Can investor coalitions regulate corporate climate action?

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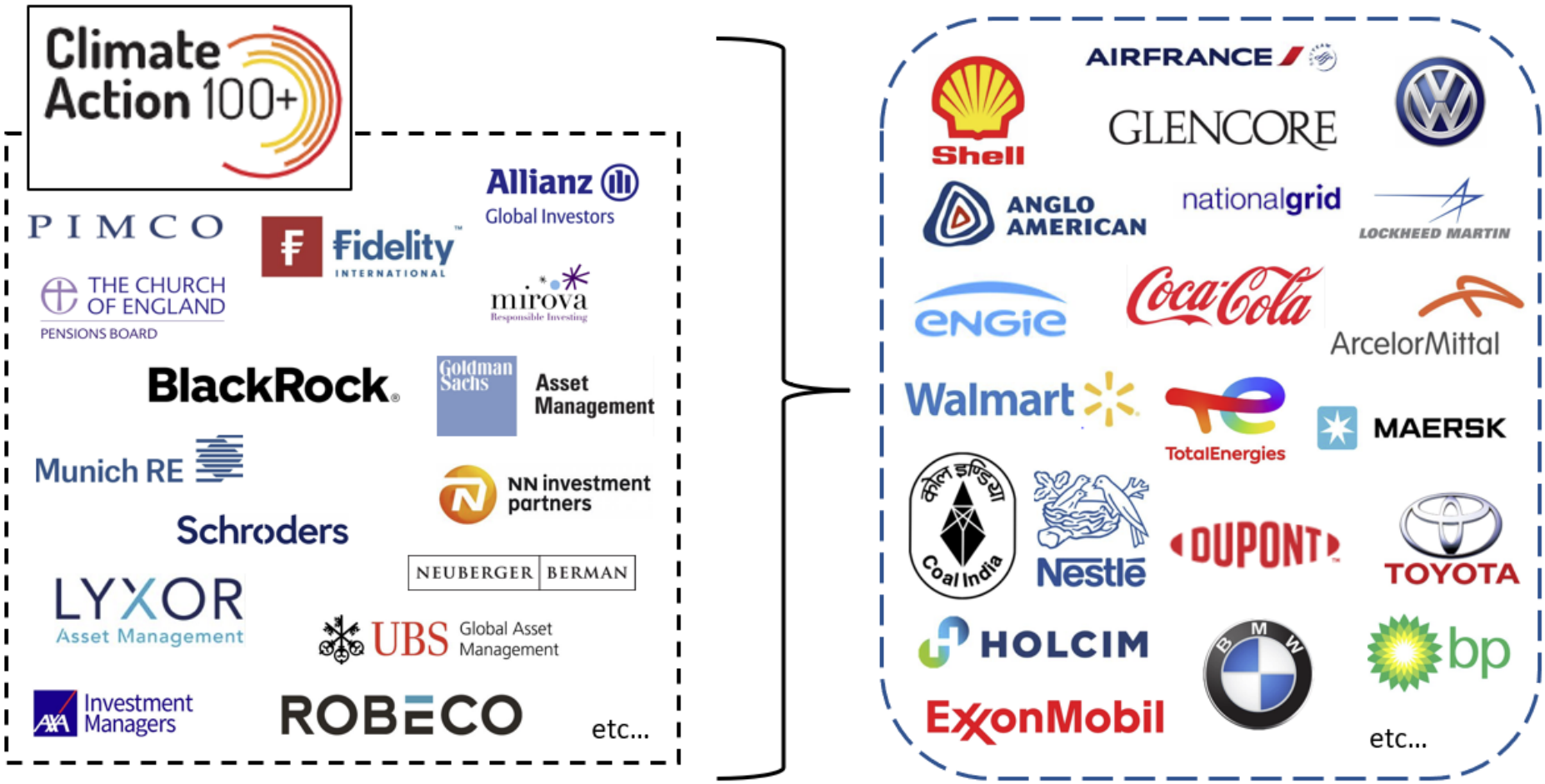
Climate Action 100+

- "*[B]iggest shareholder action plan ever launched*" (Financial Times, 2017)

Phase 1, as of June 2023 (Climate Action 100+, 2024)

Climate Action 100+

Figure 1: CA100+ investors and companies (examples)



Literature on investor impact and CA100+

Suggestive evidence on the effectiveness of investor action...

- through *voting* (ESG shareholder resolutions), e.g., David et al. (2007); Clark et al. (2008); Grewal et al. (2016)

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- through *voicing* („dialogue behind closed doors"), e.g., Dimson et al. (2021); Dyck et al. (2019); Barko et al. (2022); Bauer et al. (2023); Heeb and Kölbel (2024)

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- through *voicing* („dialogue behind closed doors"), e.g., Dimson et al. (2021); Dyck et al. (2019); Barko et al. (2022); Bauer et al. (2023); Heeb and Kölbel (2024)
- through *field building* Marti et al. (2023), e.g. benchmarking Chatterji and Toffel (2010); Sharkey and Bromley (2015)

My contribution

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→ **Data**: I focus on a small N with refined and multidimensional measures

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→ **Research Design**: Binned DiD & Matching DiD

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Goal 1: Address measurement problems regarding corporate climate action in large N studies

→ **Data**: I focus on a small N with refined and multidimensional measures

Goal 2: Isolate the causal impact of collective investor engagement

→ **Research Design**: Binned DiD & Matching DiD

Findings: No impact on climate-related disclosure and reductions in historical carbon emission intensities.
Yet, a heterogeneous effect on carbon emission reduction targets.

Plan

Treatment: CA100+ company selection

Companies could not self-select or opt out.

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The **initial CA100** focus companies (Dec 2017):

- Represent the **100 largest publicly listed corporate greenhouse gas emitters**. see list
- Selected based on reported and estimated Scope 1, 2 and 3 emissions.

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The **initial CA100** focus companies (Dec 2017):

- Represent the **100 largest publicly listed corporate greenhouse gas emitters**. see list
- Selected based on reported and estimated Scope 1, 2 and 3 emissions.

→ **Objective criterion** - does not clearly indicate a company's propensity to reduce carbon emissions.

Treatment: CA100+ company selection

The **'Plus companies'** (June 2018):

- Additional 61 companies were added in June 2018. see list
- **No clear selection criteria**, were deemed 'transition enablers'. Could have been political and based on investor knowledge.

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The **'Plus companies'** (June 2018):

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→ **Potential selection bias** and **violation of the PTA**.

Plan

Measuring corp. climate performance - challenges

Studies typically use a $\frac{GHG\ emissions}{Revenue/Assets}$ metric (Rohleder et al., 2022; Zink, 2024; Drempetic et al., 2020).

Issues: Importance of Scope 3, volatility, not-forward looking

more details

Measuring CA100+'s impact

CA100+ engagement goals: I focus on the least and the most costly measures for companies:

1. Corporate disclosure on climate change in line with the TCFD recommendations. Details
   → ClimateBERT-TCFD analysis following Bingler et al. (2022)

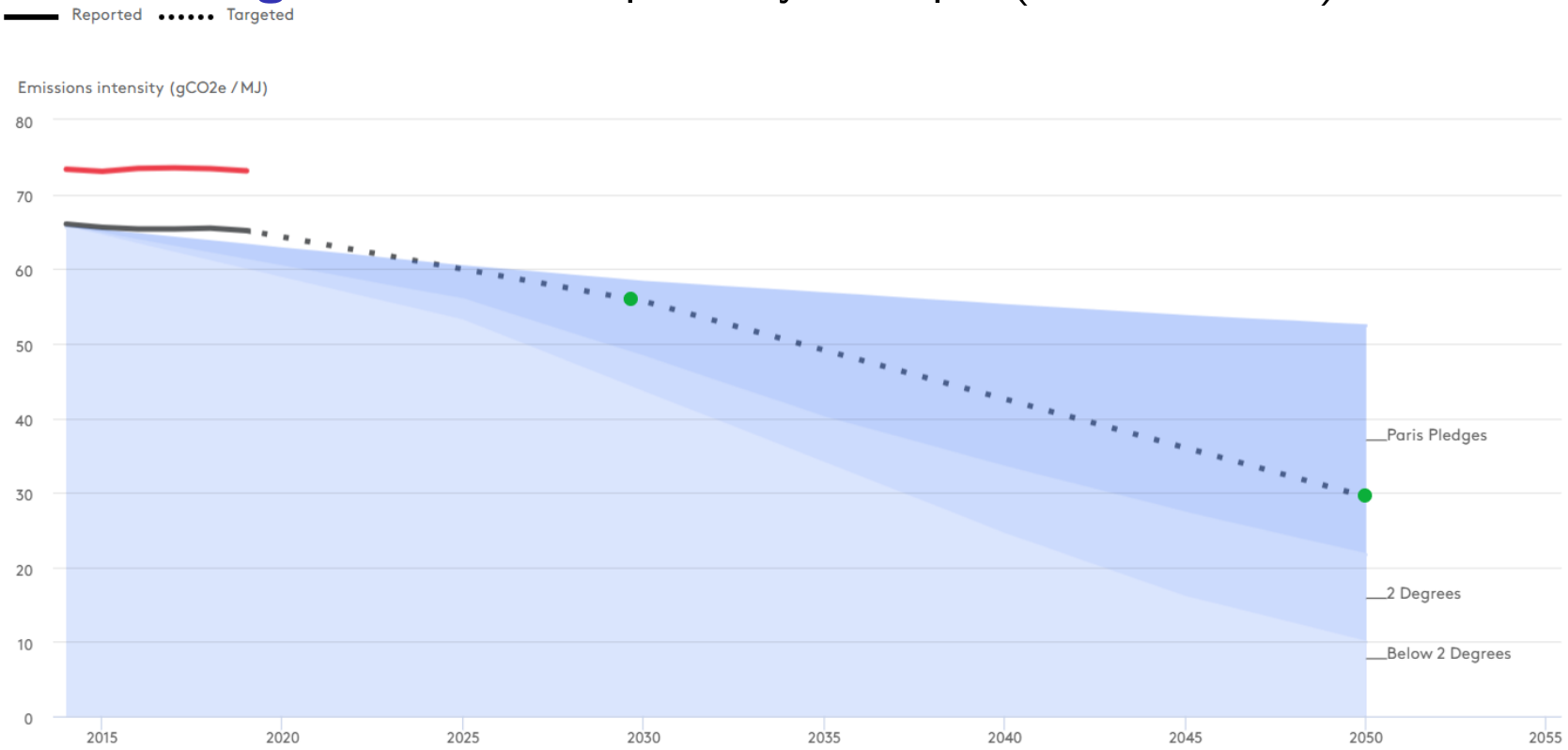
Measuring CA100+'s impact

CA100+ engagement goals: I focus on the least and the most costly measures for companies:

