Online Appendix

Do financial markets respond to green opportunities?

Authors: Tobias Kruse, Myra Mohnen and Misato Sato

Contents

Appendix A FTSE Russell Low Carbon Economy Sector Classification

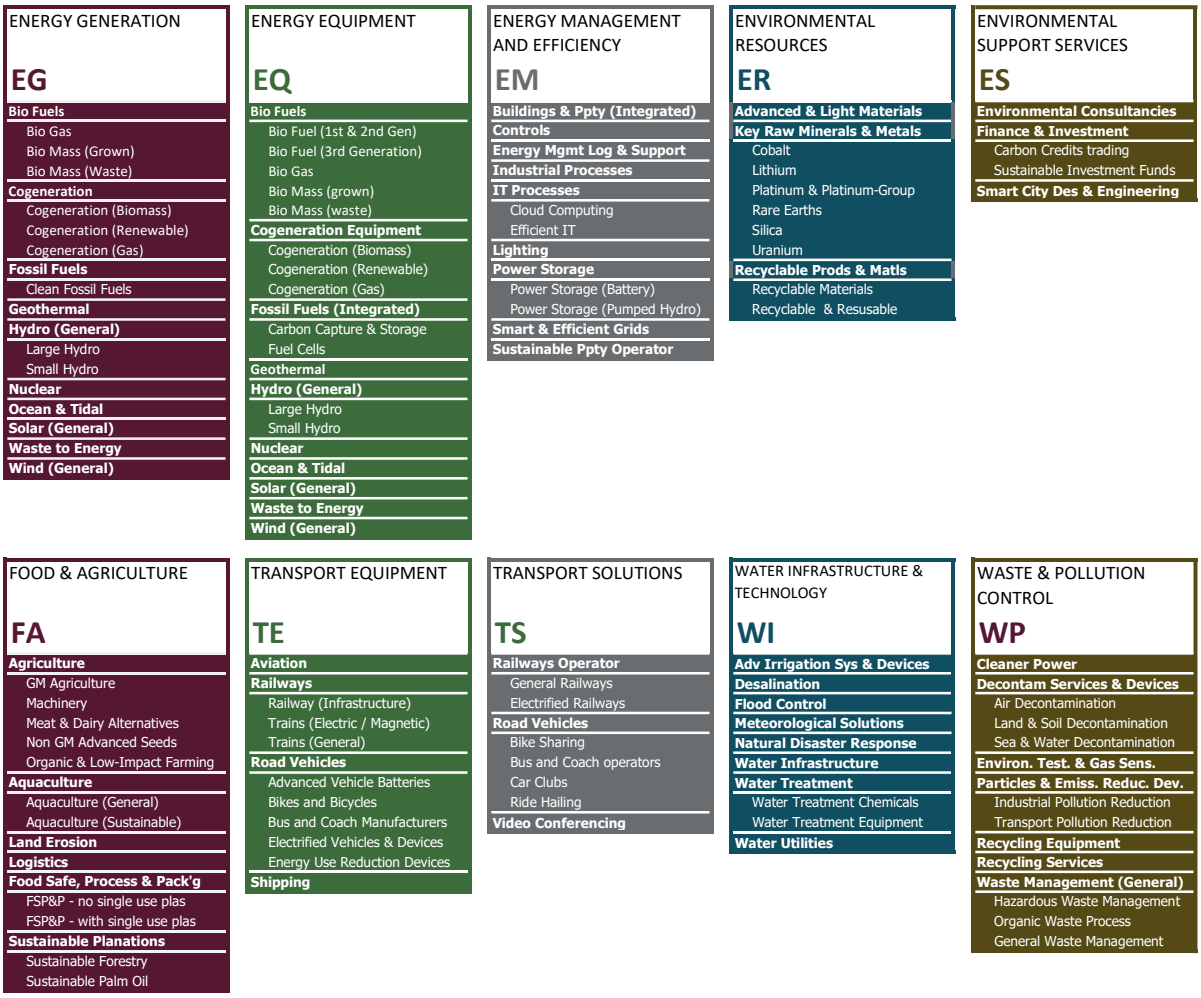

Table A.1: FTSE Russell Low carbon Economy Sectors and Sub-sectors

Appendix B Google Trend Statistics

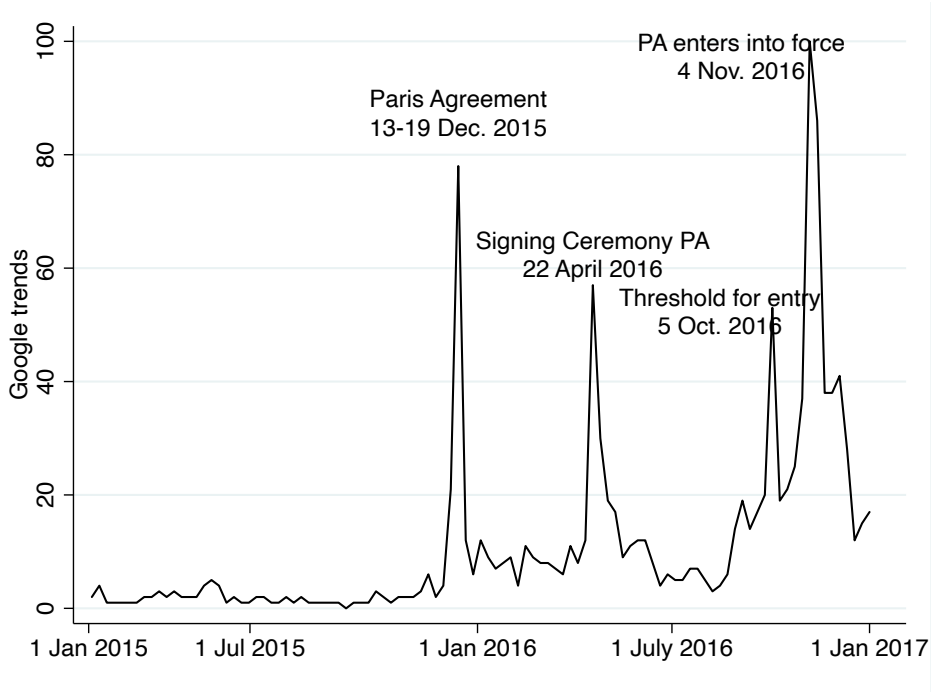

Figure B.1: Google Trend Statistics for the term 'Paris Agreement' (searched for in the US between March 2015 and December 2016).

