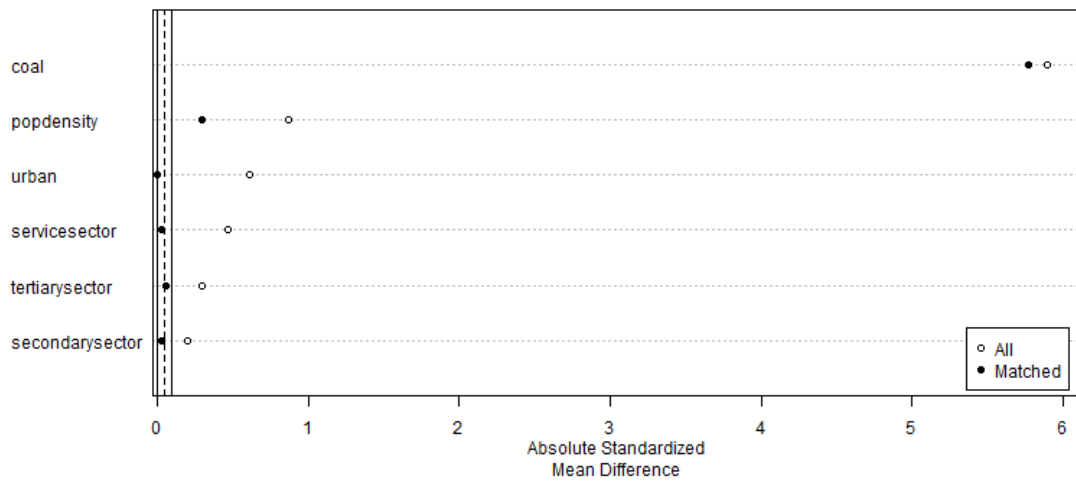
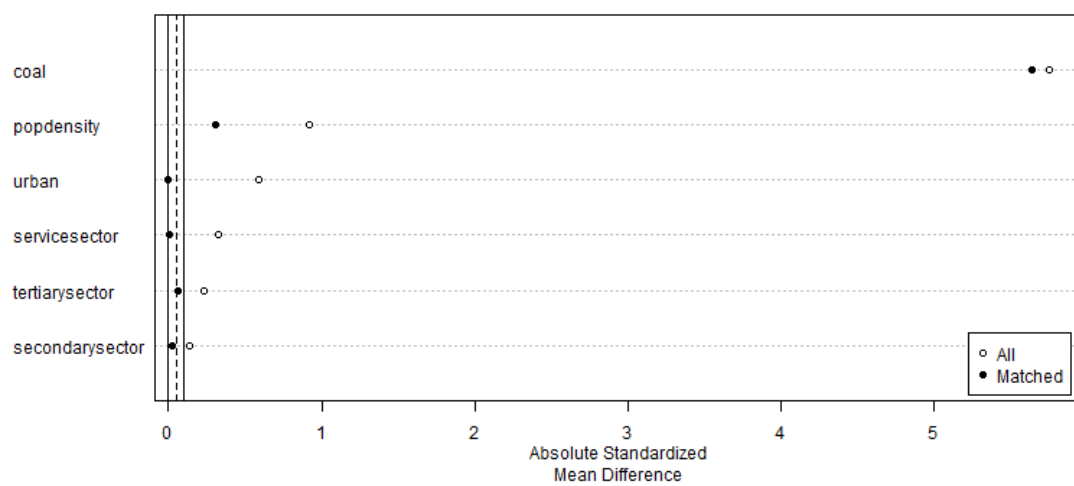
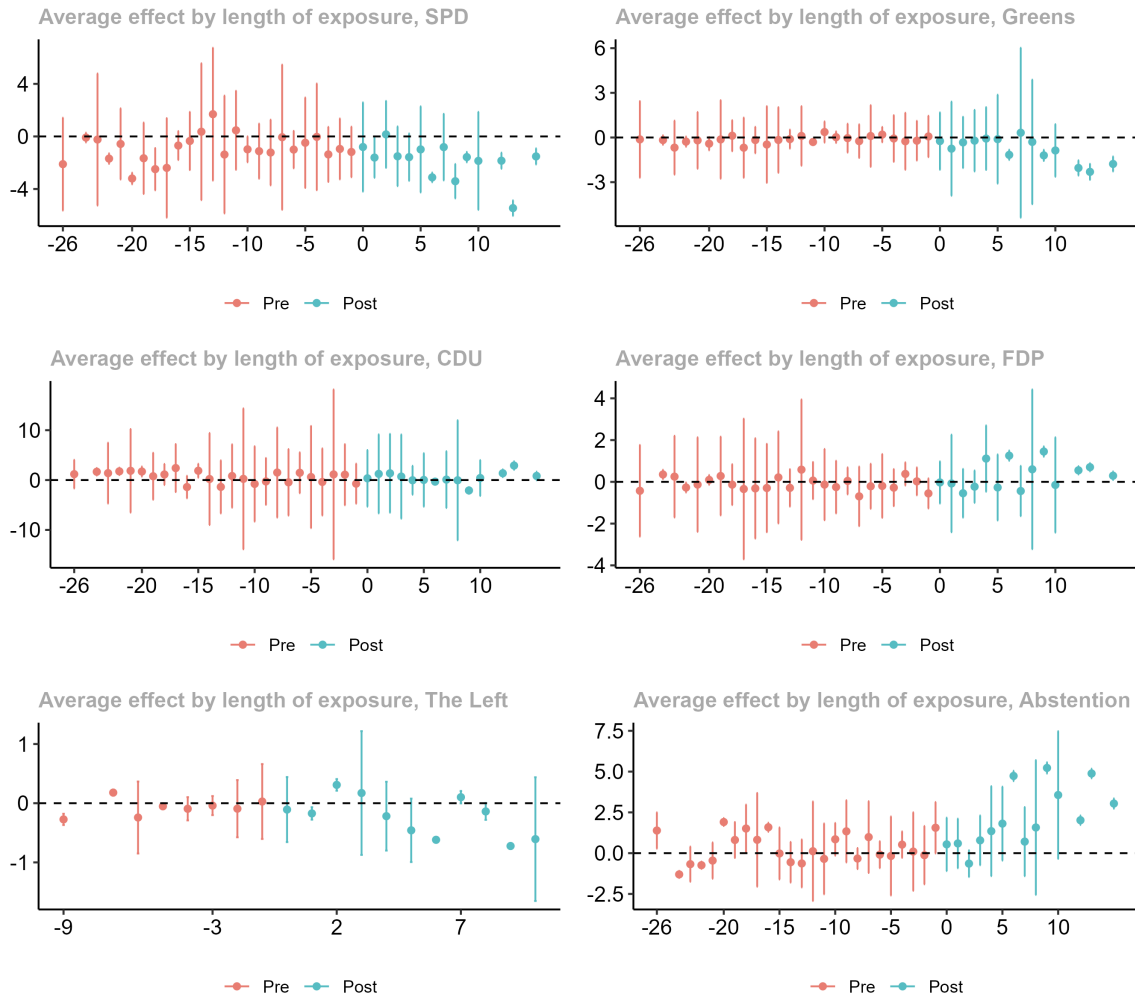


Figure B.3: Love plot of the standardized mean differences of the variables used for matching, full sample and CEM sample, local elections



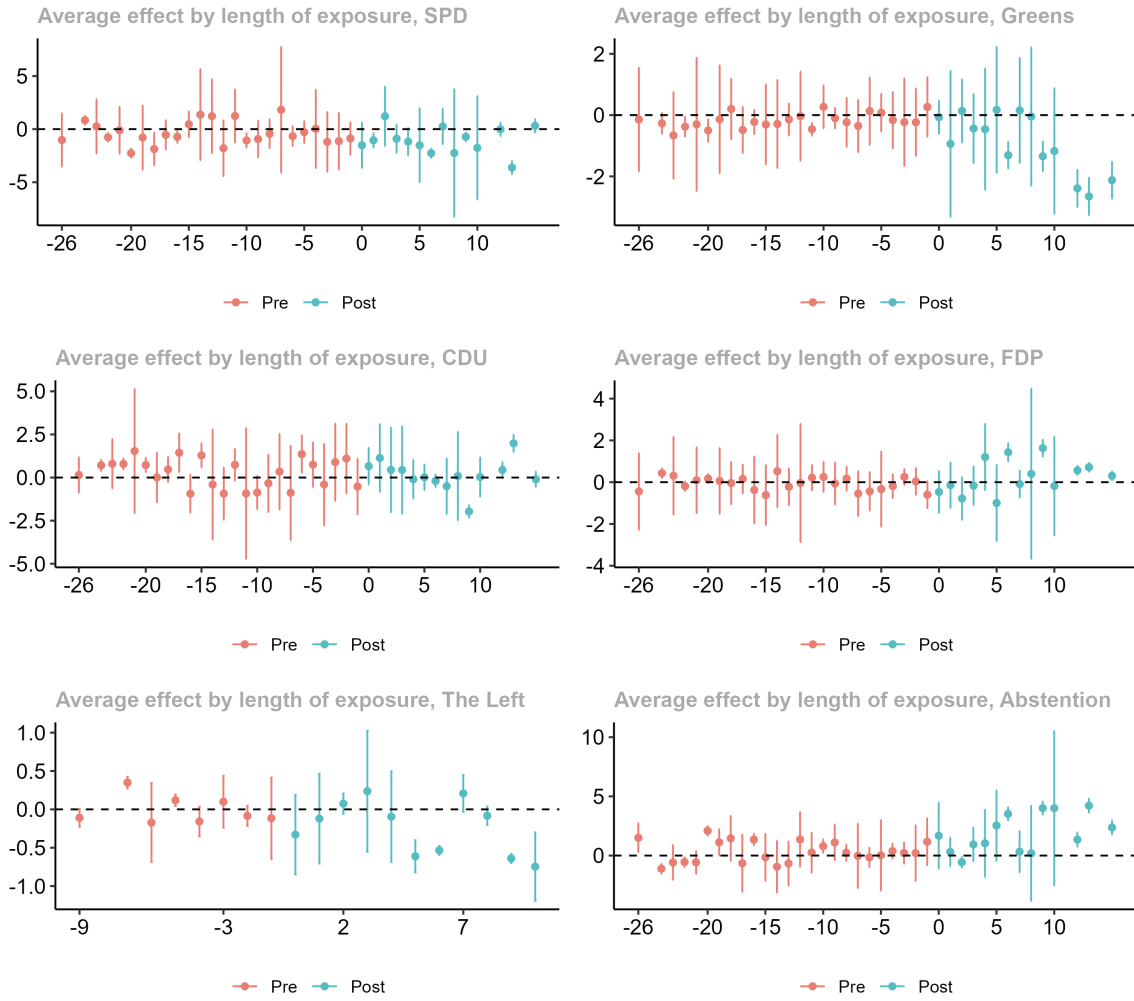
## C Event Study Plots Pre-Trends

Figure C.4: Event study plots of effect of first coal closure on vote shares, full sample, regional elections