1. Corporate disclosure on climate change in line with the TCFD recommendations. Details
   → ClimateBERT-TCFD analysis following Bingler et al. (2022)
2. Emissions reduction targets that are aligned with the Paris Agreement;
   → TPI Carbon Performance data

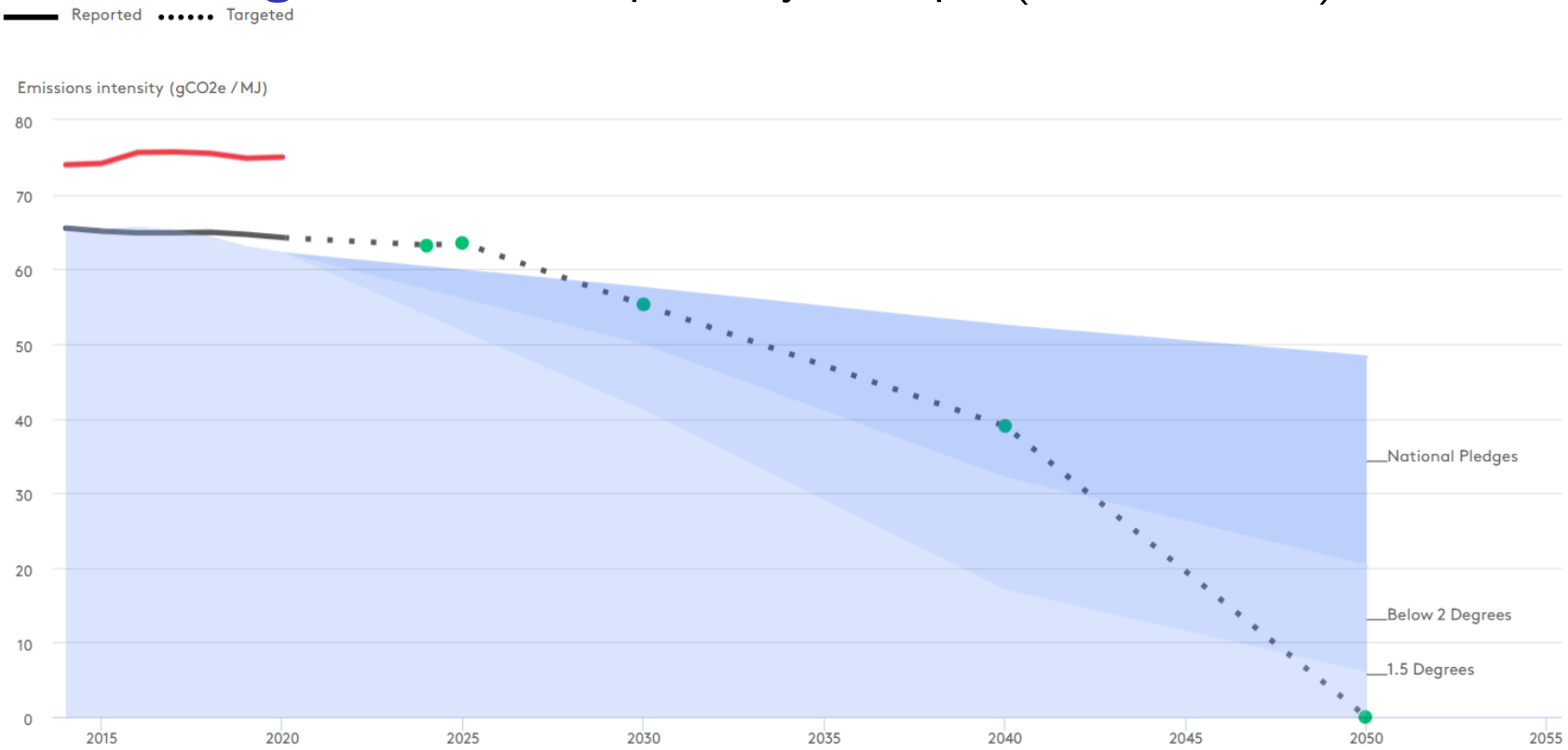
Targets - TPI CP Pathway

Figure 2: TPI CP pathway example (Eni, RC 2020)



Targets - TPI CP Pathway

Figure 3: TPI CP pathway example (Eni, RC 2021)



Plan

Matching design

CA100+ companies are the biggest corporate polluters but differences in pollution levels will be held constant by company fixed effects

→ Trends in pre-treatment period. Most important assumption for the DiD is PTA

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CA100+ companies are the biggest corporate polluters but differences in pollution levels will be held constant by company fixed effects

→ Trends in pre-treatment period. Most important assumption for the DiD is PTA

Different sectors face different challenges in the low carbon transition

→ Sector classification - using the CA100+ and TPI sector rules (apart from across sector analysis).

TWFE DiD and staggered DiD

The non-staggered TWFE model estimated **separately for CA100 companies and the Plus List** is:

$$Y_{it} = \alpha + \beta CA100_i * Post_t + \gamma_i + \mu_t + \epsilon_{it}$$

Y is the climate performance of company i in year t, $CA100_i$ is a dummy variable that takes the value of 1 for CA100+ companies, $Post_t$ is a time dummy that takes the value of 1 after the launch of CA100+ (2017 for CA100, 2018 for Plus), γ_i are company fixed effects and μ_t are year fixed effects.

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To estimate a dynamic staggered DiD specification for **CA100 companies and the Plus List together**, I follow Callaway and Sant'Anna (2021).

Plan

Climate-related and TCFD reporting and reductions

No impact of CA100+ on the focus companies' climate-related disclosure or individual TCFD categories.

see results

No impact on historical carbon intensities.

see results

Targets - Matching results

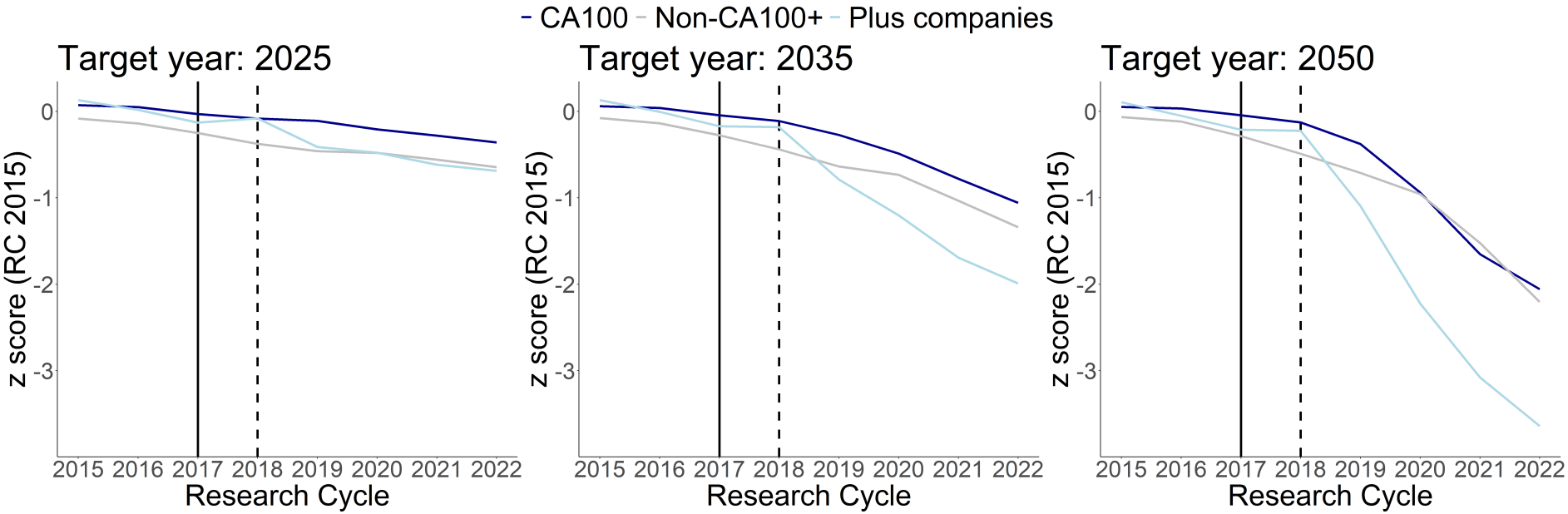


Figure 4: Pre- and post-treatment trends across CA100, Plus and Non-CA100+ companies for each target year across all sectors.

TWFE DiD - all sectors - CA100

	TY: 2025	TY: 2035	TY: 2050
CA100+	0.09	0.13	0.04
	(0.09)	(0.13)	(0.24)
R^2	0.91	0.78	0.61
Adj. R^2	0.90	0.75	0.55
Num. obs.	766	852	852

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 1: TWFE DiD, CA100 compared to Non-CA100+, across all sectors (z-scores).