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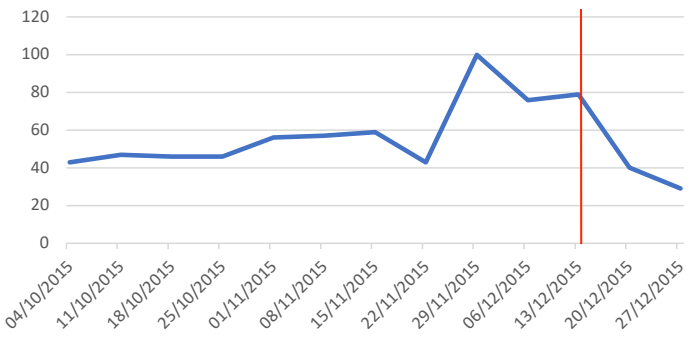


Figure B.2: Google trends index for "climate change" searches
Notes: https://trends.google.com/trends/?geo=GB

Appendix C Additional Descriptives

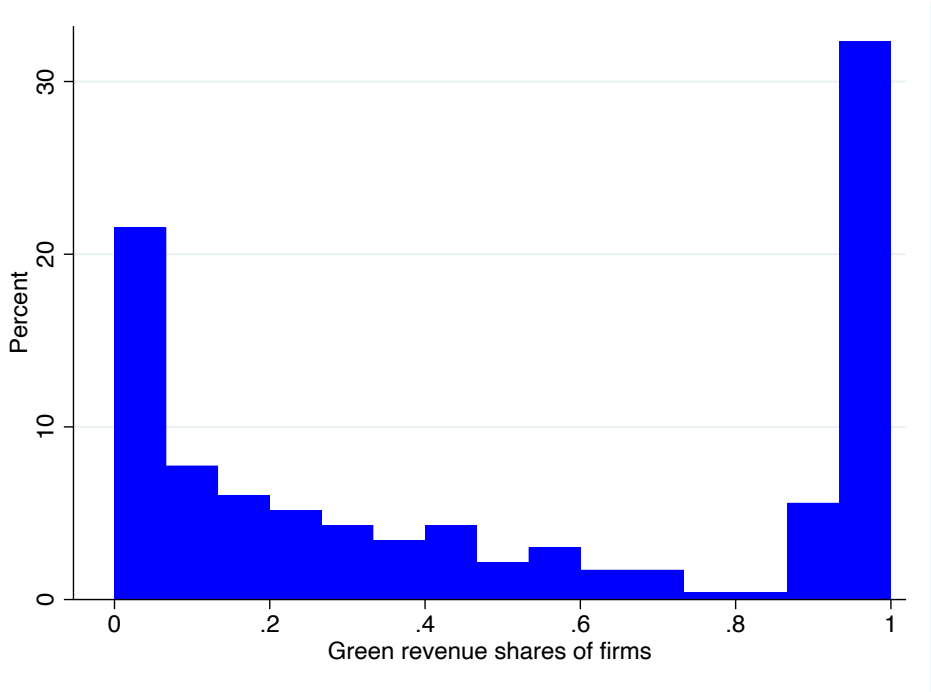


Figure C.1: The distribution of minimum green revenue shares across US firms, with a minimum green revenue share >0 between 2009-2013 (N=249).

	Mean	Median	Std. Dev	Bottom 1%	Bottom 5%	Top 5%	Top 1%	Min.	Max.
Daily Returns (in %)									
Green firms (top 30%)	-0.16	0	5.87	-12.82	-6.49	6.02	13.35	-163.14	268.17
Emission intensive firms (scope 1, top 10%)	-0.21	0	3.46	-9.20	-4.41	3.44	7.92	-98.40	45.87
Emission intensive firms (scope 2, top 10%)	-0.14	0	2.81	-7.35	-4.05	3.49	7.38	-98.40	28.04
Clean patenting firms (top 10%)	-0.17	0	10.31	-13.28	-4.30	3.99	15.42	-230.26	230.26
Market Capitalization (in million USD)									
Green firms (top 30%)	2,147.29	362.16	4,286.54	14.06	21.83	11,965.28	20,834.07	14.061	20,834.07
Emission intensive firms (scope 1, top 10%)	12,092.59	7,060.63	13,880.84	281.48	927.91	37,244.70	75,698.73	231.73	76,608.17
Emission intensive firms (scope 2, top 10%)	13,759.27	8,792.16	13,373.65	927.91	1,118.32	39,373.53	60,226.28	784.76	75,698.73
Clean patenting firms (top 10%)	6,867.26	1,236.98	10,962.36	33.71	66.47	37,584.89	39,9953.48	33.71	39,953.48
Average market capitalization (2013)	5,750.00								
3-factor parameters									
r_{mt} (in %)	-0.03	-0.07	1.13	-2.95	-2.03	1.81	2.52	-3.9	3.68
r_{ft} (in %)	0	0	0	0	0	0	0	0	0
SMB (in %)	-0.05	-0.08	0.55	-1.36	-0.87	0.85	1.43	-1.69	1.86
HML (in %)	-0.03	-0.07	0.59	-1.20	-0.9	1.14	1.87	-1.50	1.96

Table C.1: Descriptives Statistics

Note: Daily values are for the period covered in the event study. Event days [-121; +10]. Subsample market capitalization is for 2013, the last pre-treatment year. The average market capitalization is based on all listed domestic US firms in 2013 (World Bank Data). It is calculated by dividing the 2013 market capitalization of listed domestic companies in the US over the total number of listed domestic companies in the US (The World Development Indicators, 2019).