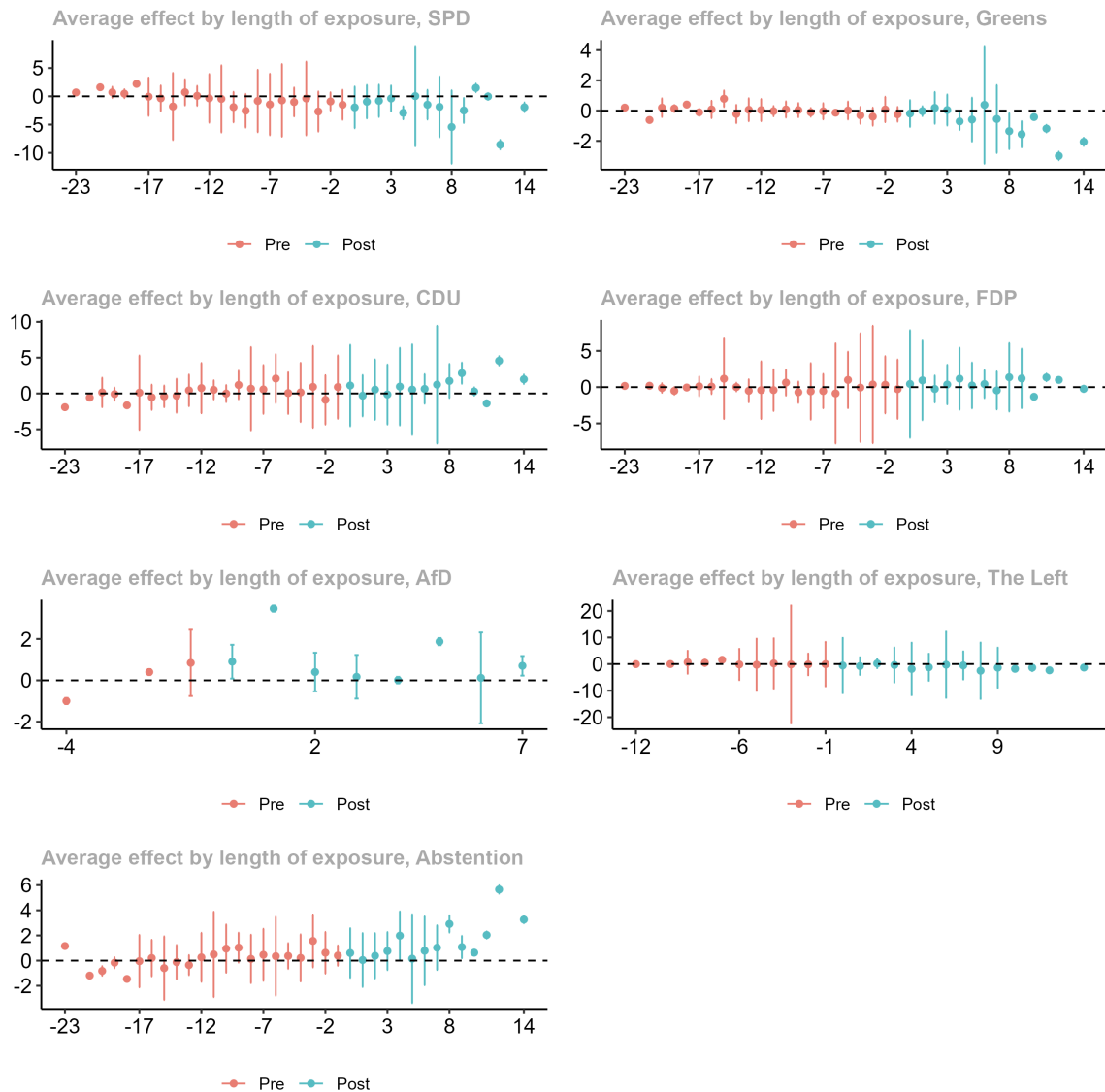
*Note: Event study plots showing the average effect of the first coal closure on regional election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the complete sample of municipalities in NRW. Model for The Left is based on years 2010-2022 only. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

Figure C.5: Event study plots of effect of first coal closure on vote shares, CEM sample, regional elections



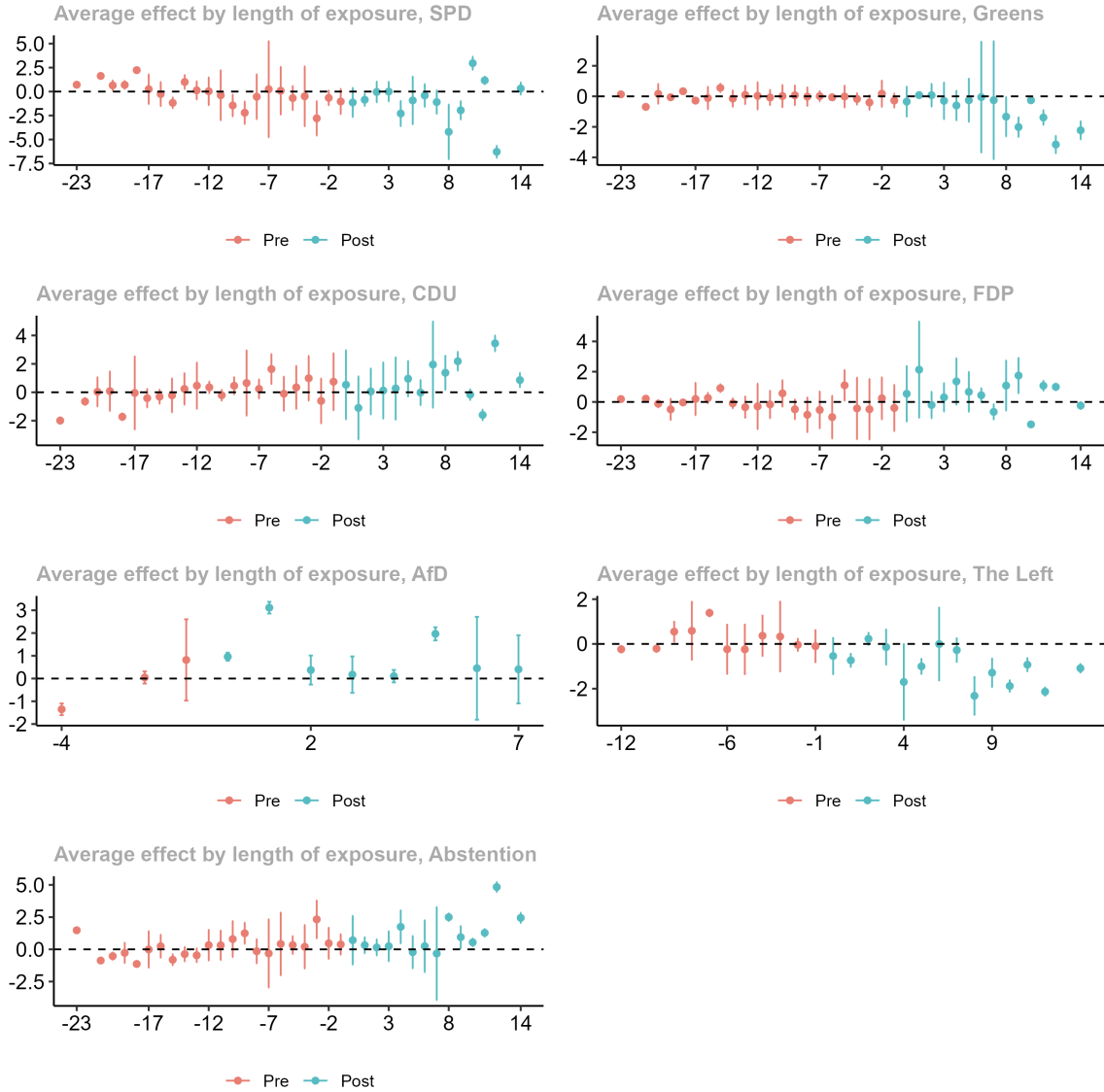
*Note: Event study plots showing the average effect of the first coal closure on regional election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the matched full sample of municipalities in NRW following CEM. Model for The Left is based on years 2010-2022 only. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

Figure C.6: Event study plots of effect of first coal closure on vote shares, full sample, national elections



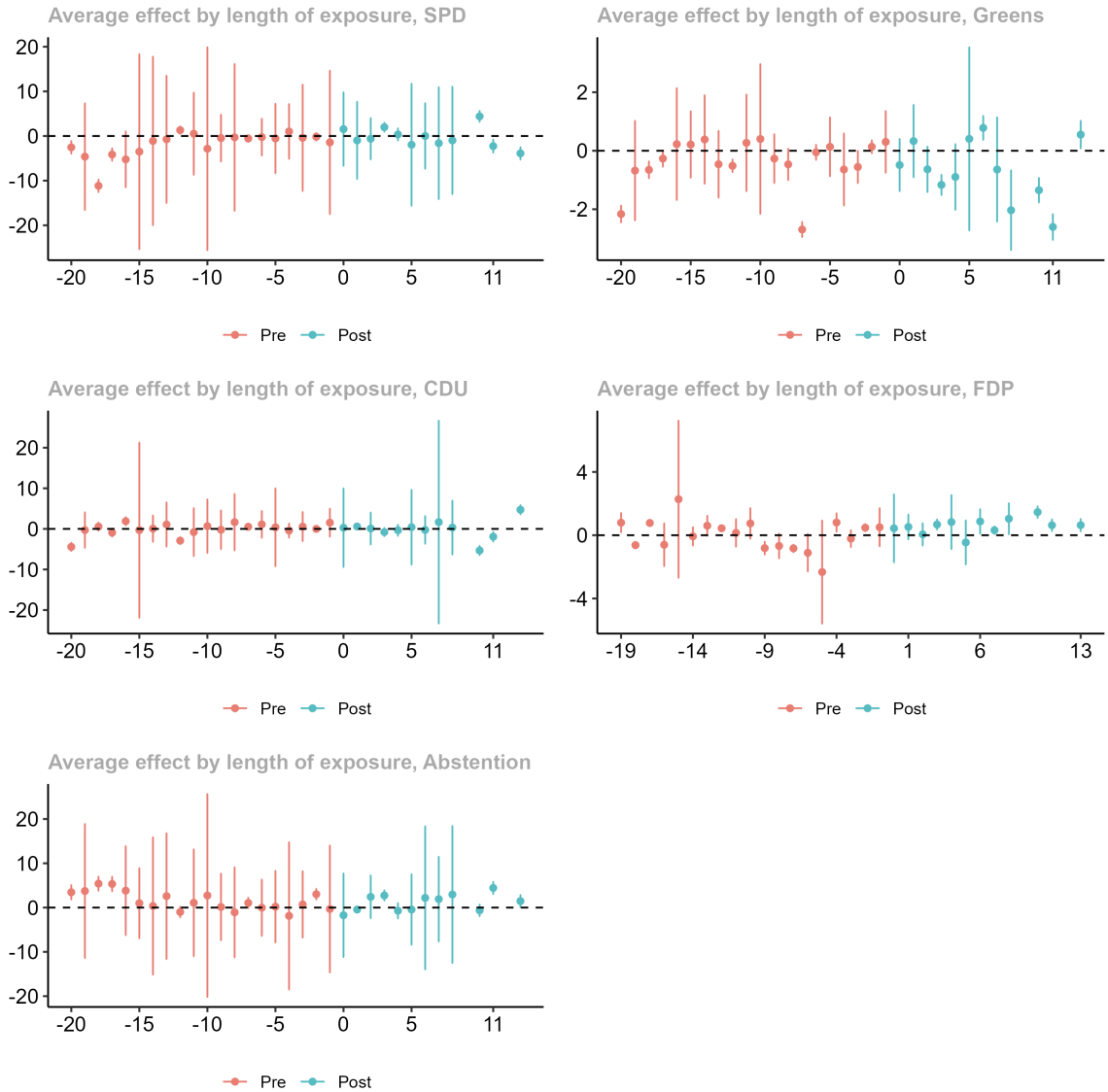
*Note: Event study plots showing the average effect of the first coal closure on national election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the full sample of municipalities in NRW. AfD model is based on years 2013-2021 only, model for The Left is based on years 2005-2021 only. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