TWFE DiD - all sectors - Plus

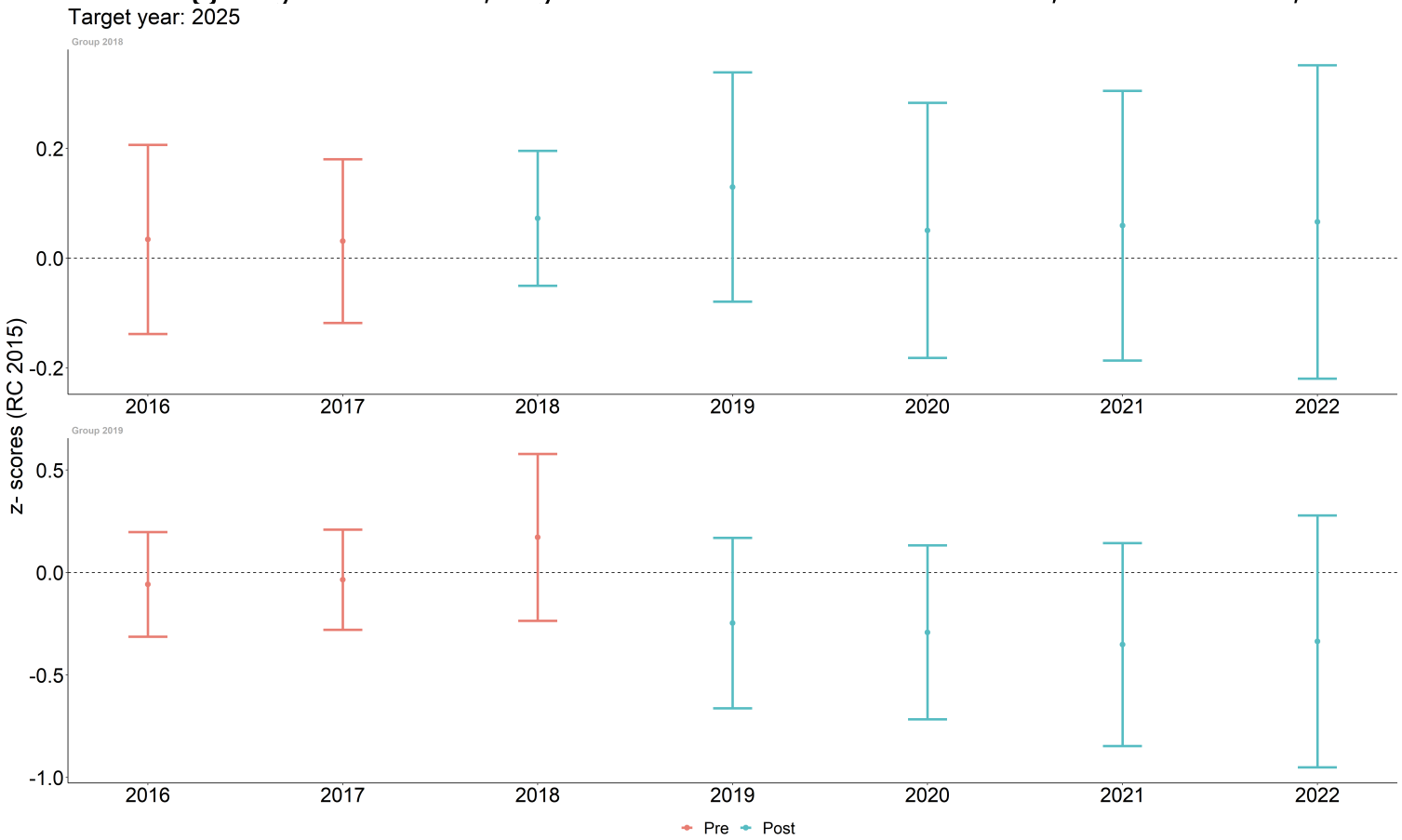
	TY: 2025	TY: 2035	TY: 2050
CA100+	-0.14	-0.48*	-0.97*
	(0.11)	(0.22)	(0.46)
R^2	0.86	0.71	0.56
Adj. R^2	0.84	0.66	0.49
Num. obs.	695	779	779

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 2: TWFE DiD, Plus compared to Non-CA100+, across all sectors (z-scores).

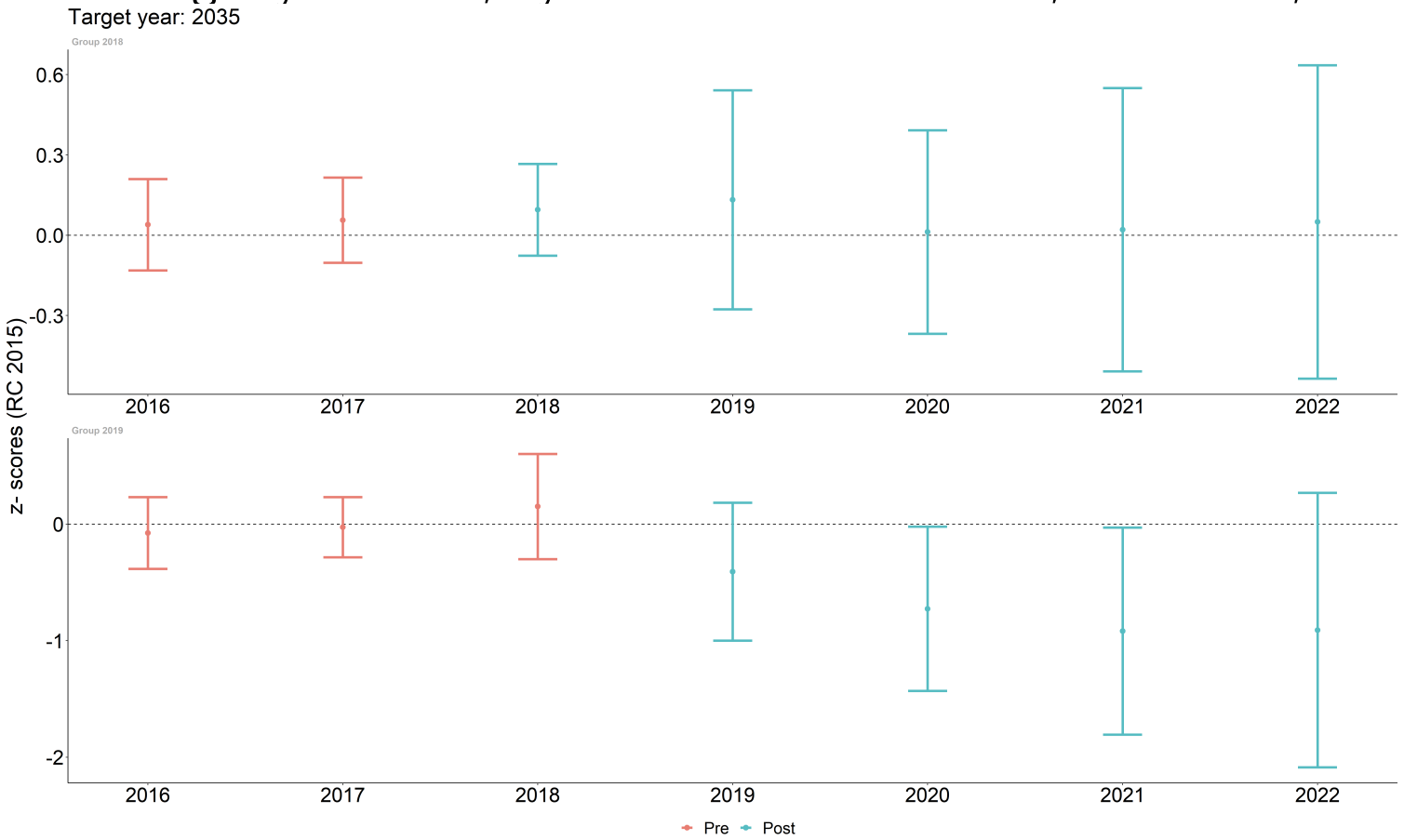
Event study TY2025 - all sectors

Figure 5: Target year 2025, dynamic treatment effect, all sectors, $\alpha = 5\%$)



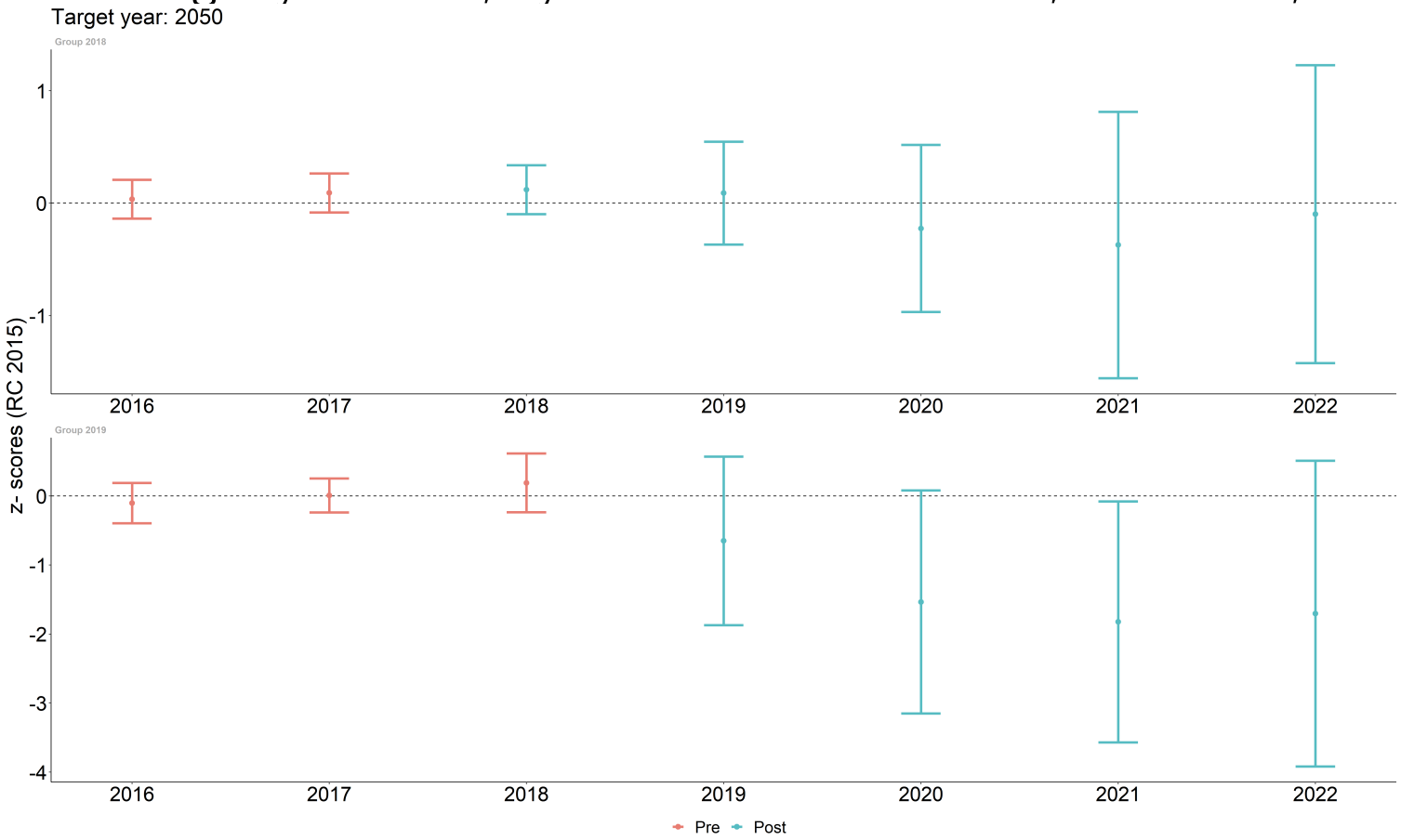
Event study TY2035 - all sectors

Figure 6: Target year 2035, dynamic treatment effect, all sectors, $\alpha = 5\%$)



Event study TY2050 - all sectors

Figure 7: Target year 2050, dynamic treatment effect, all sectors, $\alpha = 5\%$)



Robustness Checks

On climate-related disclosure - no impact on:

- CDP responses
- Reporting of carbon intensities

see results

Controlling for varying regulatory environments using the *Climate Change Policy Index*

see results

Within sector matching and DiD

see results

Plan

Discussion

Limited effectiveness: No impact on most indicators and companies.