Appendix D Additional Results

D.1 Intensive Margin

(1) Sample A "Greenest"	(2) Mean (Std.dev) CAAR [0;5]	(3) Sample B "Green"	(4) Mean (Std.dev) CAAR [0;5]	(5) Two-sided p-value
GR 100%	10.74 (16.72)	GR>0	2.77 (11.55)	0.000
		GR 25-96%	3.77 (12.37)	0.012
		GR 25-42%	1.60 (6.71)	0.015
GR 97-100%	8.91 (15.48)	GR>0	2.77 (11.55)	0.001
		GR 25-96%	3.77 (12.37)	0.042
		GR 25-42%	1.60 (6.71)	0.035

Table D.1: Difference in intensive green revenue margin for CAAR
Note: This table tests the difference in the post-event CAARs (days 0-5) between different definition of "green" portfolios. The mean and standard deviation of the CAARs for the greenest samples are reported in column 2. The mean CAARs of the firms in the relatively less green portfolios are reported in column 4. Column 5 reports the results from the two sided t-test.

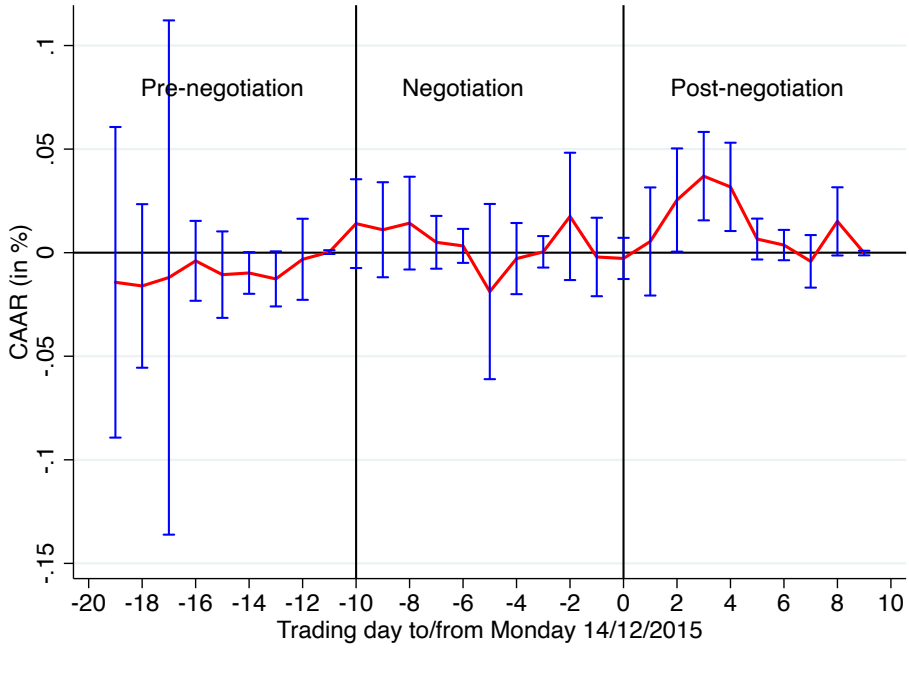


Figure D.1: Abnormal returns for firms in the 50-70% of minimum green revenues (N=63, GR 25-96%)

Note: This red line shows the event path using the rolling 3-day CAARs of firms in the 50-70% of minimum green revenues (N=63, GR 25-96%). The blue bars show the 95% Corrado-Cowan confidence intervals. Monday 14 December 2015 is event day 0. The estimation window is the 100 days prior to the pre-negotiation period.

D.2 The Trump Election

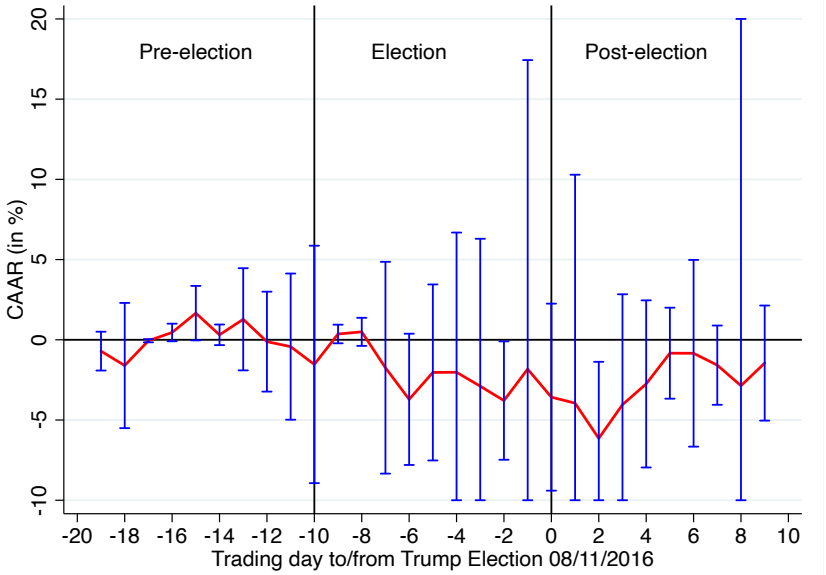


Figure D.2: Abnormal returns for top 30% green revenue firms in the US following the Trump Election

Note: This figure shows the event paths for top 30% green firms (N=128). The red line shows the rolling 3-day CAARs. The blue bars show the 95% Corrado-Cowan confidence intervals.