Figure C.7: Event study plots of effect of first coal closure on vote shares, CEM sample, national elections



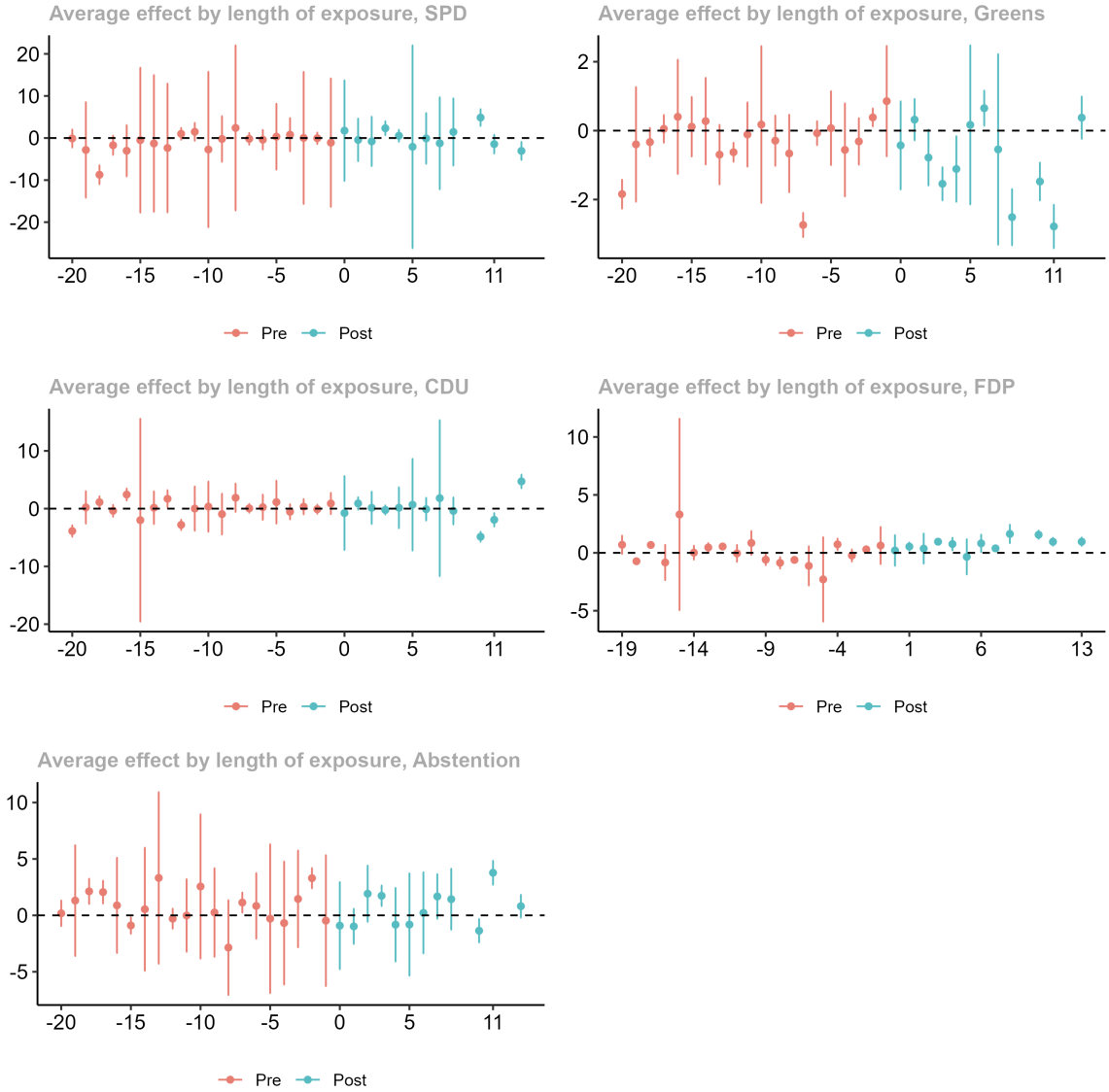
*Note: Event study plots showing the average effect of the first coal closure on national election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the matched full sample of municipalities in NRW following CEM. AfD model is based on years 2013-2021 only, model for The Left is based on years 2005-2021 only. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

Figure C.8: Event study plots of effect of first coal closure on vote shares, full sample, local elections



*Note: Event study plots showing the average effect of the first coal closure on local election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

Figure C.9: Event study plots of effect of first coal closure on vote shares, CEM sample, local elections



*Note: Event study plots showing the average effect of the first coal closure on local election results by length of exposure, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the matched full sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Note that because of the small size of the group-years, the blue bars showing effects by lengths of exposure to the treatment should be interpreted with caution. For interpreting the effect on vote sizes, the overall ATT, which is reported in the Results section, is the more meaningful and appropriate measure in the event of small group sizes (Callaway and Sant'Anna 2022). Instead, these plots are useful to analyse common pre-trends as shown by the red bars.*

## D Tables and Figures Main Analyses

Table D.3: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, full sample, regional elections

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-1.458*	-0.351*	0.236	0.372	-0.461	-0.184*	1.522*
Sdt.error	0.218	0.145	0.174	0.197	0.409	0.093	0.37
Num.obs.	392	392	392	392	392	392	392

*Note: Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table D.4: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, matched sample (CEM), regional elections

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-0.988*	-0.428*	0.082	0.282	-0.253	-0.127	1.327*
Sdt.error	0.241	0.177	0.153	0.225	0.379	0.158	0.313
Obs.	155	155	155	155	155	155	155

*Note: Estimates based on the matched sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table D.5: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, full sample, national elections

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-1.308*	-0.237	0.684	0.35	0.377	-0.663*	0.896*
Sdt.error	0.299	0.219	0.37	0.207	0.41	0.144	0.248
Num.obs.	392	392	392	392	392	392	392

*Note: Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table D.6: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, matched sample (CEM), national elections

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-0.643*	-0.395	0.357	0.518	0.368	-0.471*	0.451
Sdt.error	0.263	0.238	0.302	0.265	0.63	0.188	0.257
Num.obs.	155	155	155	155	155	155	155

*Note: Estimates based on the matched sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table D.7: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, full sample, local elections

	SPD	Greens	CDU	FDP	Abstention
ATT	-0.391	-0.498*	0.027	0.238	1.383*
Sdt.error	0.337	0.222	0.25	0.177	0.398
Num.obs.	392	392	392	392	392

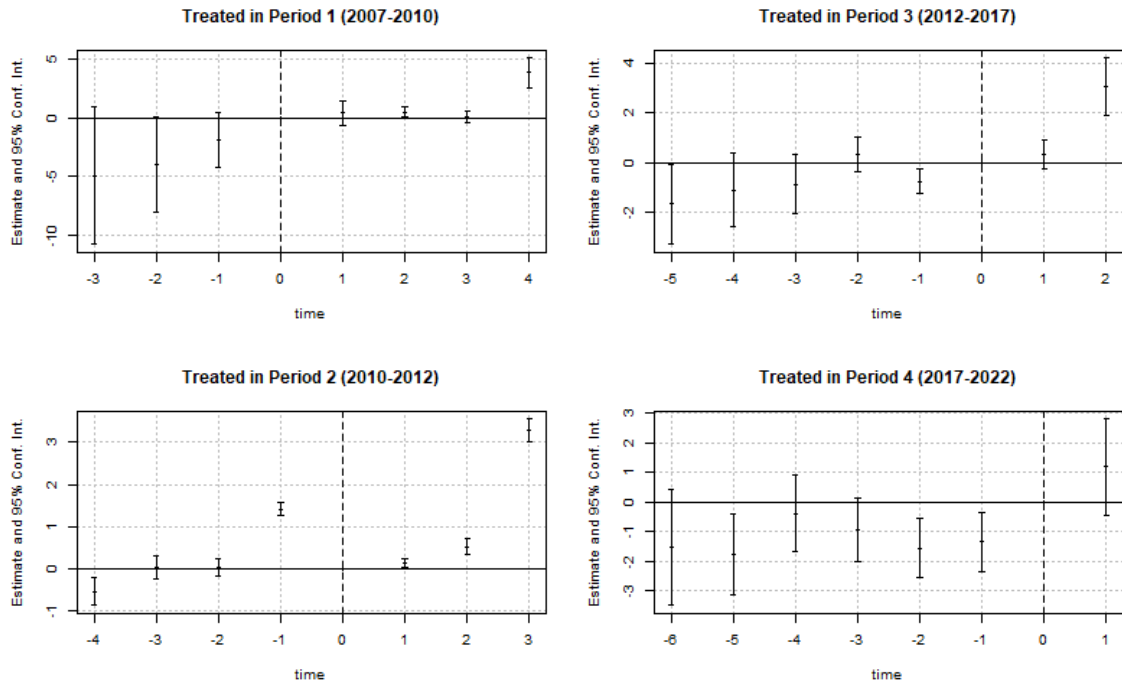
*Note: Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table D.8: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, matched sample (CEM), local elections

	SPD	Greens	CDU	FDP	Abstention
ATT	-0.427	-0.612*	0.346	0.383*	0.643
Sdt.error	0.411	0.209	0.399	0.192	0.408
Num.obs.	152	152	152	152	152