Possible endogeneity: Effect on targets is only significant for Plus List.

Temporal heterogeneity: Effect only significant on medium-term and long-term target setting.

Discussion

Limited effectiveness: No impact on most indicators and companies.

Possible endogeneity: Effect on targets is only significant for Plus List.

Temporal heterogeneity: Effect only significant on medium-term and long-term target setting.

Limitations:

- Small sample size and limited data availability.
- Varying intensity of the treatment effect.
- Spillover effects between the CA100+ and non-CA100+ companies, e.g. through changes in institutional norms (Matisoff, 2015).
  → Treatment effect would be an underestimate.
  → I measure the effect of targeted collective investor action.

Thank you!

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Appendix - Measurement issues of CSP

Several studies use aggregate ESG scores (e.g. Dyck et al., 2019, Barko et al, 2022). However,

- Scores aggregate disclosure, processes and outcome indicators,
- Ratings from different providers diverge (Berg et al., 2022),
- The underlying methodologies are often not publicly disclosed.

The few studies which focus on corporate climate performance typically use a $\frac{Scope1\&2}{Revenue/Assets}$ metric (e.g. Rohleder et al, 2022). However,

- In several hard to abate sectors, Scope 3 emissions are significant,
- Financial metrics used in the denominator are volatile,
- Historical intensities aren't forward-looking. Back

Appendix - CA100 companies

Airbus	Exxon Mobil	Petrochina	Anglo American
Arcelor Mittal	BASF	Berkshire Hathaway	BHP
Boeing	BP	Canadian Natural Resources	Caterpillar
Centrica	Chevron	China Shenhua Energy	CNOOC
Coal India	ConocoPhillips	Cummins	Daikin Industries
Dow	Duke Energy	E.ON	Ecopetrol
EDF	Enel	Eneos	Engie
Eni	Equinor	Exelon	Fiat Chrysler
Ford	Formosa Petrochemical	Gazprom	General Electric
General Motors	Glencore	Hitachi	Holcim
Honda	Hon Hai Precision Industry	Imperial Oil	International Paper
KEPCO	Lockheed Martin	Lukoil	LyondellBasell Industries
Marathon Petroleum	Martin Marietta Materials	Naturgy Energy	Nestle
Nippon Steel	Nissan	Nornickel	NTPC
Oil & Natural Gas	OMV	PACCAR	Panasonic
Pepsico	Petrobras	Phillips	Phillips 66
Posco	Procter & Gamble	PTT	Raytheon Technologies
Reliance Industries	Repsol	Rio Tinto	Rolls-Royce
Rosneft Oil	SAIC motor	Sasol	Shell
Siemens	Sinopec	SK Innovation	Southern Company
Suncor Energy	Suzuki	Teck Resources	ThyssenKrupp
Toray Industries	TotalEnergies	Toyota	Trane Technologies
Vale	Valero Energy	Vedanta	Volkswagen
Volvo	Petrochina	Exxon Mobil	Petrobras

Table 3: List of CA100 companies as of April 2023.

Appendix - + companies

ADBRI	Eskom	Saudi Aramco
AES	Firstenergy	Severstal
AGL Energy	Fortum	Siemens Energy
Air France KLM	Groupe PSA	South32
Air Liquide	Grupo Argos	Souther Copper
American Airlines	Grupo Mexico	SSAB
American Electric Power	HeidelbergCement	SSE
ANTAM	Iberdrola	St Gobain
Bluescope Steel	Incitec Pivot	Stellantis NV
BMW	Kinder Morgan	Suzano
Boral	National Grid	TC Energy
Bumi	NextEra Energy	UltraTech Cement
Bunge	NovaTek	Unilever
Cemex	NRG Energy	Uniper
CEZ	Occidental Petroleum	United Continental
China Steel	Oil Search	United Tractors
Coca-Cola	Orica	Vistra Energy
Colgate-Palmolive	Origin Energy	Walmart
CRH	Pemex	WEC Energy Group
Daimler	PGE	Wesfarmer
Dangote Cement	Power Assets	Weyerhaeuser
Danone	PPL	Williams
Delta Air Lines	Qantas	Woodside Petroleum
Devon Energy	Renault	Woolworths
Dominion Energy	RWE	XCEL Energy
Enbridge	Santos	Back

Table 4: List of '+ companies' as of April 2023.

Appendix - Climate-BERT-TCFD

- Define baseline universe for the counterfactuals
  → TPI universe - 580 companies
  - Large listed companies
  - Considerable carbon footprints
  - Same sectors as CA100+ companies
- I manually download companies' ARs from 2014 to 2022
- I extract raw text from PDFs, split into paragraphs and analyse with ClimateBERT-TCFD.

Appendix - ClimateBERT-TCFD descr. statistics

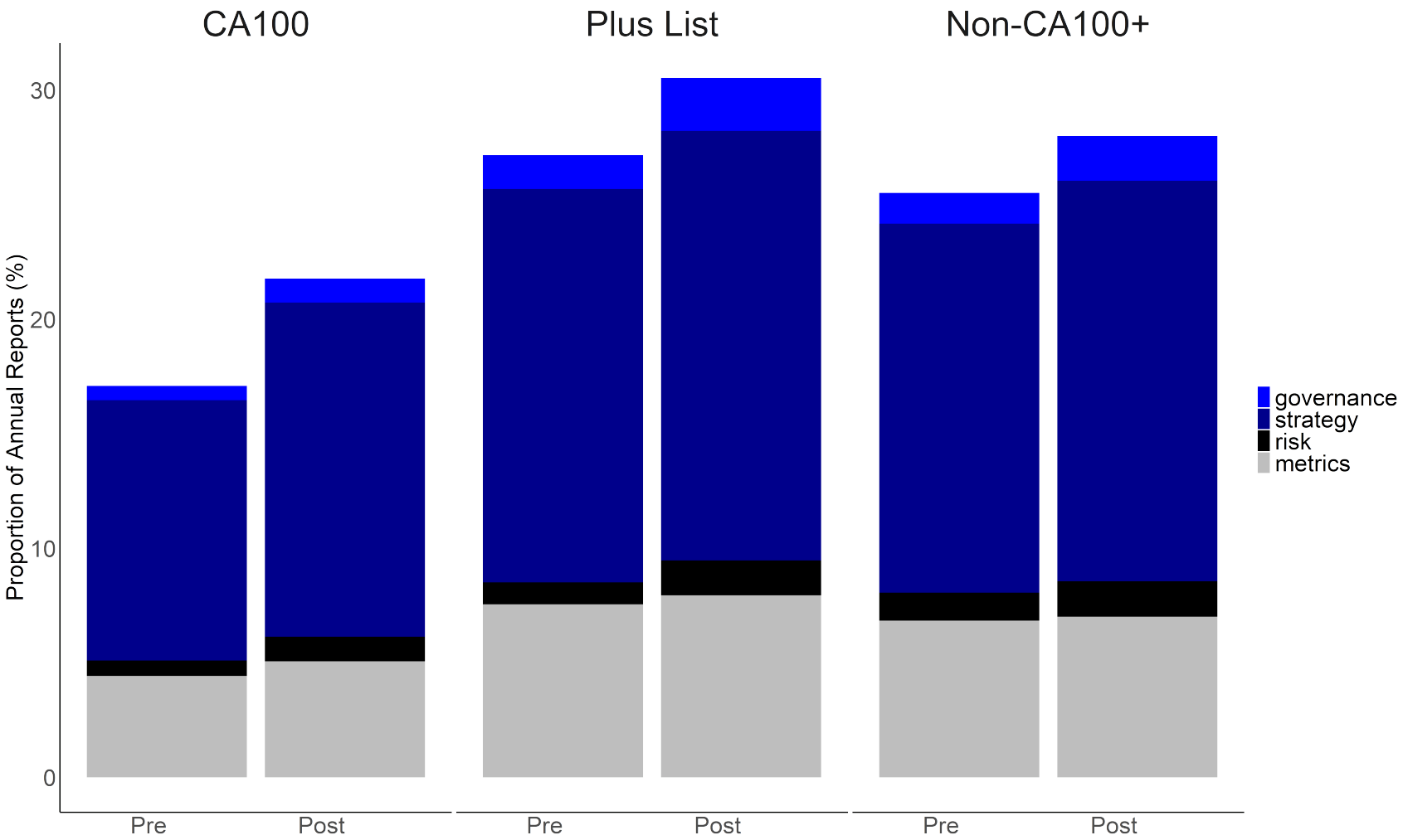

Figure 8: Climate-related reporting on TCFD-categories in ARs (electricity and autos). Back

Appendix - TCFD - First-Differences

	Climate	Governance	Strategy	Risk	Metrics & targets
(Intercept)	2.48*	0.60**	1.38	0.32**	0.17
	(1.14)	(0.22)	(0.83)	(0.11)	(0.31)
CA100+	2.21	−0.18	1.85	0.08	0.46
	(2.41)	(0.47)	(1.75)	(0.24)	(0.65)
Num. obs.	84	84	84	84	84
R^2	0.01	0.00	0.01	0.00	0.01
Adj. R^2	−0.00	−0.01	0.00	−0.01	−0.01

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 5: First-Differences analysis on climate-related and TCFD reporting, comparing the CA100 to Non-CA100+ companies.

Appendix - TCFD - First-Differences - CA100

	Climate	Governance	Strategy	Risk	Metrics & targets
(Intercept)	2.73**	0.70*	1.39	0.40***	0.24
	(1.03)	(0.27)	(0.78)	(0.11)	(0.30)
CA100+	0.63	0.13	0.18	0.17	0.15
	(2.17)	(0.57)	(1.65)	(0.23)	(0.63)
Num. obs.	84	84	84	84	84
R^2	0.00	0.00	0.00	0.01	0.00
Adj. R^2	−0.01	−0.01	−0.01	−0.01	−0.01

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 6: First-Differences analysis on climate-related and TCFD reporting, comparing the Plus to Non-CA100+ companies.