D.3 Green firms in Europe and Japan

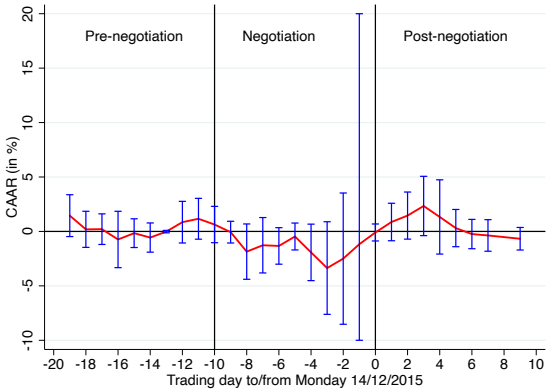


Figure D.3: Abnormal returns for top 30% green revenue firms in Europe

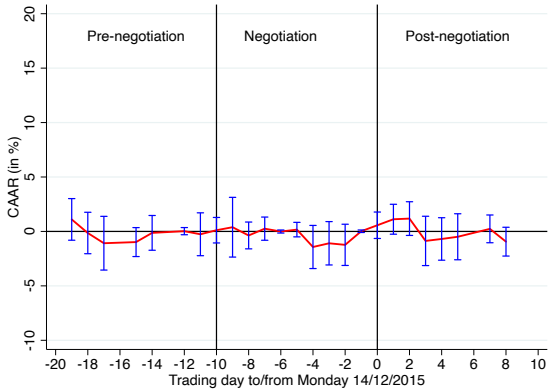


Figure D.4: Abnormal returns for top 30% green revenue firms in Japan

Note: This figure shows the event paths for top 30% green firms in Europe (N=61) and Japan (N=48). The red line shows the rolling 3-day CAARs. The blue bars show the 95% Corrado-Cowan confidence intervals.

D.4 Controlling for climate risk

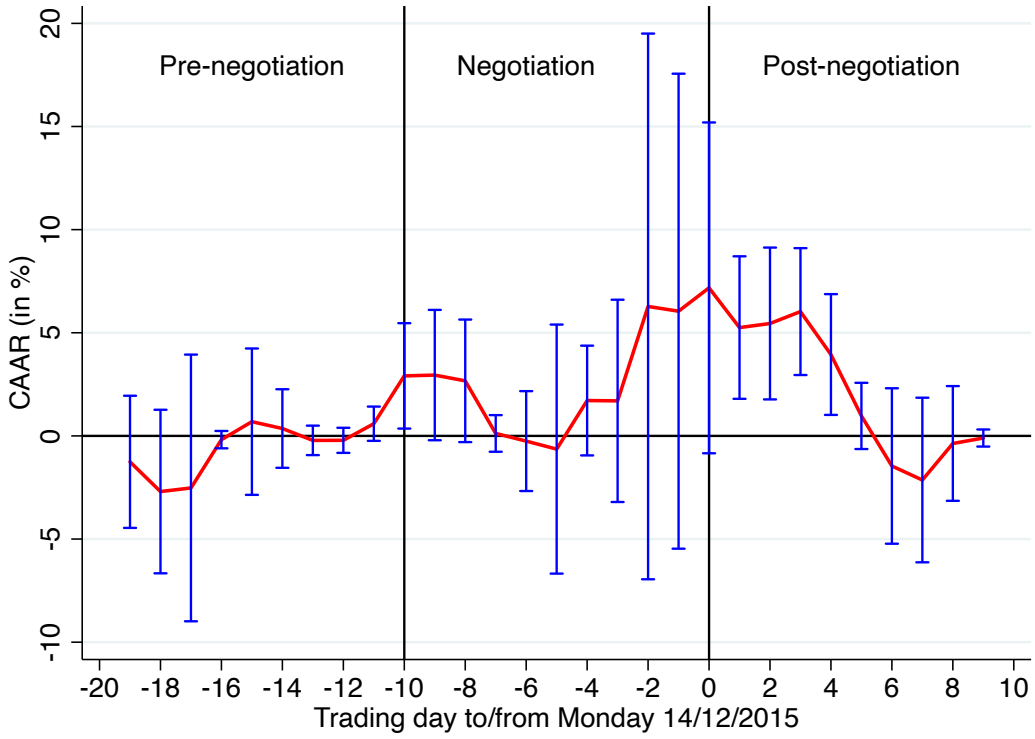


Figure D.5: Abnormal returns for top 30% green firms (GR 97-100%) controlling for climate risk

Note: The red line shows the event path using the 3-day rolling CAARs for top 30% of green firms (GR share 97-100%, N = 63). Here we are additionally controlling for climate-related physical risk exposure as a fourth factor, using data from Gostlow (2021). The blue bars show the 95% Corrado-Cowan confidence intervals.