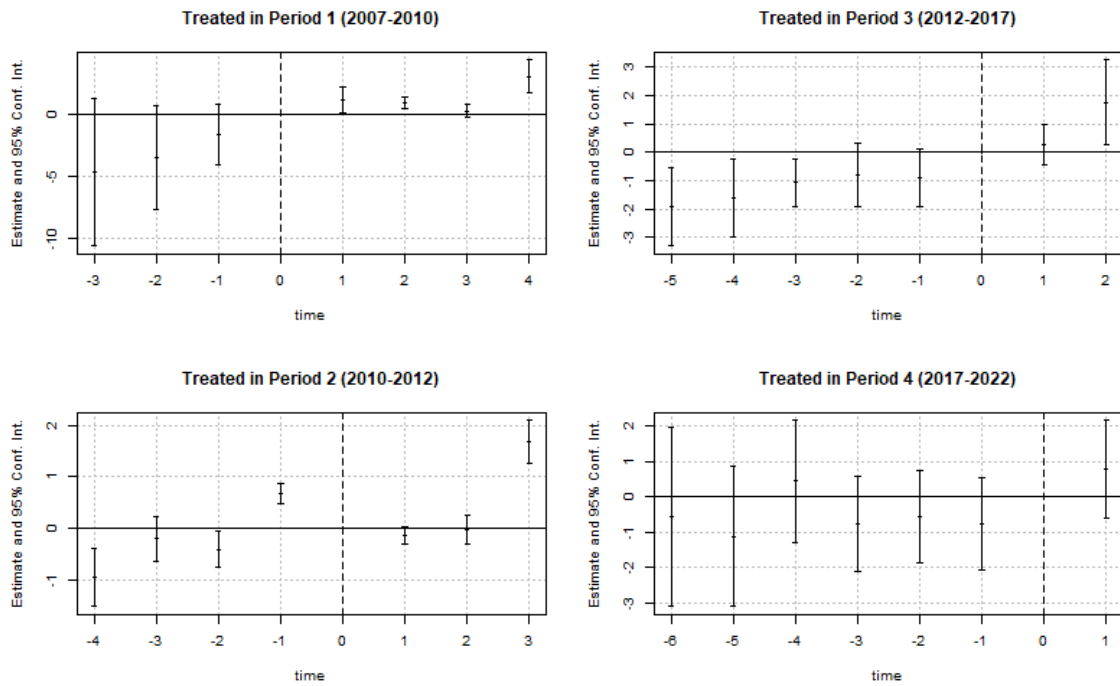
*Note: Estimates based on the matched sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Figure D.10: Event study plots of the effect of first coal closure on abstention rates in subsequent elections, full sample



*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on abstention rates in subsequent elections. For each election period, I estimate a model in which treatment is defined by whether a municipality experienced a first coal closure during that election period. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the full sample of municipalities in NRW. Standard errors clustered by municipality.*

Figure D.11: Event study plots of the effect of first coal closure on abstention rates in subsequent elections, matched sample (CEM)



*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on abstention rates in subsequent elections. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the matched full sample of municipalities in NRW following CEM. Standard errors clustered by municipality.*

## E Robustness: Complete NRW sample

Figure E.12: Love plot of the standardized mean differences of the variables used for matching, full sample and CEM sample

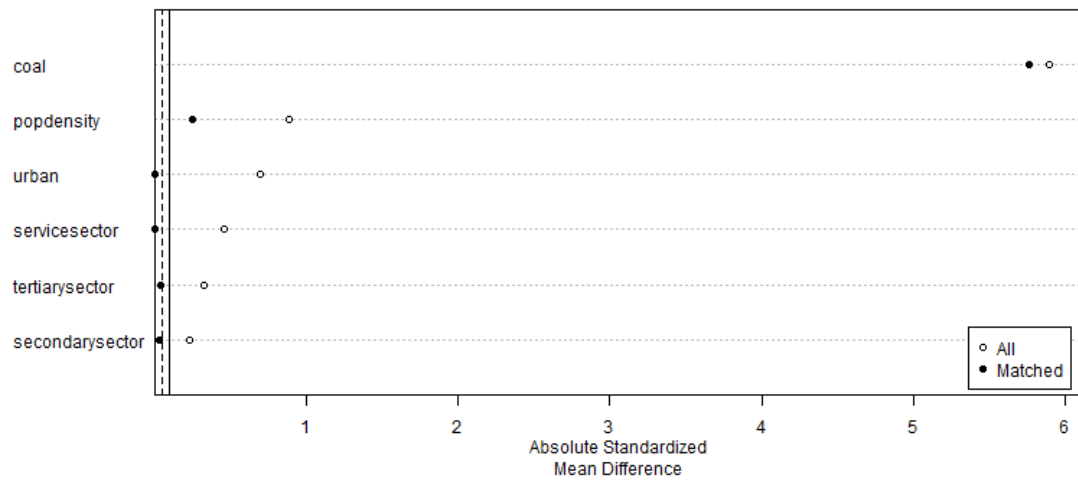


Table E.9: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, complete sample

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-1.517*	-0.346*	0.218	0.378*	-0.459	-0.15	1.537*
Sdt.error	0.209	0.153	0.295	0.161	0.386	0.091	0.354
Num.obs.	396	396	396	396	396	396	396

*Note: Estimates based on the complete sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table E.10: Staggered DiD estimates (overall ATT) of first coal closure on vote shares, complete matched sample (CEM)

	SPD	Greens	CDU	FDP	AfD	The Left	Abstention
ATT	-0.861*	-0.442*	-0.087	0.44	-0.166	-0.019	1.174*
Sdt.error	0.193	0.182	0.297	0.295	0.332	0.095	0.311
Num.obs.	178	178	178	178	178	178	178

*Note: Estimates based on the matched complete sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

## F Mechanisms

Table F.11: Staggered DiD estimates (overall ATT) of first coal closure on economic indicators, full sample

	Empl. rate	Purch. Power
ATT	-0.292*	-673.43*
Sdt.error	0.144	203.514
Num.obs.	388	388

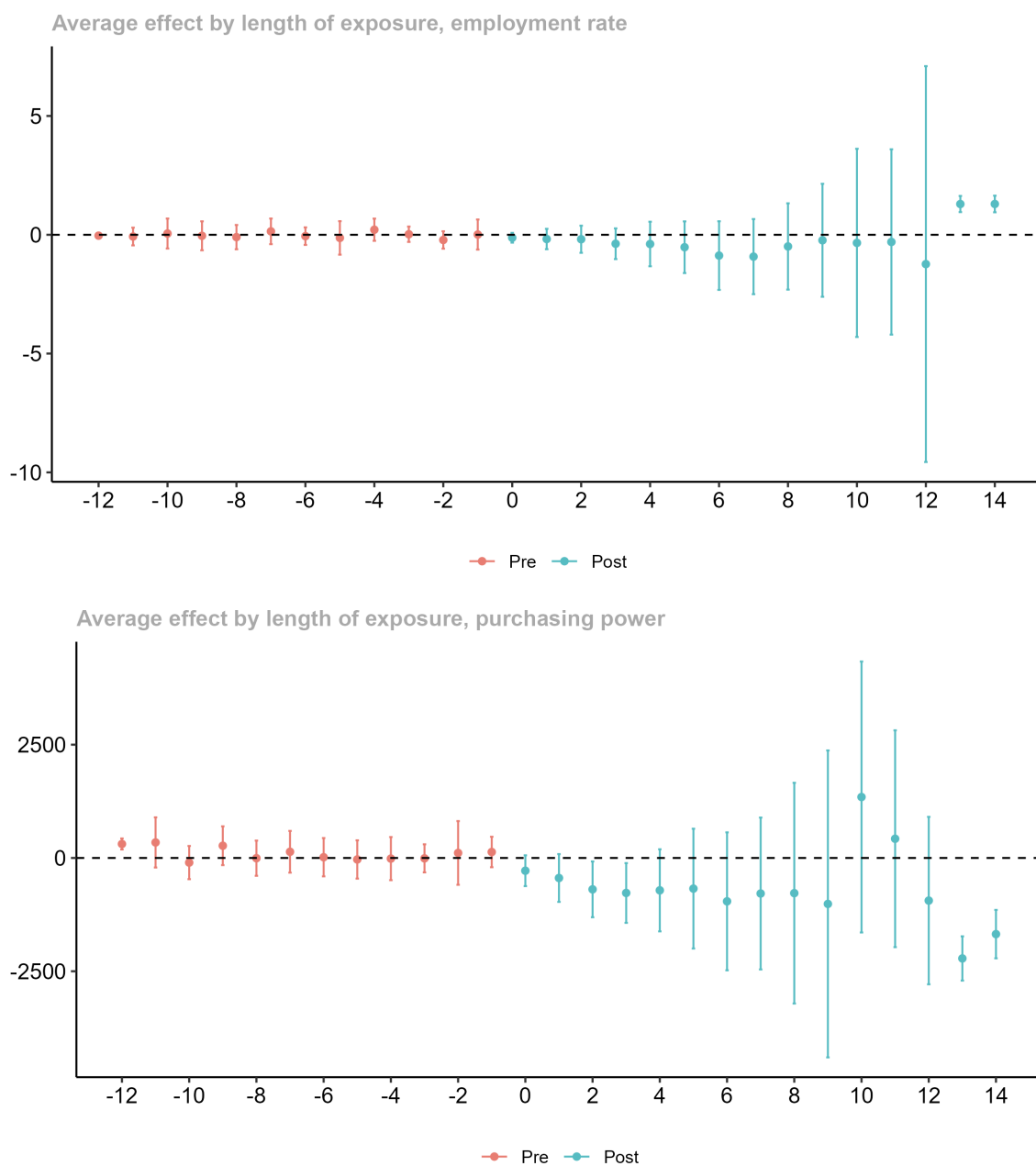
*Note: Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Table F.12: Staggered DiD estimates (overall ATT) of first coal closure on economic indicators, matched sample (CEM)

	Empl. rate	Purch. Power
ATT	0.02	-204.853
Sdt.error	0.143	345.672
Num.obs.	152	152

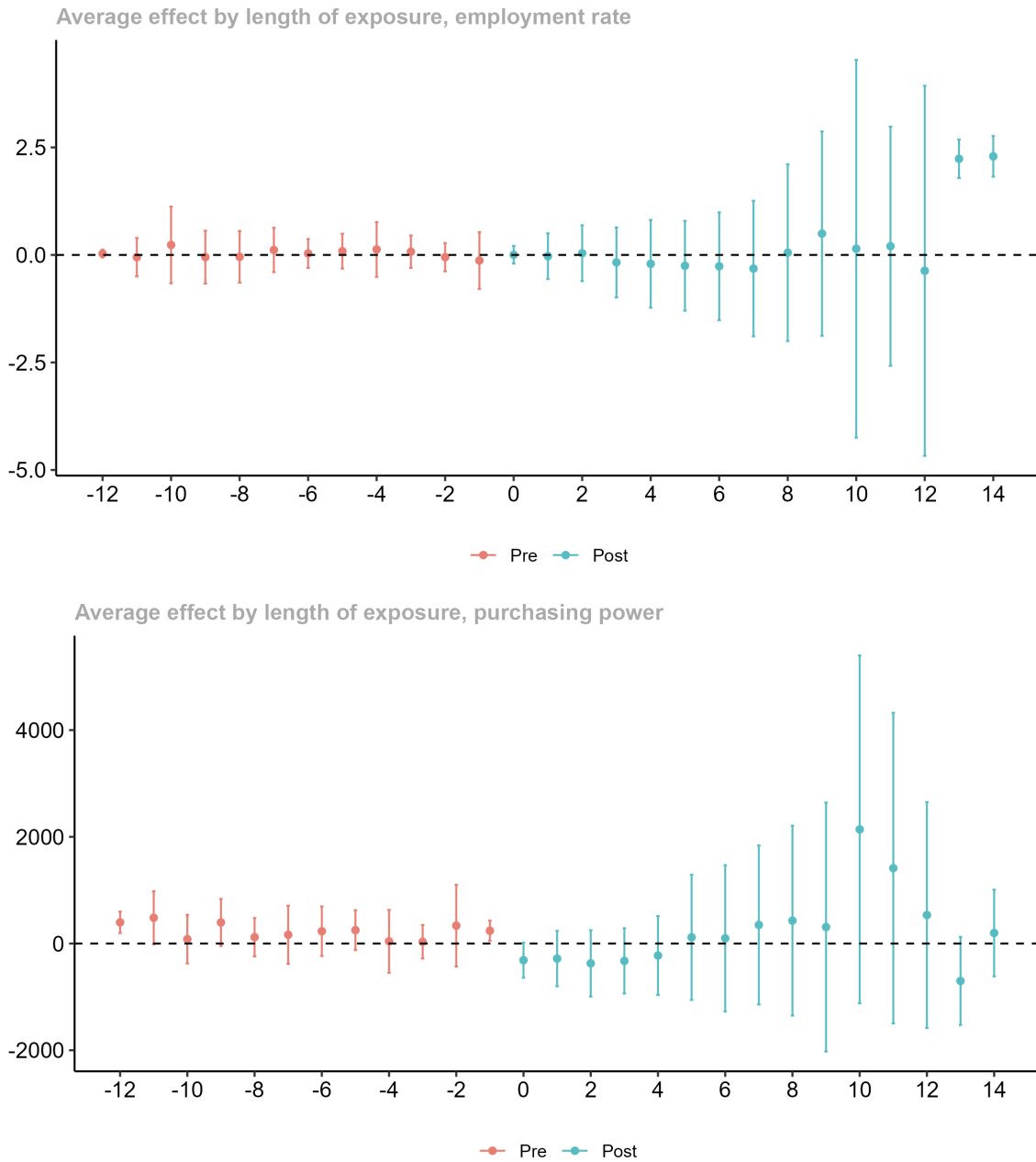
*Note: Estimates based on the matched sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality. Signif. Code: \* $p < 0.05$ .*