Appendix - Matching TCFD - Plus

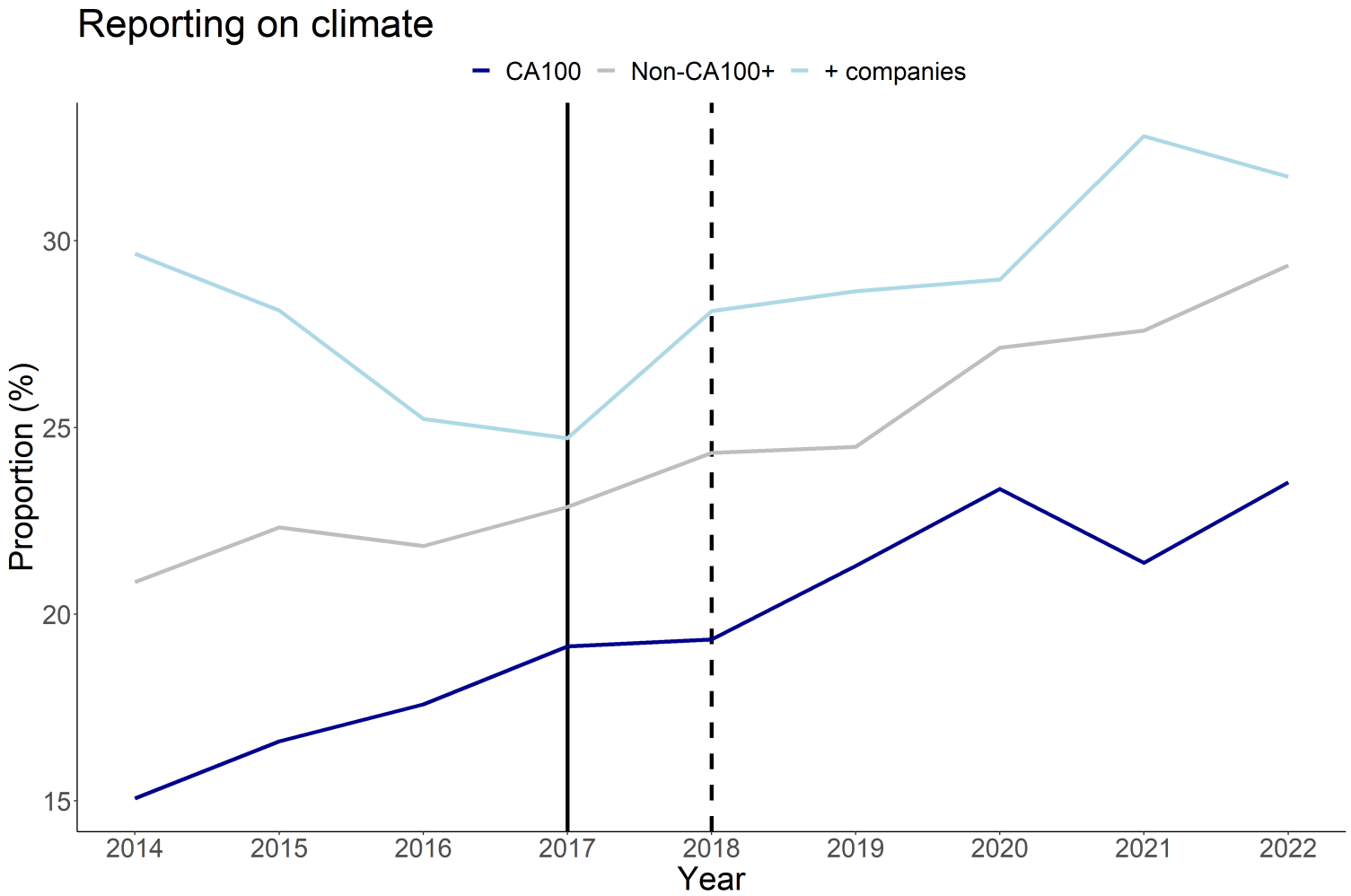

Figure 9: Pre- and post-treatment trends on climate-related reporting, all sectors after matching.

Appendix - TCFD - TWFE DiD - CA100

	Climate	Governance	Strategy	Risk	Metrics & Targets
CA100+	0.64	−0.31	0.43	0.06	0.78
	(1.49)	(0.45)	(1.06)	(0.15)	(0.51)
Num. obs.	513	513	513	513	513
R^2	0.78	0.33	0.77	0.57	0.81
Adj. R^2	0.75	0.23	0.74	0.51	0.79

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 7: DiD analysis on TCFD reporting, comparing the CA100 to Non-CA100+ companies.

Appendix - TCFD - TWFE DiD - Plus

	Climate	Governance	Strategy	Risk	Metrics & Targets
CA100+	−1.49	−0.01	−1.56	0.10	0.11
	(1.30)	(0.46)	(0.96)	(0.13)	(0.43)
Num. obs.	513	513	513	513	513
R^2	0.79	0.34	0.75	0.55	0.83
Adj. R^2	0.76	0.24	0.71	0.48	0.80

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 8: DiD analysis on TCFD reporting, comparing the Plus to Non-CA100+ companies.

back

Appendix - Historical CI - First-Differences

	CA100	Plus List
(Intercept)	-0.18^{***}	-0.18^{***}
	(0.03)	(0.04)
CA100+	0.04	−0.08
	(0.06)	(0.08)
Num. obs.	139	127
R^2	0.00	0.01
Adj. R^2	−0.00	−0.00

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 9: First-Differences analysis on historical carbon intensities (in z-scores), comparing the CA100 and Plus to Non-CA100+ companies.

Appendix - Historical CI - Matching

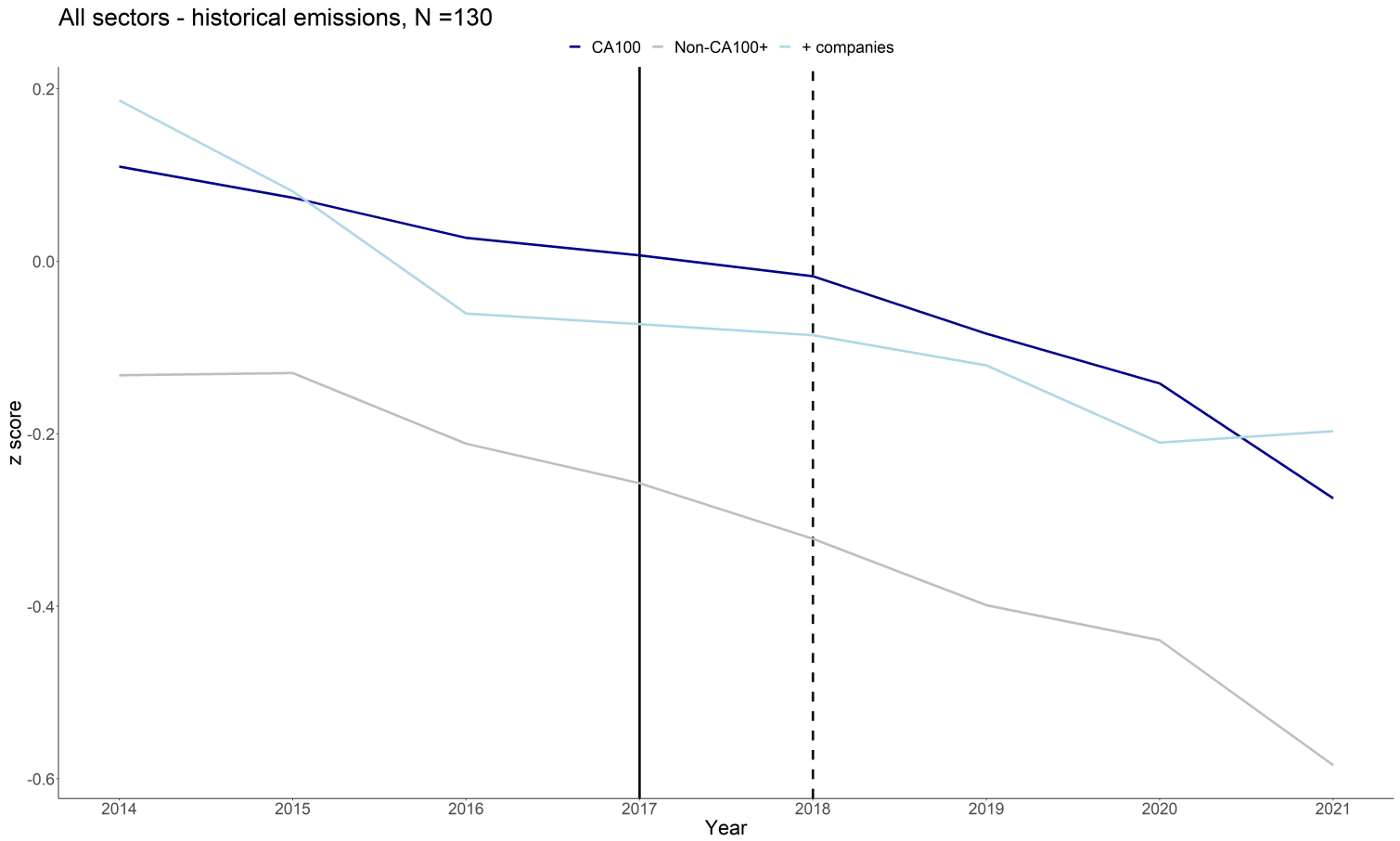

Figure 10: Pre- and post-treatment trends across CA100, Plus and Non-CA100+ companies for historical carbon emission across all sectors.

Appendix - Historical CI - TWFE DiD

	CA100	Plus List
CA100+	0.06	0.05
	(0.07)	(0.09)
Num. obs.	798	690
R^2	0.95	0.93
Adj. R^2	0.94	0.92

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 10: DiD conducted on historical carbon intensities for the CA100 and Plus companies across all sectors.

back

Appendix - CDP - First-Differences

	CA100	Plus List
CA100+	−0.10**	−0.07
	(0.04)	(0.04)
Num. obs.	316	290
R^2	0.02	0.01
Adj. R^2	0.02	0.00

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 11: First-Differences analysis on reporting to CDP, comparing the CA100 and Plus to Non-CA100+ companies.