D.5 Distinguishing by climate related exposure to physical risk

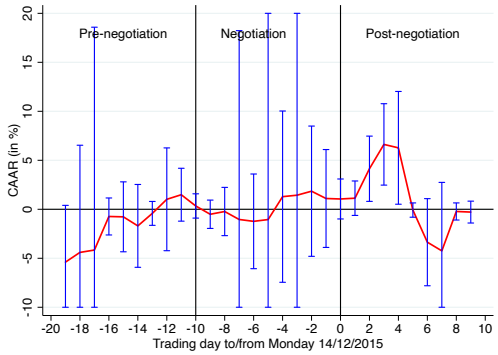


Figure D.6: High climate physical risk exposure

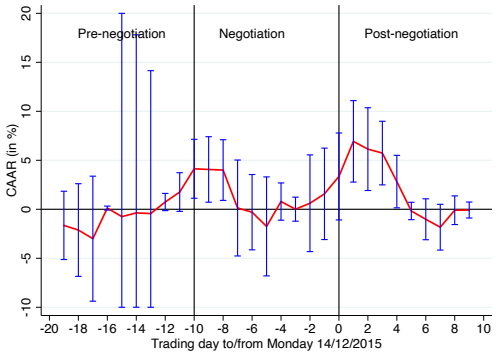


Figure D.7: Low climate physical risk exposure

Note: These figures show the event path for firms exposed to high climate opportunity (N = 20, Figure D.4), to low climate opportunity (N = 20, Figure D.5), to high climate physical risk (N = 8, Figure D.6), and low climate physical risk (N = 32, Figure D.7), using the climate opportunity and physical risk factors from Sautner et al. (2022). The red line shows the rolling 3-day CAARs. The blue bars show the 95% Corrado-Cowan confidence intervals.

Table D.2: CAARs by climate related exposures

H_a : 5-day CAARs of high $\neq$ 5-day CAARs of low			
	Mean 5-day CAARs (Std.dev.)		
Climate change exposure	High	Low	Diff. [p-value]
related to opportunities	0.148	0.039	0.109***
	(0.165)	(0.067)	[0.009]
related to physical shocks	0.075	0.098	-0.024
	(0.072)	(0.148)	[0.668]

Note: This table tests the difference in the post-event CAARs (days 0-5) between High and Low climate change opportunity and physical risk portfolios. The mean and standard deviation of the CAARs for the High and Low portfolios are reported in the left and middle columns respectively. The right column reports the results from the two sided t-test. *,**,***= significant at 10% 5%, 1%.

D.6 Green revenues of carbon intensive firms in electric services

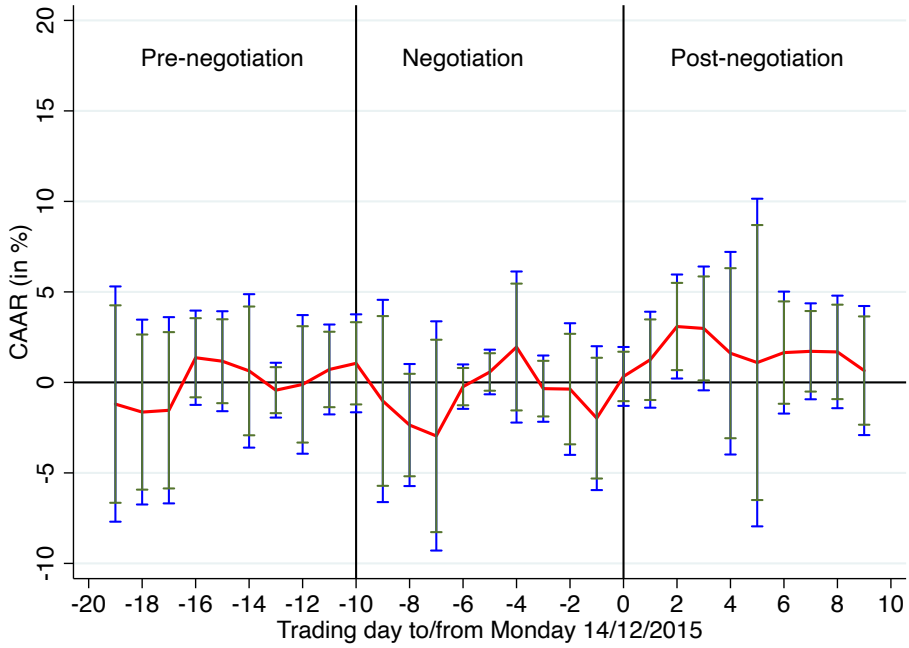


Figure D.8: Abnormal returns for the most emissions intensive firms in electric services

Note: This figure shows the event paths for firms among the 10% most carbon intensive within electric services (SIC=491; N=23). The red line shows the rolling 3-day CAARs. The blue bars show the 95% Corrado-Cowan confidence intervals. The grey bars show the 90% Corrado-Cowan confidence intervals.