Figure F.13: Event study plots of effect of first coal closure on economic indicators, full sample



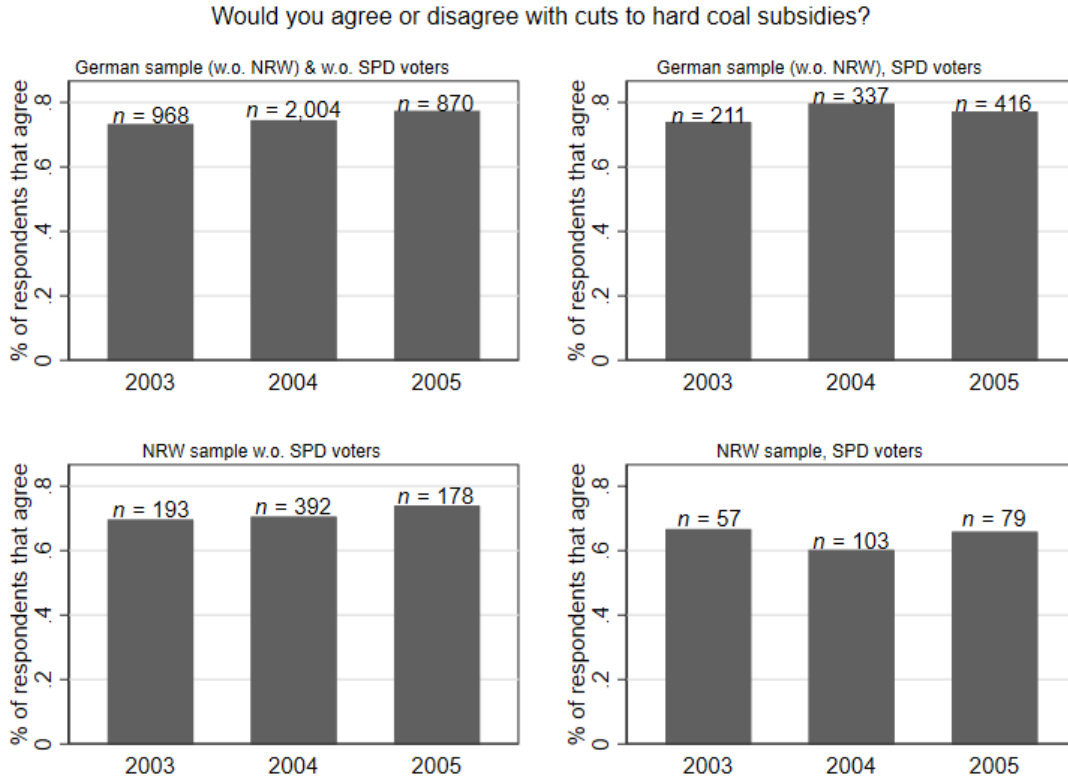
*Note: Event study plots showing the average effect of the first coal closure on economic indicators by length of exposure at the municipal level, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the full sample of municipalities in NRW. Bootstrapped standard errors clustered by municipality.*

Figure F.14: Event study plots of effect of first coal closure on economic indicators, matched sample (CEM)



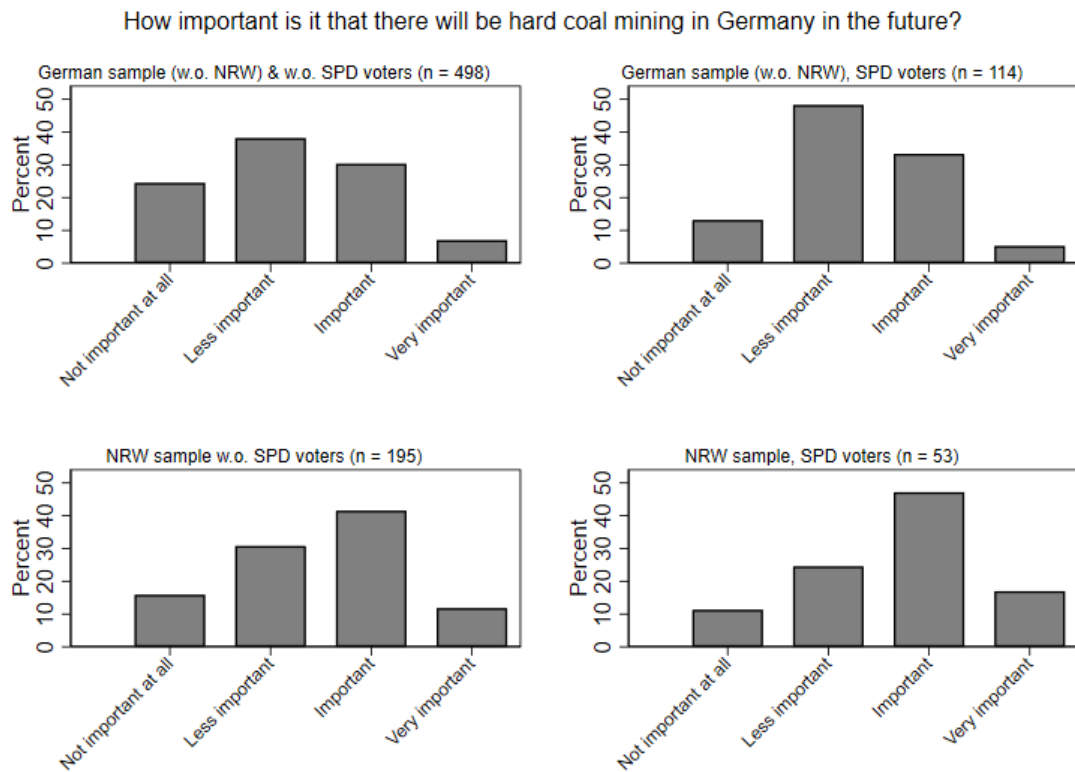
*Note: Event study plots showing the average effect of the first coal closure on economic indicators by length of exposure at the municipal level, using Callaway and Sant'Anna (2021)'s staggered DiD estimator. Bars show 95% confidence intervals and x-axis depicts time relative to treatment. Estimates based on the matched full sample of municipalities in NRW following CEM. Bootstrapped standard errors clustered by municipality.*

Figure F.15: Preferences regarding cuts to hard-coal subsidies



*Note: Author's own compilation based on Politbarometer data (Forschungsgruppe Wahlen, Mannheim 2019). The figure shows the percentage of respondents that agree with the statement in four subgroups that are formed according to two criteria: those that live in NRW vs. those who do not and those who answered that they would vote for the SPD in the next election vs. those who would vote for another party. The question was asked in three consecutive years (2003-2005). According to t-tests, the mean (pooled across all three years in which the survey question was asked) of SPD voters in NRW is significantly different to the mean of SPD voters in the rest of Germany and to the mean of non-SPD voters within NRW. On the other hand, the mean of the German non-SPD voters is not statistically different to the mean of German SPD voters and NRW non-SPD voters.*

Figure F.16: Preferences regarding importance of German hard coal in the future



*Note: Author's own compilation based on Politbarometer data (Jung, Schroth, and Wolf 2008). The figure shows the distribution of answers across four subgroups that are formed according to two criteria: those that live in NRW vs. those who do not and those who answered that they would vote for the SPD in the next election vs. those who would vote for another party. According to t-tests, the mean of SPD voters in NRW is significantly different to the mean of SPD voters in the rest of Germany and the mean of non-SPD voters in NRW is significantly different to the mean of non-SPD voters in NRW. On the other hand, the differences within the German sample (SPD voters vs. non-SPD voters) and within the NRW sample are not statistically significant.*

## G Alternative Explanation: Incumbency

To test whether incumbency influenced how parties were punished or rewarded in the wake of a coal closure, I estimate two-year DiD models with period and municipality fixed effects separately for each of the four election periods during the time of observation for each of the parties involved in government, using two consecutive elections to estimate the effect of the closures that happened during an election period on the subsequent election. For each model, treatment (at the municipal level) is defined as experiencing a coal closure during a certain election period. I estimate these models with the full and matched samples for both regional and national election results. Moreover, those municipalities that become treated during a different election period are excluded from the control group, so that the control group is constituted only by the never-treated, as for the staggered DiD estimations.