Appendix - CI disclosure - First-Differences

	CA100	Plus List
CA100+	−0.12*	−0.1
	(0.05)	(0.05)
Num. obs.	214	203
R^2	0.03	0.02
Adj. R^2	0.02	0.01

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$;$^{\cdot}p < 0.1$

Table 12: First-Differences analysis on the years with reported carbon intensities (%), comparing the CA100 and Plus to Non-CA100+ companies.

back

Appendix - Targets with CCPI - DiD - CA100

	TY: 2025	TY: 2035	TY: 2050
CA100+	0.09	0.13	0.04
	(0.09)	(0.13)	(0.23)
CCPI	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.01)
R^2	0.91	0.78	0.61
Adj. R^2	0.90	0.75	0.55
Num. obs.	766	852	852

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 13: DiD on target setting, including CCPI country scores, CA100 compared to Non-CA100+ (z-scores)

Appendix - Targets with CCPI - DiD - Plus

	TY: 2025	TY: 2035	TY: 2050
CA100+	-0.14	-0.49*	-1.00*
	(0.11)	(0.21)	(0.46)
CCPI	-0.00	-0.01	-0.01
	(0.00)	(0.01)	(0.01)
R^2	0.86	0.71	0.56
Adj. R^2	0.84	0.66	0.49
Num. obs.	695	779	779

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 14: DiD on target setting, including CCPI country scores, Plus compared to Non-CA100+ (z-scores)

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Appendix - Matching results - within sectors

Sector	CA100	Plus	Non-CA100+	Total
Electricity	9	15	24	48
Autos	9	4	13	26
Oil and gas	9	NA	9	18
Cement	1	3	4	8
Steel	4	3	7	14
Total	32	25	57	**114**

Table 15: Sample size by company group and sector after matching on pre-trends within sectors.

Appendix - Matching results - Electricity

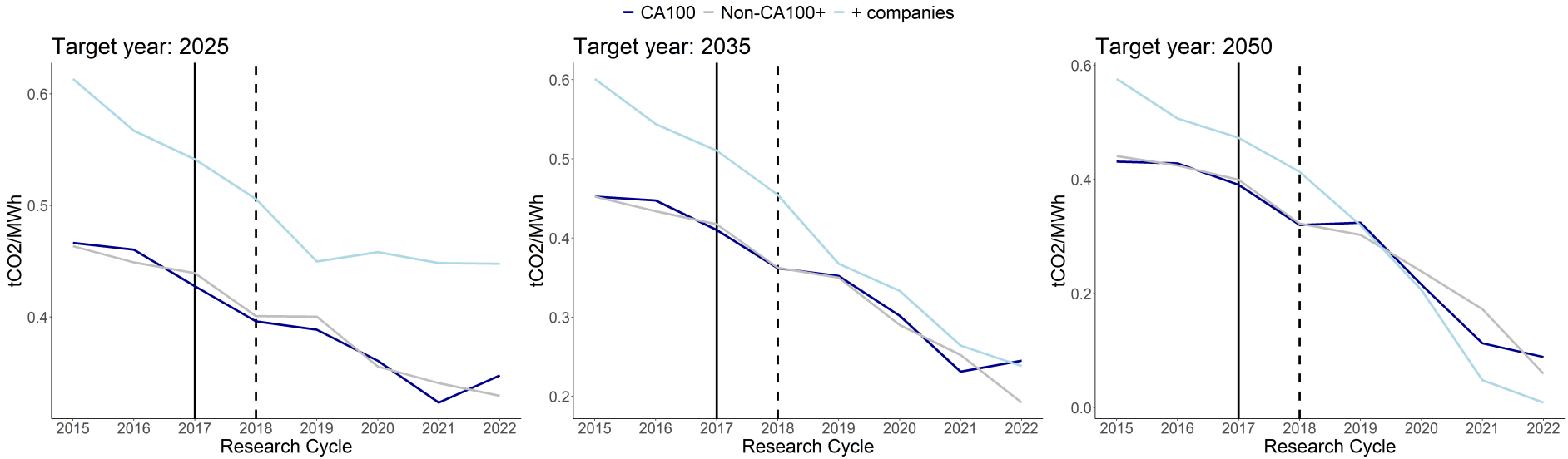


Figure 11: Matching results, Electricity - gCO2/MWh)

Appendix - TWFE DiD - Electricity - CA100

	TY: 2025	TY: 2035	TY: 2050
CA100+	-0.02	-0.01	-0.00
	(0.03)	(0.04)	(0.05)
R^2	0.88	0.81	0.72
Adj. R^2	0.86	0.78	0.67
Num. obs.	275	275	275

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 16: DiD, CA100 compared to Non-CA100+, electricity sector.

Appendix - TWFE DiD - Electricity - Plus

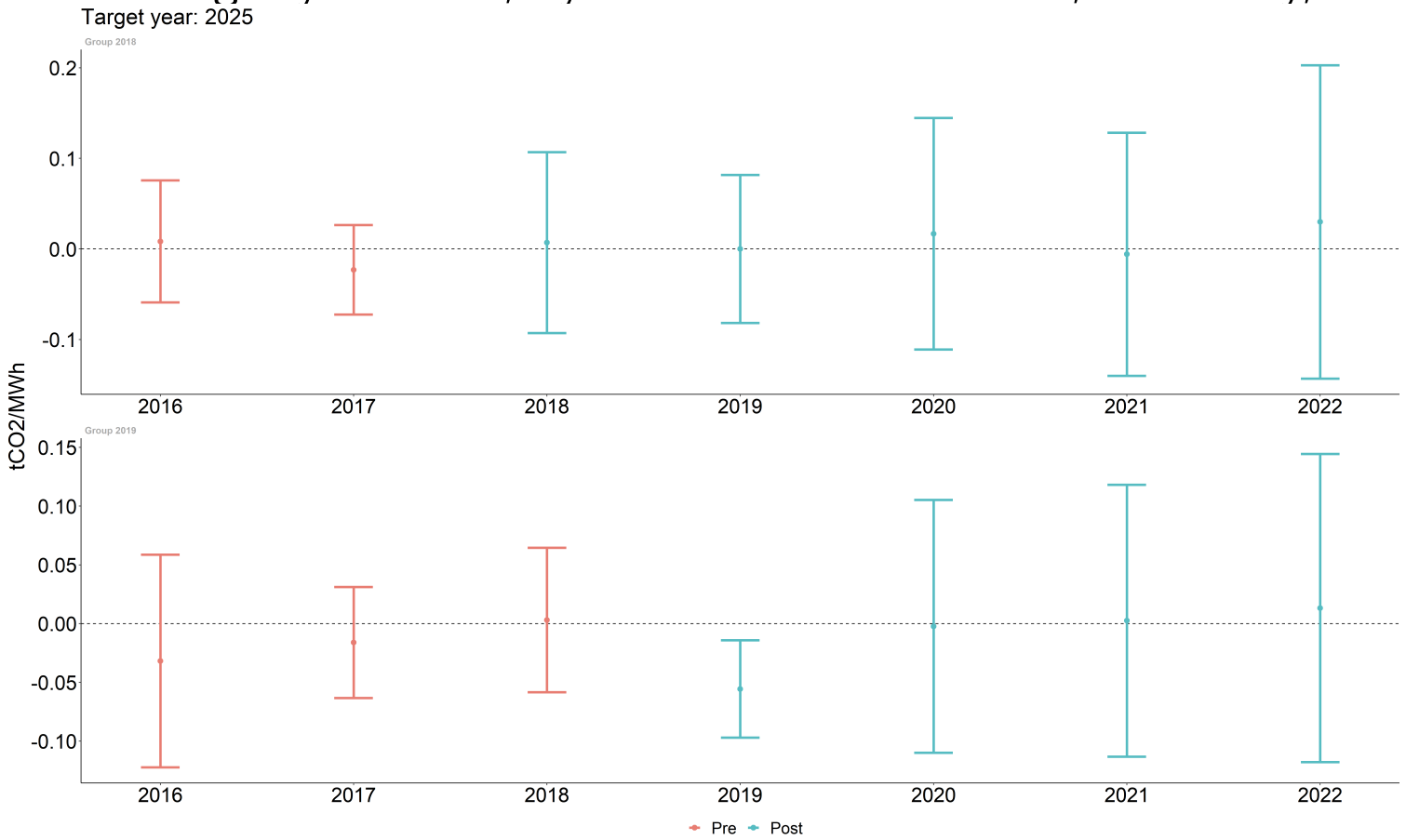
	TY: 2025	TY: 2035	TY: 2050
CA100+	-0.02	-0.07*	-0.10**
	(0.02)	(0.03)	(0.04)
R^2	0.87	0.78	0.71
Adj. R^2	0.84	0.74	0.66
Num. obs.	338	338	338

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 17: DiD, Plus compared to Non-CA100+, electricity sector.

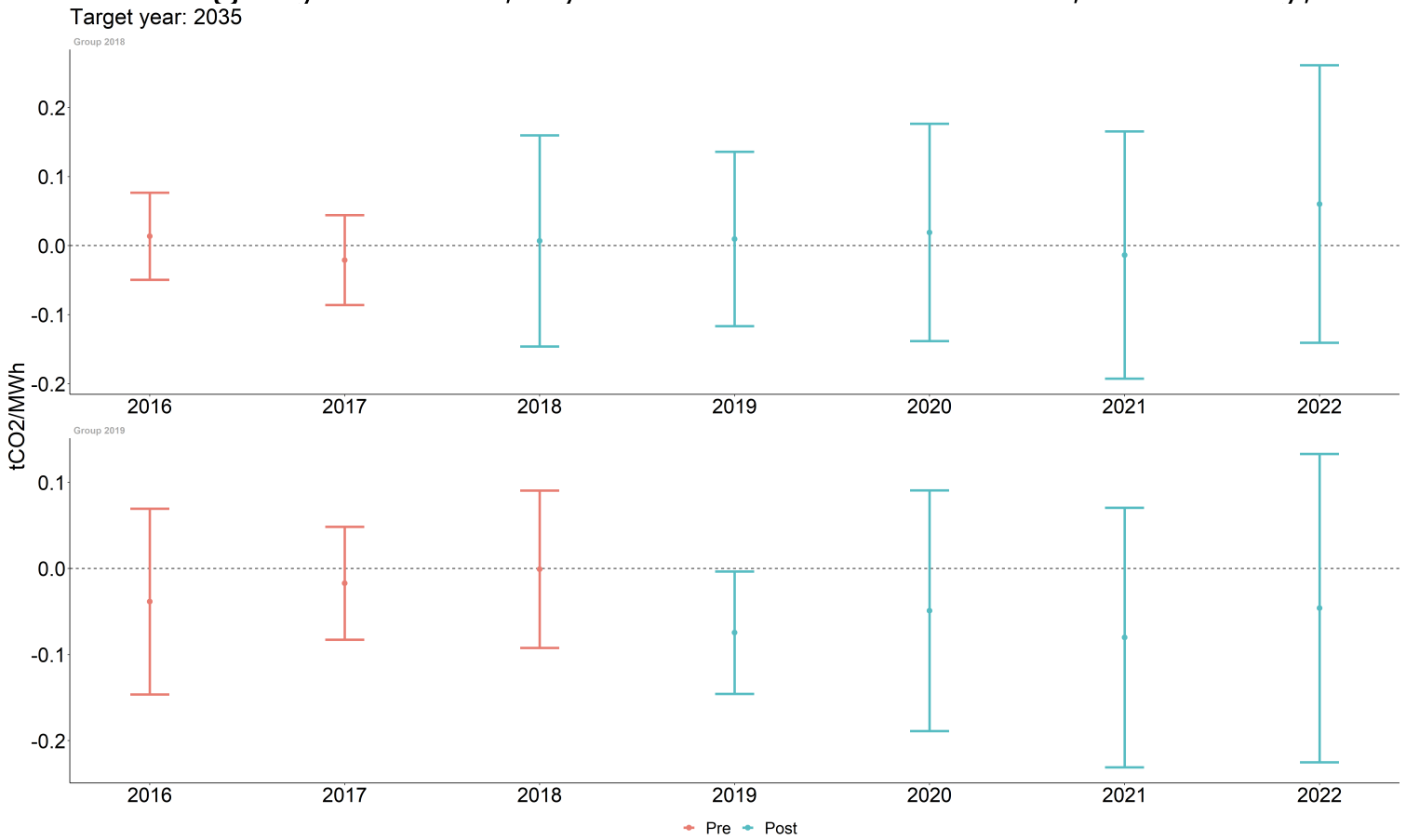
Appendix - Event study TY2025 - Electricity