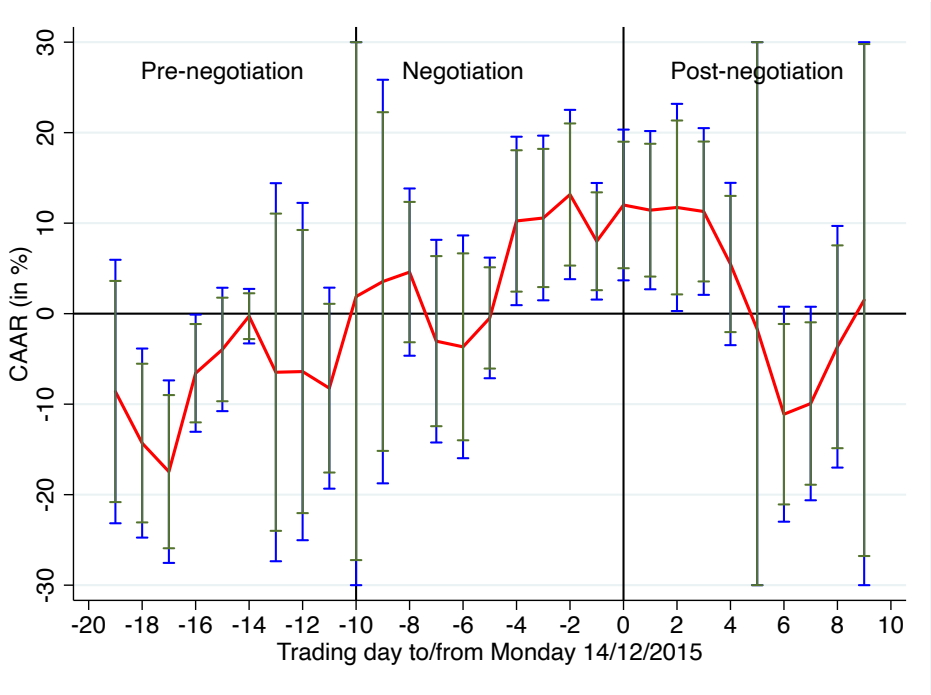
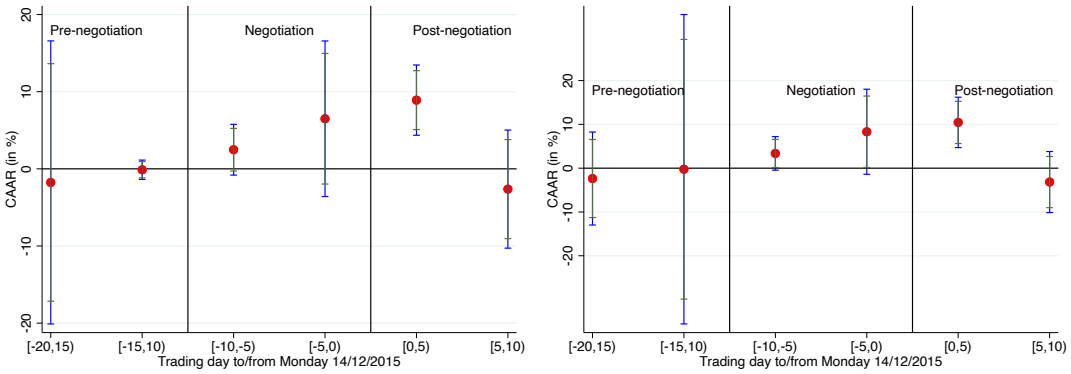


Figure D.9: Abnormal returns for the lowest emissions intensity firms in electric services

Note: This figure shows the event paths for top 30% green firms in electric services (SIC=491; N=10). The red line shows the rolling 3-day CAARs. The blue bars show the 95% Corrado-Cowan confidence intervals. The grey bars show the 90% Corrado-Cowan confidence intervals.

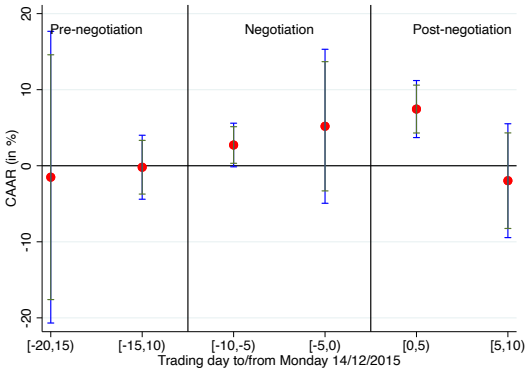
Appendix E Robustness Checks

E.1 Results with a 5-day event window

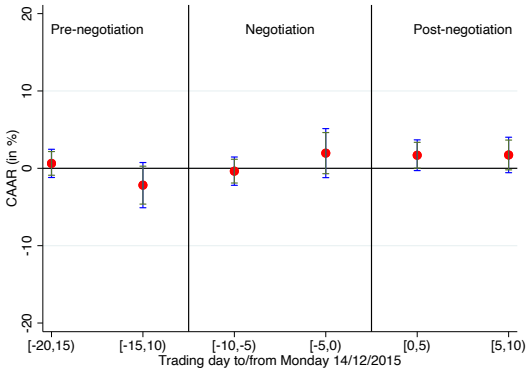


(a) Top 30% green firms

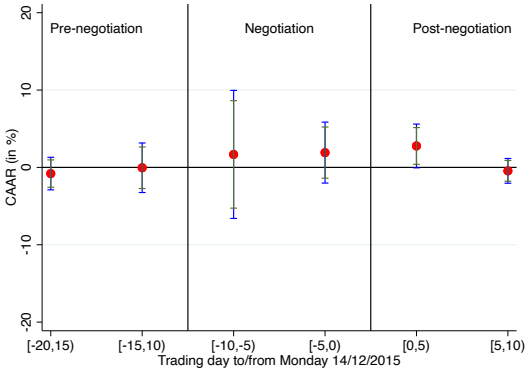
(b) Firm with 100% GR



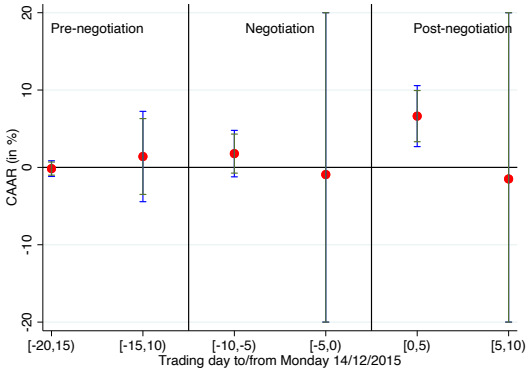
(c) Top 40% green firms



(d) Median of green firms



(e) Any green revenue (>0) between 2009-13



(f) Top 30% of green firms excluding electricity generation (SIC 491)

Figure E.1: Abnormal returns using 5-day CAARs

Note: This figure shows the 5-day CAARs of the different green portfolios. The blue (grey) bars are 95% (90%) Corrado-Cowan confidence intervals.