Table G.13: Incumbency at the regional level in NRW 2005-2022

Election period	Government coalition
2005-2010	Christian Democrats (CDU) and Liberals
2010-2012	SPD and Greens
2012-2017	SPD and Greens
2017-2022	CDU and Liberals

*Note: Source: Landtag NRW (2022).*

Table G.14: Incumbency at the national level in Germany 2005-2021

Election period	Government coalition
2005-2009	CDU and SPD
2009-2013	CDU and Liberals
2013-2017	CDU and SPD
2017-2021	CDU and SPD

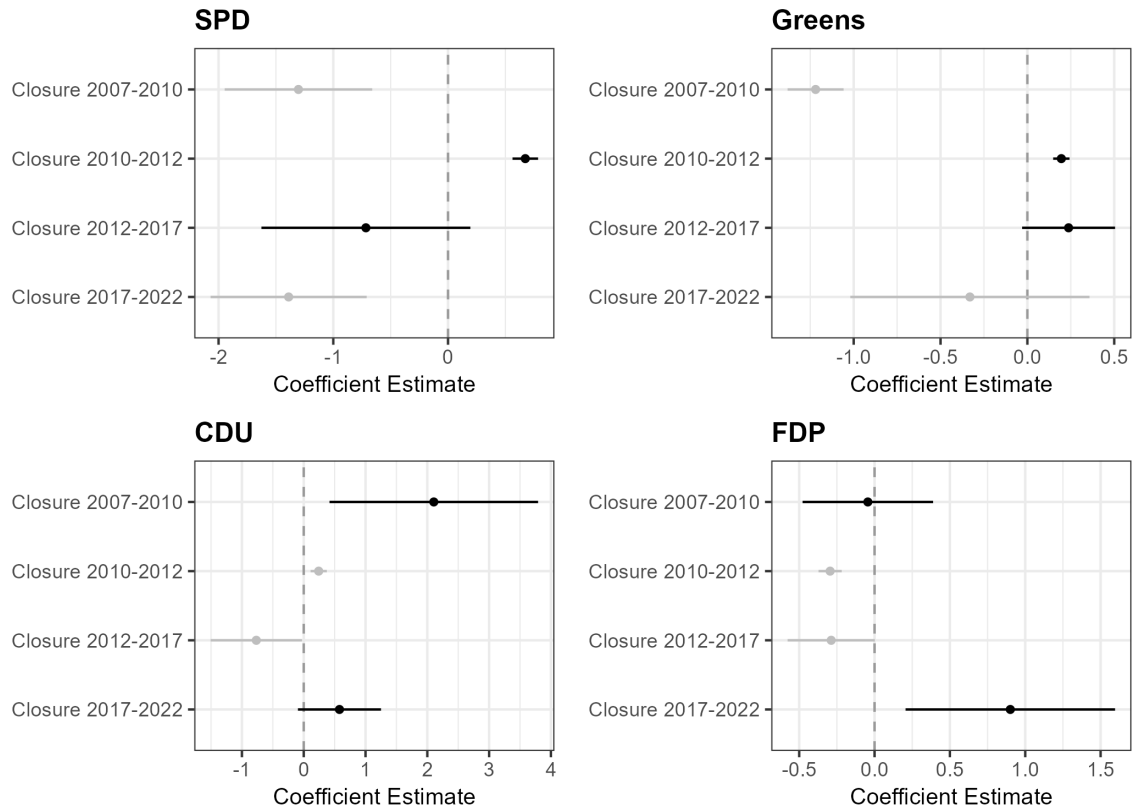
*Note: Source: Bundesregierung (2022).*

Table G.15: Incumbency (mayor) at the district (*Landkreis*)/municipal level in treated municipalities 2004-2020

Municipality	Year of closure	2004	2009	2014/15	2020
Hückelhoven	2007	CDU	CDU	CDU	CDU
Gelsenkirchen	2009	SPD	SPD	SPD	SPD
Hamm	2010	CDU	CDU	CDU	SPD
Kamp-Lintfort	2012	SPD	SPD	SPD	SPD
Bergheim	2012	CDU	CDU	CDU	CDU
Eschweiler	2012	SPD	SPD	SPD	SPD
Herne	2013	SPD	SPD	SPD	SPD
Dortmund	2014	SPD	SPD	SPD	SPD
Werdohl	2014 (pre-election)	No party aff.	SPD	CDU	SPD
Hürth	2015 (post-election)	SPD	SPD	CDU	CDU
Porta Westfalica	2015 (post-election)	SPD	SPD	SPD	CDU/FDP
Marl	2016	No party aff.	SPD	SPD	SPD
Voerde	2017	CDU	CDU	SPD	SPD/Greens
Ibbenbüren	2018	SPD	SPD	SPD	SPD
Mettingen	2018	SPD	SPD	SPD	SPD
Bottrop	2018	SPD	SPD	SPD	SPD
Lünen	2018	No party aff.	SPD	No party aff.	No party aff.
Wuppertal	2018	CDU	CDU	SPD	CDU/Greens
Werne	2019	SPD	No party aff.	No party aff.	No party aff.

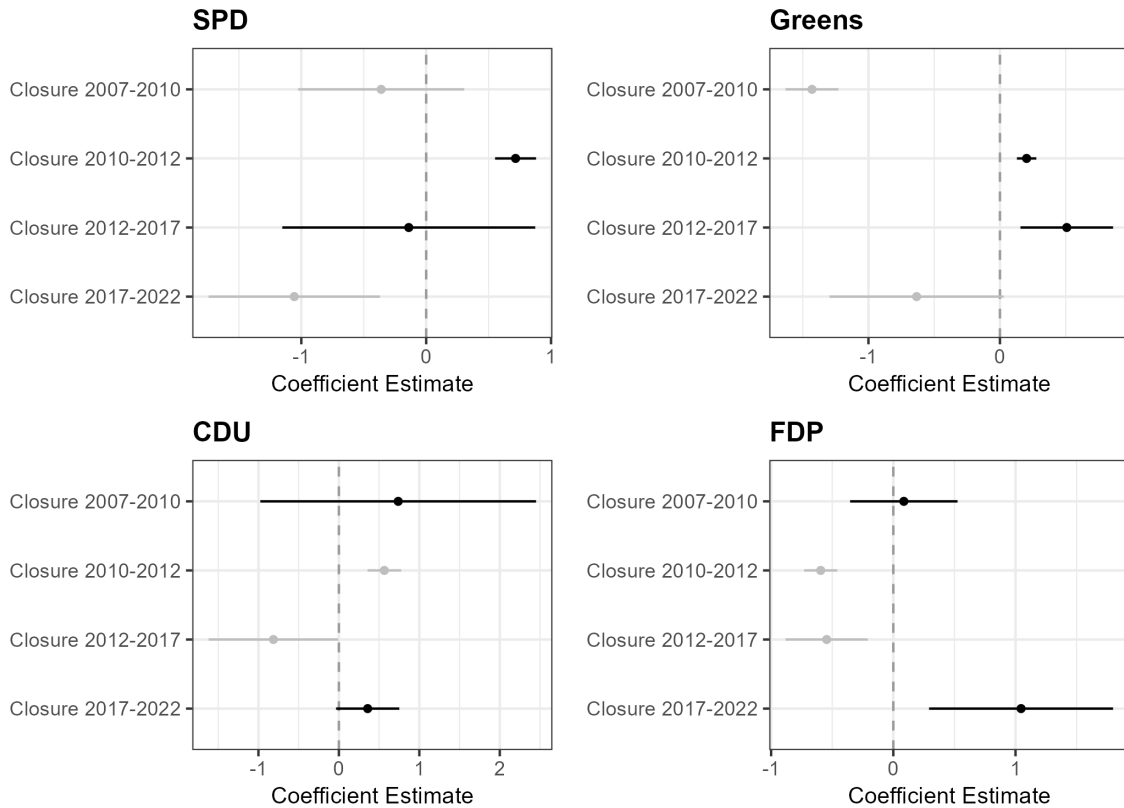
*Note: Sources: Landwahlleiterin NRW (2009; 2024). Due to a change in the procedural rules regarding local elections in NRW, around half of the local elections that were supposed to take place in September 2015 were advanced to May 2014.*

Figure G.17: Effect of first coal closure on vote shares in subsequent regional election, full sample



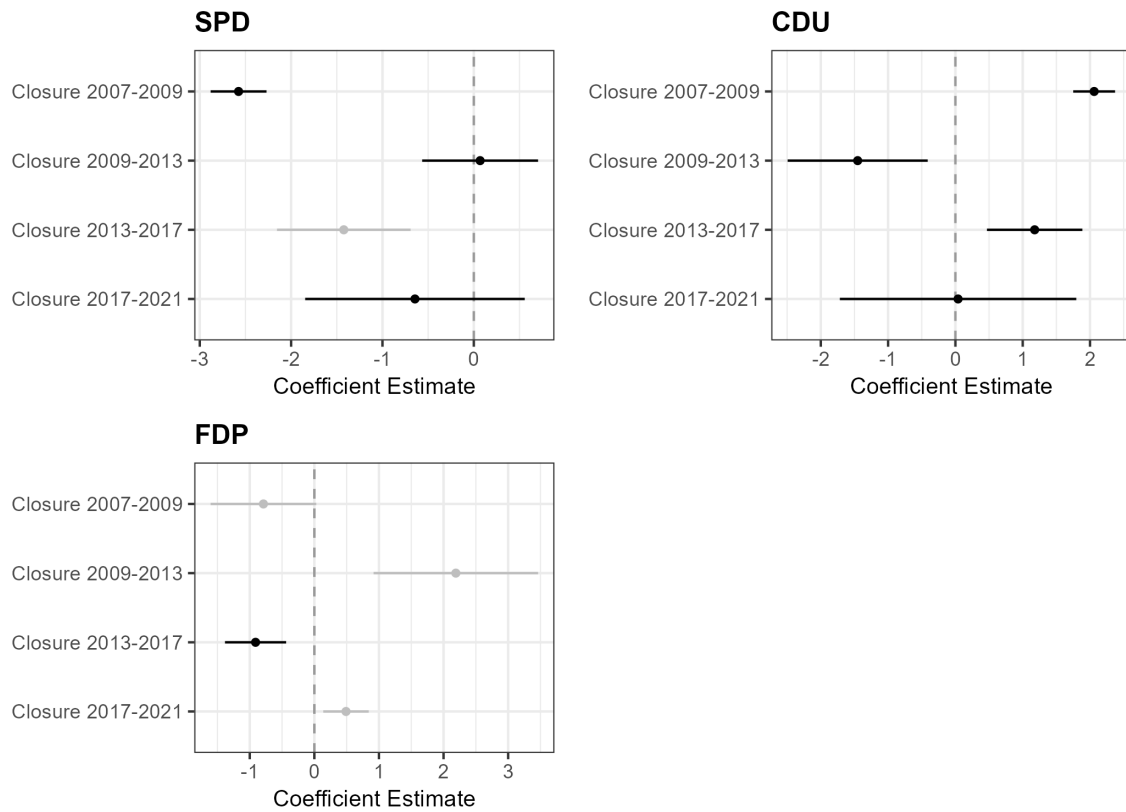
*Note: For each party, four separate DiD models (one for each election period) are estimated. Treatment defined as experiencing the first coal closure during the respective election period. Number of treated municipalities per election period: 2007-2010: 2; 2010-2012: 1; 2012-2017: 10; 2017-2022: 8. Bars show 95% confidence intervals. Black bars denote effect of closure during incumbency and grey bars denote effect of closure during non-incumbency. Estimates based on the full sample of municipalities in NRW ( $n = 392$ ). The Left and the AfD are omitted as they were never part of a regional government of NRW. Standard errors clustered by municipality.*

Figure G.18: Effect of first coal closure on vote shares in subsequent regional election, matched sample (CEM)