Figure 12: Target year 2025, dynamic treatment effect, electricity, $\alpha = 5\%$)



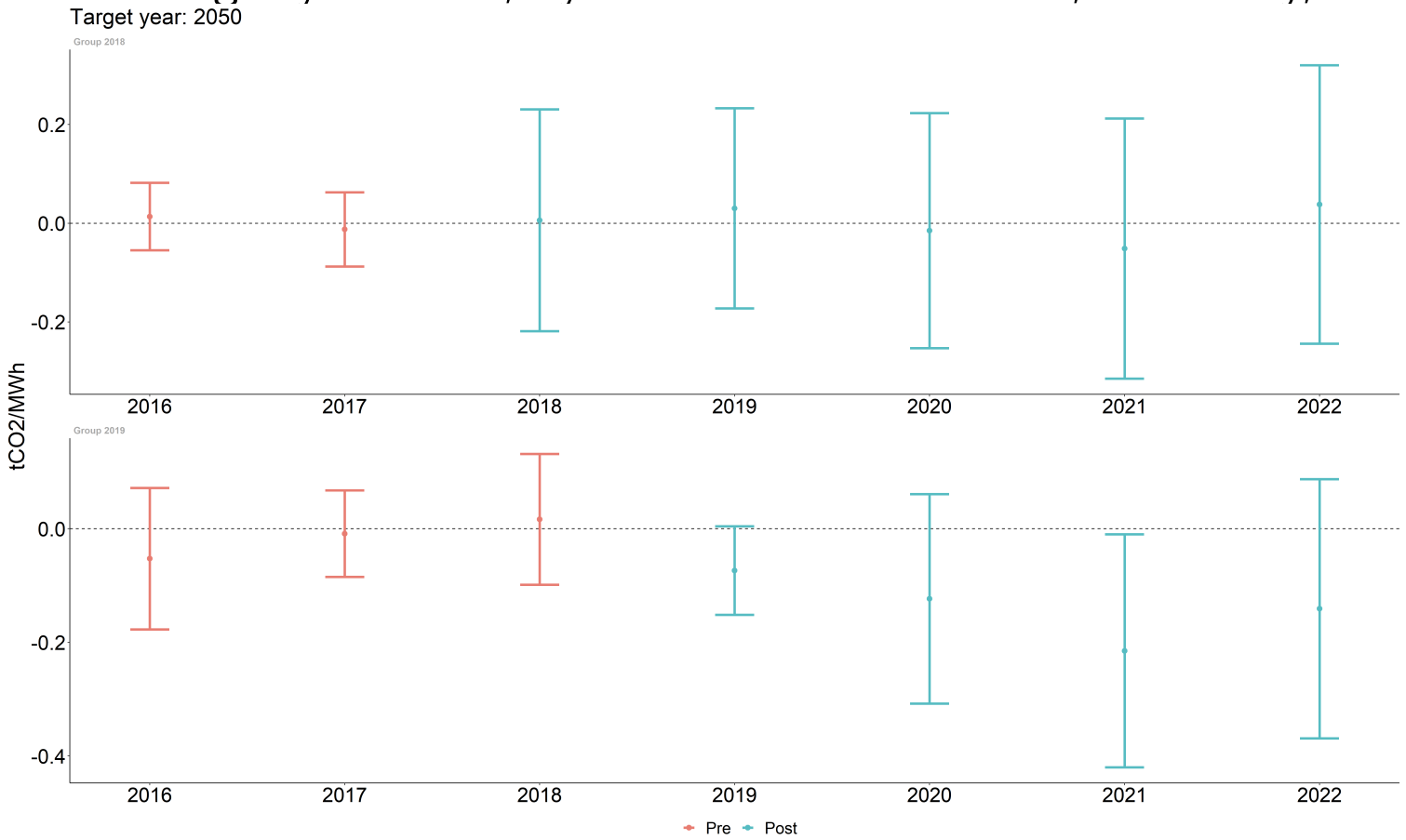
Appendix - Event study TY2035 - Electricity

Figure 13: Target year 2035, dynamic treatment effect, electricity, $\alpha = 5\%$)



Appendix - Event study TY2050 - Electricity

Figure 14: Target year 2050, dynamic treatment effect, electricity, $\alpha = 5\%$)



Appendix - Matching results - Autos

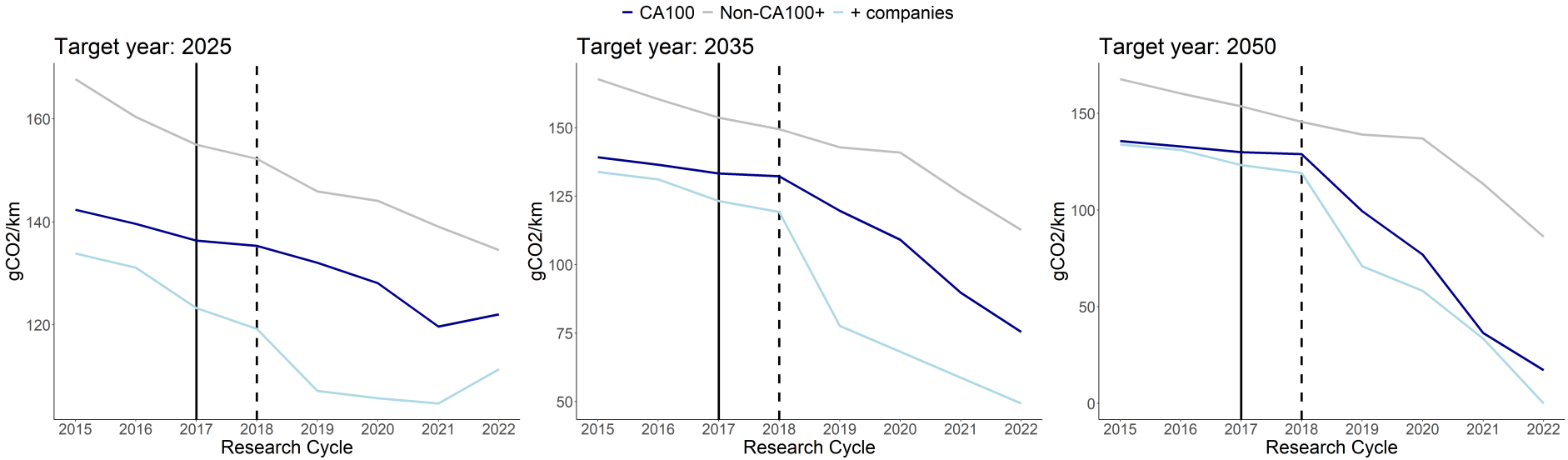


Figure 15: Matching results, Autos - gCO2/km)

Appendix - TWFE DiD - Autos - CA100

	TY: 2025	TY: 2035	TY: 2050
CA100+	6.85	-1.43	-17.90
	(4.26)	(7.21)	(11.91)
R^2	0.96	0.92	0.86
Adj. R^2	0.96	-0.90	0.83
Num. obs.	175	175	175

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 18: DiD, CA100 compared to Non-CA100+, automotive sector.