E.2 Excluding Renewable Energy

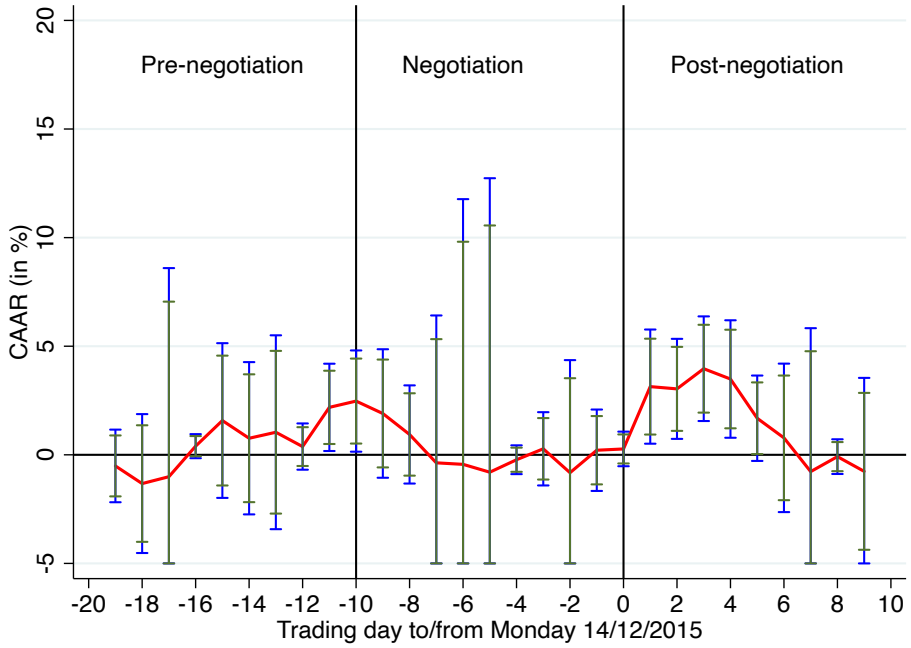


Figure E.2: Abnormal returns for top 30% green firms excluding electricity generation (SIC491)

Note: This figure shows the event paths for the top 30% of green firms, excluding firms in electricity generation (excluding SIC 491). The red line shows the rolling 3-day CAARs. The black bars show the 95% Corrado-Cowan confidence intervals. The grey bars show the 90% Corrado-Cowan confidence intervals.

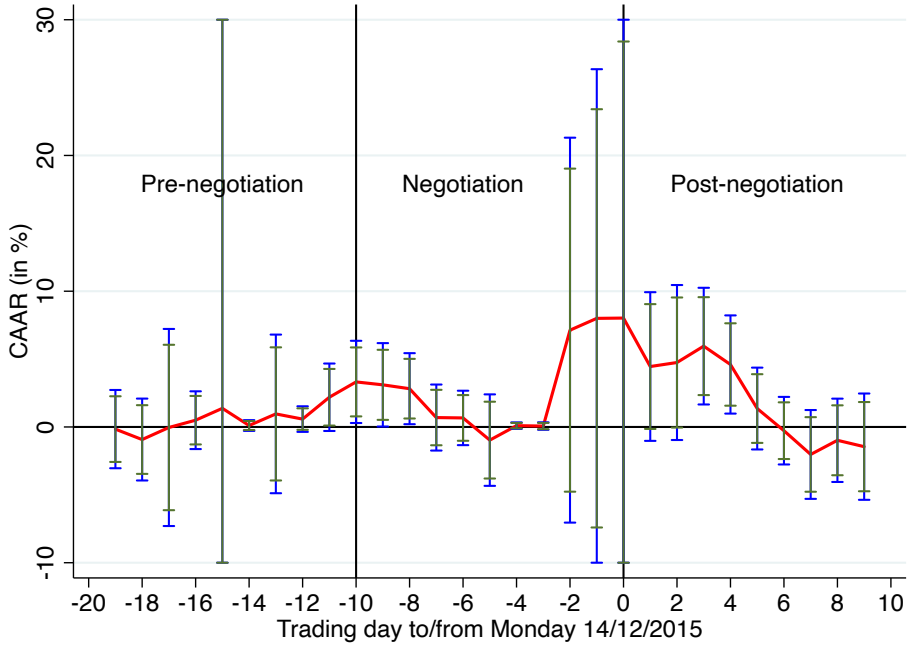
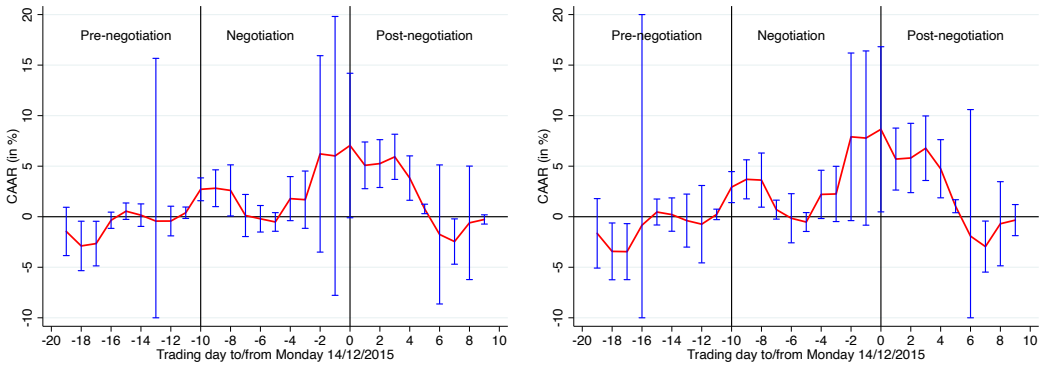