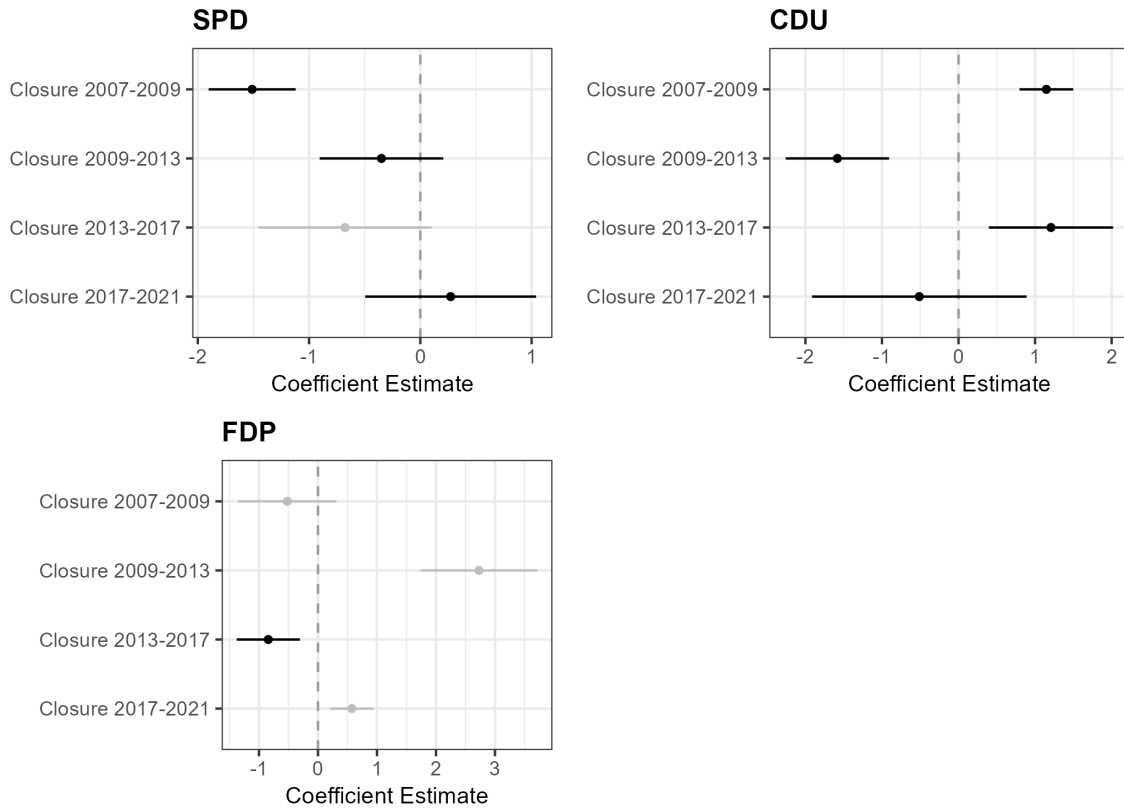
*Note: For each party, four separate DiD models (one for each election period) are estimated. Treatment defined as experiencing the first coal closure during the respective election period. Number of treated municipalities per election period: 2007-2010: 2; 2010-2012: 1; 2012-2017: 10; 2017-2022: 8. Bars show 95% confidence intervals. Black bars denote effect of closure during incumbency and grey bars denote effect of closure during non-incumbency. Estimates based on matched sample following CEM ( $n = 155$ ). The Left and the AfD are omitted as they were never part of a regional government of NRW. Standard errors clustered by municipality.*

Figure G.19: Effect of first coal closure on vote shares in subsequent national election, full sample



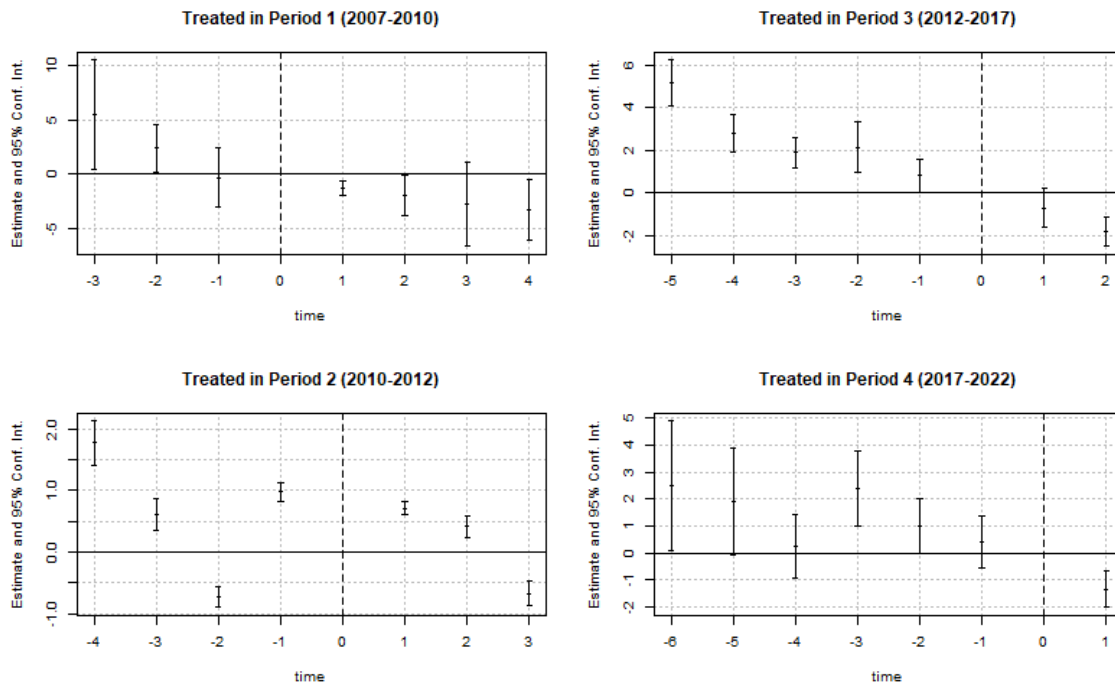
*Note: For each party, four separate DiD models (one for each election period) are estimated. Treatment defined as experiencing the first coal closure during the respective election period. Number of treated municipalities per election period: 2007-2009: 2; 2009-2013: 5; 2013-2017: 6; 2017-2021: 7. Bars show 95% confidence intervals. Black bars denote effect of closure during incumbency and grey bars denote effect of closure during non-incumbency. Estimates based on the full sample of municipalities in NRW ( $n = 392$ ). Greens, The Left and AfD are omitted as they were been part of the German national government during the time of observation. Standard errors clustered by municipality.*

Figure G.20: Effect of first coal closure on vote shares in subsequent national election, matched sample (CEM)



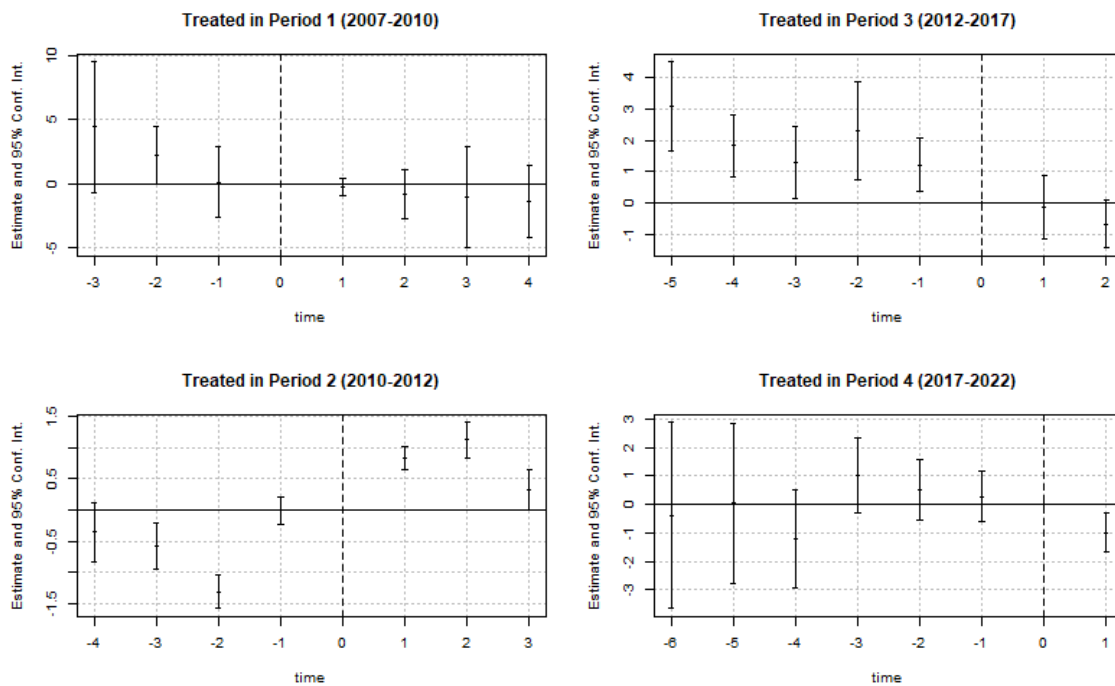
*Note: For each party, four separate DiD models (one for each election period) are estimated. Treatment defined as experiencing the first coal closure during the respective election period. Number of treated municipalities per election period: 2007-2009: 2; 2009-2013: 5; 2013-2017: 6; 2017-2021: 7. Bars show 95% confidence intervals. Black bars denote effect of closure during incumbency and grey bars denote effect of closure during non-incumbency. Estimates based on matched sample following CEM ( $n = 155$ ). Greens, The Left and AfD are omitted as they were never part of the German national government during the time of observation. Standard errors clustered by municipality.*

Figure G.21: Event study plots of the effect of first coal closure on SPD vote shares in subsequent regional elections, full sample



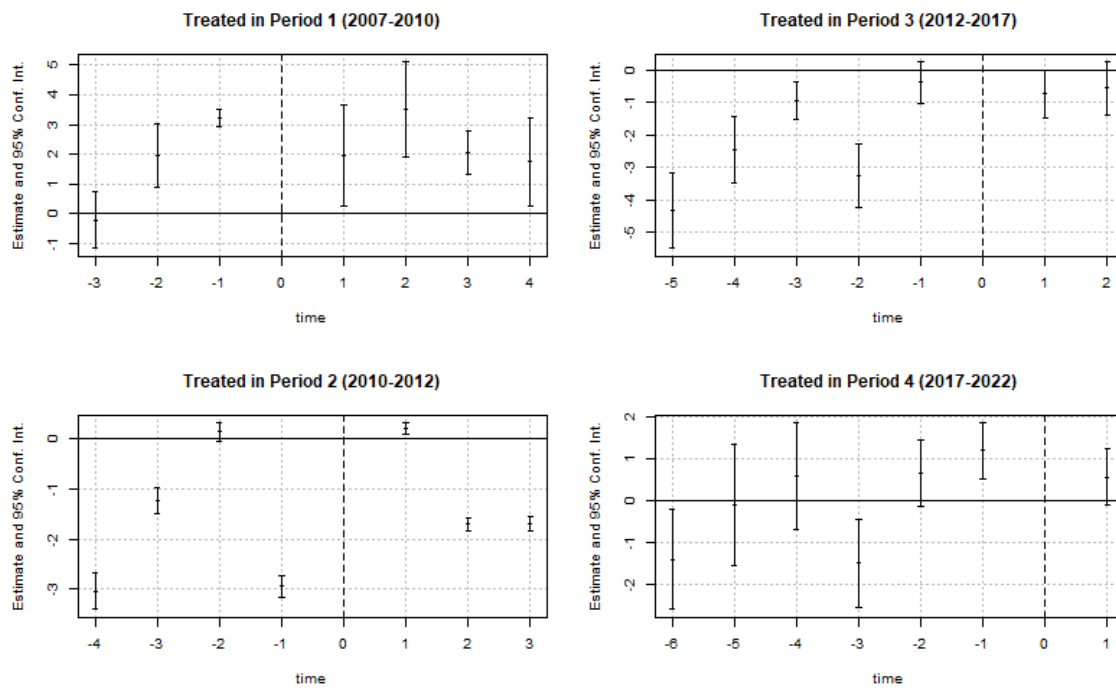
*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on SPD vote shares in subsequent regional elections. For each election period, I estimate a model in which treatment is defined by whether a municipality experienced a first coal closure during that election period. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the full sample of municipalities in NRW. Standard errors clustered by municipality.*