Appendix - TWFE DiD - Autos - Plus

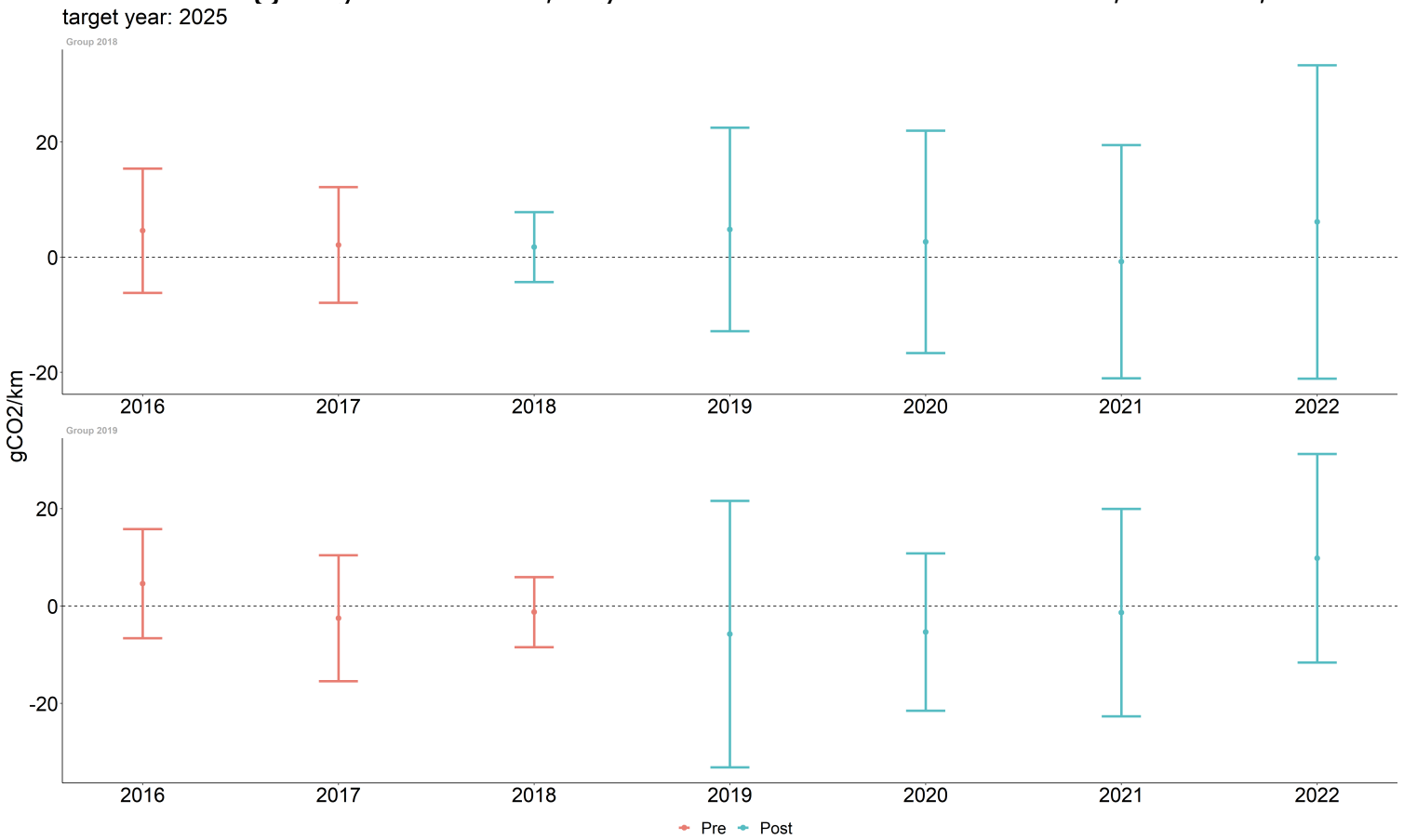
	TY: 2025	TY: 2035	TY: 2050
CA100+	-1.93	-28.59***	-36.75**
	(4.78)	(8.00)	(12.42)
R^2	0.97	0.94	0.89
Adj. R^2	0.97	0.93	0.87
Num. obs.	135	135	135

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\cdot}p < 0.1$

Table 19: DiD, Plus compared to Non-CA100+, automotive sector.

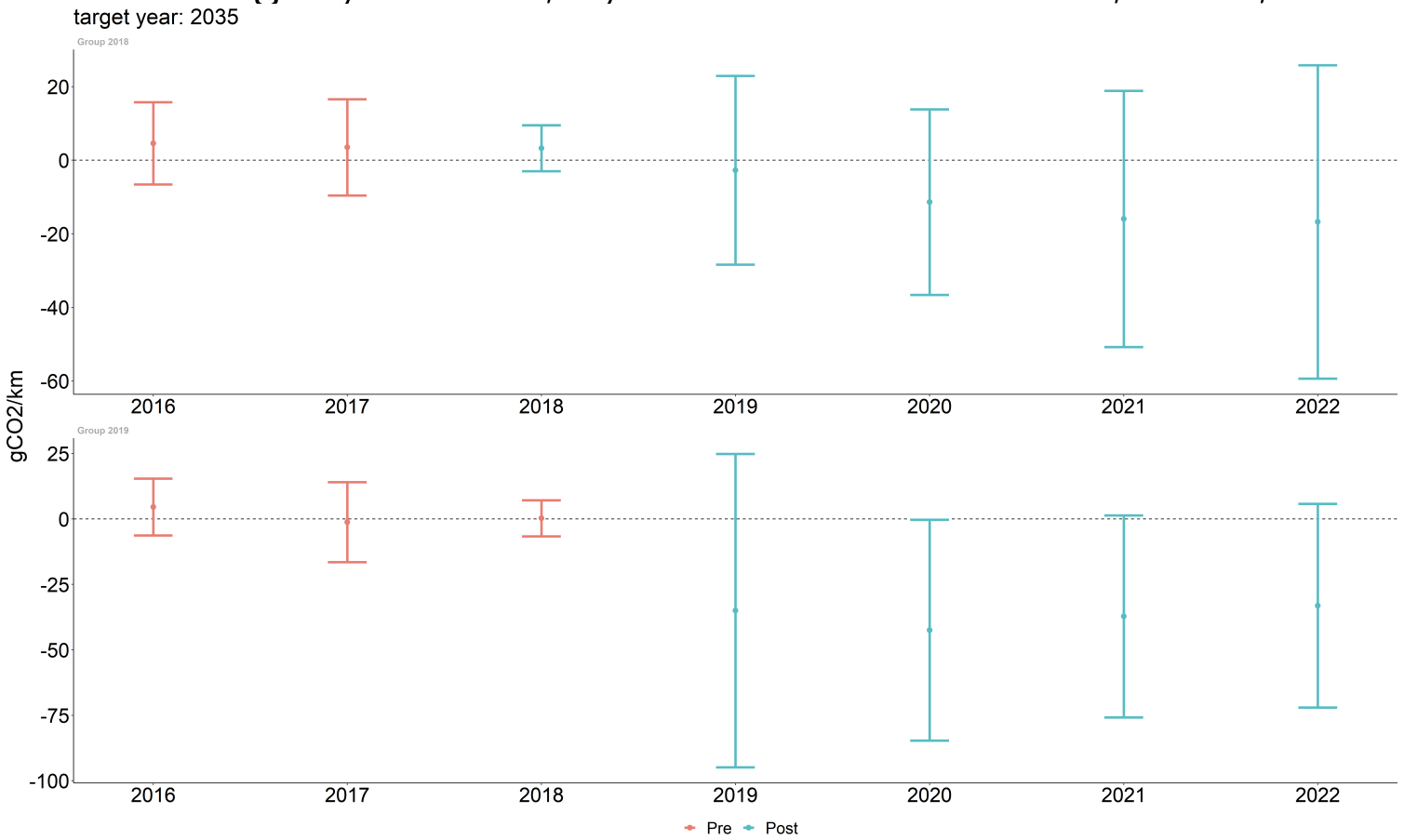
Appendix - Event study TY2025 - Autos

Figure 16: Target year 2025, dynamic treatment effect, autos, $\alpha = 5\%$)



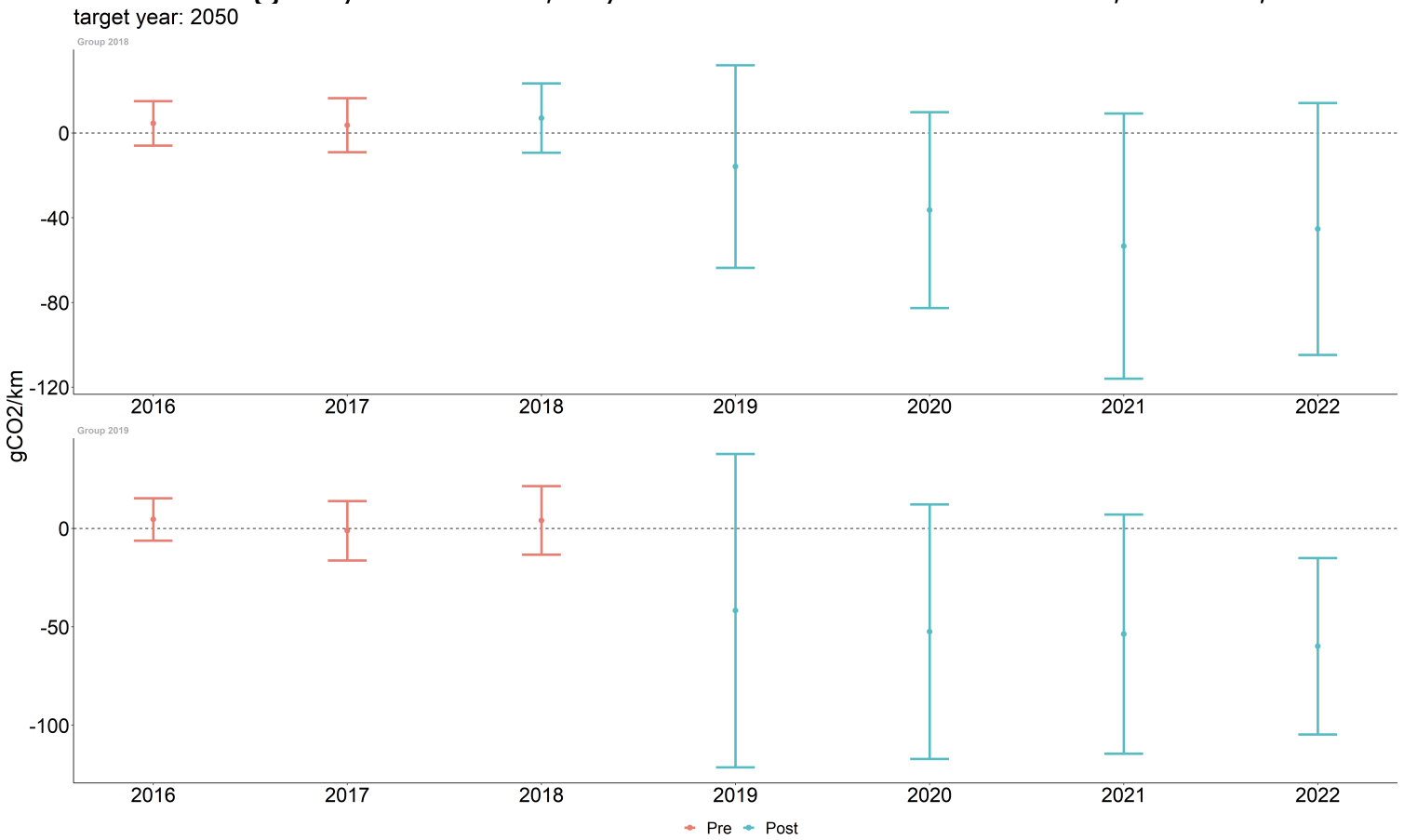
Appendix - Event study TY2035 - Autos

Figure 17: Target year 2035, dynamic treatment effect, autos, $\alpha = 5\%$)



Appendix - Event study TY2050 - Autos

Figure 18: Target year 2050, dynamic treatment effect, autos, $\alpha = 5\%$)



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