Figure G.22: Event study plots of the effect of first coal closure on SPD vote shares in subsequent regional elections, matched sample (CEM)



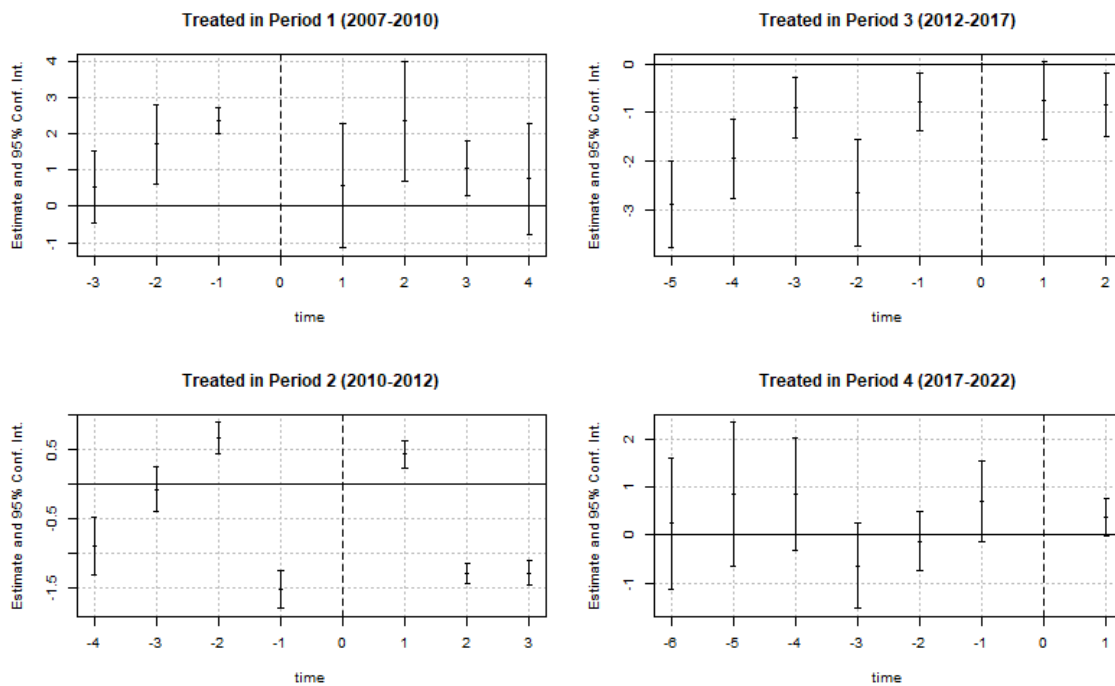
*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on SPD vote shares in subsequent regional elections. For each election period, I estimate a model in which treatment is defined by whether a municipality experienced a first coal closure during that election period. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the full sample of municipalities in NRW following CEM. Standard errors clustered by municipality.*

Figure G.23: Event study plots of the effect of first coal closure on CDU vote shares in subsequent regional elections, full sample



*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on CDU vote shares in subsequent regional elections. For each election period, I estimate a model in which treatment is defined by whether a municipality experienced a first coal closure during that election period. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the full sample of municipalities in NRW. Standard errors clustered by municipality.*

Figure G.24: Event study plots of the effect of first coal closure on CDU vote shares in subsequent regional elections, matched sample (CEM)



*Note: Event study plots showing two-way fixed effects models of the effect of the first coal closure on CDU vote shares in subsequent regional elections. For each election period, I estimate a model in which treatment is defined by whether a municipality experienced a first coal closure during that election period. Number of treated municipalities per election period: Period 1 (2007-2010): 2; Period 2 (2010-2012): 1; Period 3 (2012-2017): 10; Period 4 (2017-2022): 8. Bars show 95% confidence intervals and x-axis depicts election periods relative to treatment. Estimates based on the full sample of municipalities in NRW following CEM. Standard errors clustered by municipality.*

## H Alternative Explanation: Announcement of Phase-out Law

To test the possibility of an announcement effect on vote shares, I estimate another set of two-year DiD models to compare the vote shares for the regional elections before and after 2007 (i.e. in 2005 and 2010) for treated and untreated municipalities. I use two different conceptualisations of the treatment: first, treatment is defined as experiencing at least one coal closure after 2007. In a second step, those municipalities that had at least one operating CFPP or coal mine before the entry into force of the 2007 phase-out law are considered as treated (regardless of whether they experienced a coal closure between 2007 and 2022). Similar to the main analyses, I perform these analyses for the full and matched datasets.

Table H.16: DiD estimation 2005-2010, full sample, closure as treatment indicator

	SPD	Greens	CDU	FDP	Abstention
DiD estimate	3.609*** (0.768)	0.617* (0.267)	-11.034*** (0.841)	-1.240*** (0.161)	5.352*** (0.784)
Num. obs.	784	784	784	784	784

*Note: DiD estimation of the effect of the announcement of the coal phase-out law on vote shares in the first regional election after its entry into force (2010). Treatment defined as experiencing a coal closure between 2007 and 2022. Estimates based on the full sample of municipalities in NRW. Standard errors (in parentheses) clustered by municipality. Signif. Code: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .*

Table H.17: DiD estimation 2005-2010, matched sample (CEM), closure as treatment indicator

	SPD	Greens	CDU	FDP	Abstention
DiD estimate	1.706 (0.937)	0.425 (0.311)	-7.859*** (0.922)	-1.120*** (0.212)	4.591*** (0.724)
Num. obs.	310	310	310	310	310

*Note: DiD estimation of the effect of the announcement of the coal phase-out law on vote shares in the first regional election after its entry into force (2010). Treatment defined as experiencing a coal closure between 2007 and 2022. Estimates based on matched sample following CEM. Standard errors (in parentheses) clustered by municipality. Signif. Code: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .*

Table H.18: DiD estimation 2005-2010, full sample, coal as treatment indicator

	SPD	Greens	CDU	FDP	Abstention
DiD estimate	2.005** (0.648)	0.811*** (0.190)	-9.700*** (0.647)	-0.696*** (0.167)	4.946*** (0.575)
Num. obs.	784	784	784	784	784

*Note: DiD estimation of the effect of the announcement of the coal phase-out law on vote shares in the first regional election after its entry into force (2010). Treatment defined as having an operating coal mine or CFPP before the announcement of the phase-out law. Estimates based on the full sample of municipalities in NRW. Robust standard errors (in parentheses) clustered by municipality. Signif. Code: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .*

Table H.19: DiD estimation 2005-2010, matched sample (CEM), coal as treatment indicator

	SPD	Greens	CDU	FDP	Abstention
DiD estimate	0.543 (0.843)	0.629* (0.264)	-7.091*** (0.800)	-0.790*** (0.203)	4.465*** (0.630)
Num. obs.	310	310	310	310	310

*Note: DiD estimation of the effect of the announcement of the coal phase-out law on vote shares in the first regional election after its entry into force (2010). Treatment defined as having an operating coal mine or CFPP before the announcement of the phase-out law. Estimates based on matched sample following CEM. Robust standard errors (in parentheses) clustered by municipality. Signif. Code: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .*

## References

- BBSR. 2024. *Home*. Accessed May 27, 2024. [https://www.bbsr.bund.de/BBSR/EN/home/\\_node.html](https://www.bbsr.bund.de/BBSR/EN/home/_node.html).
- Bundesregierung. 2022. *Bundeskanzlerin Angela Merkel 2005 – 2021*. Accessed April 18, 2024. <https://www.bundesregierung.de/breg-de/suche/bundeskanzlerin-angela-merkel-2005-2021-2045938>.
- Callaway, Brantly, and Pedro H. C. Sant’Anna. 2022. *Estimating Group-Time Average Treatment Effects*. Accessed April 30, 2024. <https://cran.r-project.org/web/packages/did/vignettes/did-basics.html>.
- Callaway, Brantly, and Pedro H. C. Sant’Anna. 2021. “Difference-in-Differences with multiple time periods.” *Journal of Econometrics* 225 (2): 200–230. <https://doi.org/10.1016/j.jeconom.2020.12.001>.
- Forschungsgruppe Wahlen, Mannheim. 2019. “Politbarometer - Gesamtkumulation.” ZA5100 Datenfile Version 2.0.0, *GESIS Datenarchiv, Köln*, <https://doi.org/10.4232/1.13299>. [https://search.gesis.org/research\\_data/ZA5100?doi=10.4232/1.13299](https://search.gesis.org/research_data/ZA5100?doi=10.4232/1.13299).
- Jung, Matthias, Yvonne Schroth, and Andrea Wolf. 2008. “Politbarometer West 2007 (Kumulierter Datensatz inkl. Kurzbarometer).” ZA4803 Datenfile Version 1.0.0, *GESIS Datenarchiv, Köln*, <https://doi.org/https://doi.org/10.4232/1.4803>.
- Landesdatenbank NRW. 2024a. *Landesdatenbank Nordrhein-Westfalen: Allgemeine Bundestagswahlstatistik*. Text. Accessed May 3, 2024. <https://www.landesdatenbank.nrw.de/ldbnrw/online?operation=statistic&levelindex=0&levelid=1714748055289&code=14111#abreadcrumb>.
- . 2024b. *Landesdatenbank Nordrhein-Westfalen: Kommunalwahlen*. Text. Accessed May 3, 2024. <https://www.landesdatenbank.nrw.de/ldbnrw/online?operation=statistic&levelindex=0&levelid=1714748218635&code=14491#abreadcrumb>.
- Landeswahlleiterin des Landes NRW. 2009. *Kommunalwahlen am 30.08.2009*. Accessed February 7, 2024. <http://alt.wahlergebnisse.nrw.de/kommunalwahlen/2009/index.html>.
- . 2024. *Kommunalwahlen 2020 in NRW*. Accessed February 7, 2024. <https://www.wahlergebnisse.nrw/kommunalwahlen/2020/index.shtml>.
- Landtag NRW. 2022. *Landtag NRW: Rückblick auf Wahlperioden*. Accessed February 7, 2024. <https://www.landtag.nrw.de/home/der-landtag/geschichte-des-landtags/rueckblick-auf-wahlperioden-1.html>.
- Wegweiser Kommune. 2024. *Home - Wegweiser Kommune*. Accessed May 6, 2024. <https://www.wegweiser-kommune.de/>.