Figure E.3: Abnormal returns for top 30% green firms (GR 97-100%) excluding public utilities: Electricity, Gas, and Sanitary Services (SIC 49)

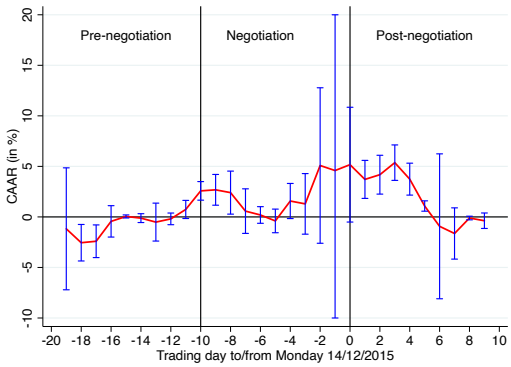
Note: The red line shows the event path using the 3-day rolling CAARs for top 30% green firms (top 30% excluding public utilities: Electricity, Gas, and Sanitary Services (excl. SIC 49, N=38). The blue bars are 95% Corrado-Cowan confidence intervals. The grey bars are 90% Corrado-Cowan confidence intervals).

E.3 Robustness check using the BMP test statistic

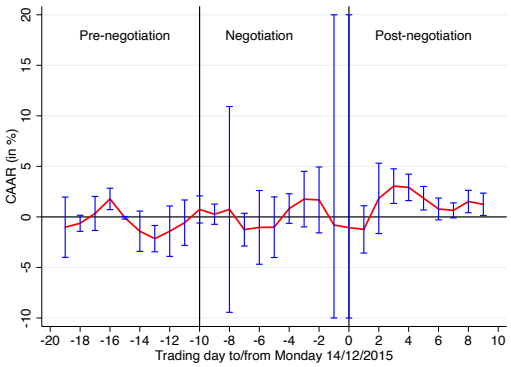


(a) Top 30% green firms

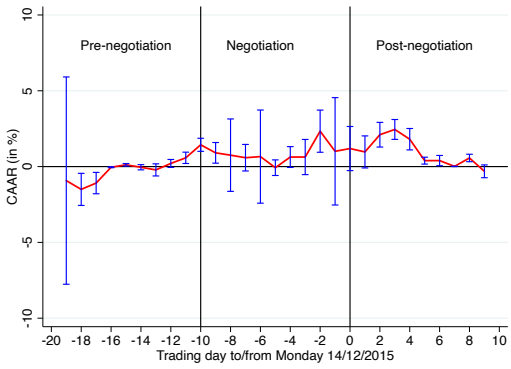
(b) Firm with 100% GR



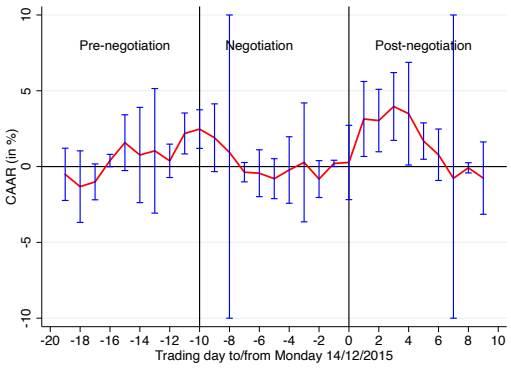
(c) Top 40% green firms



(d) Median of green firms



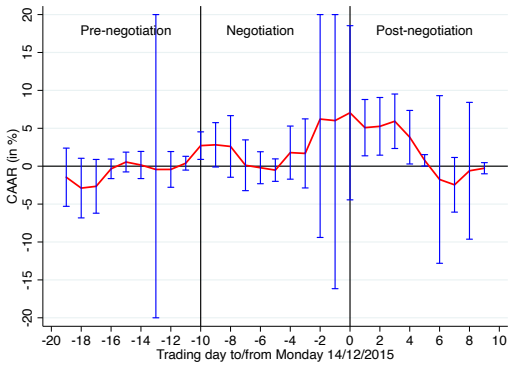
(e) Any green revenue (>0) between 2009-13



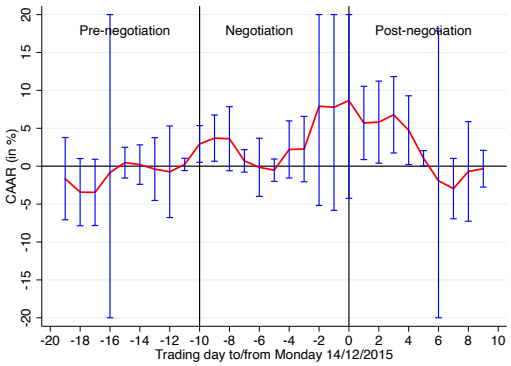
(f) Top 30% of green firms excluding electricity generation (SIC 491)

Figure E.4: Abnormal returns for top 30% green revenue firms using BMP test statistic
Note: This figure shows the 3-day CAARs of the different green portfolios with BMP confidence intervals (Boehmer et al., 1991)

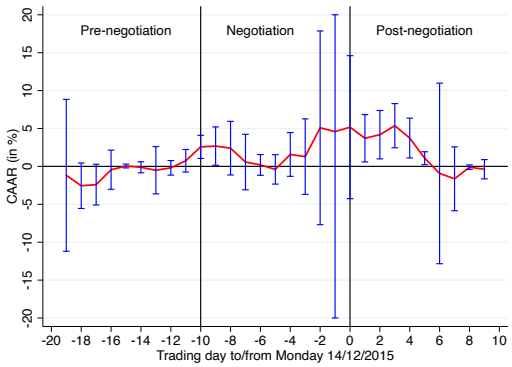
E.4 Robustness Check using the KP test statistic



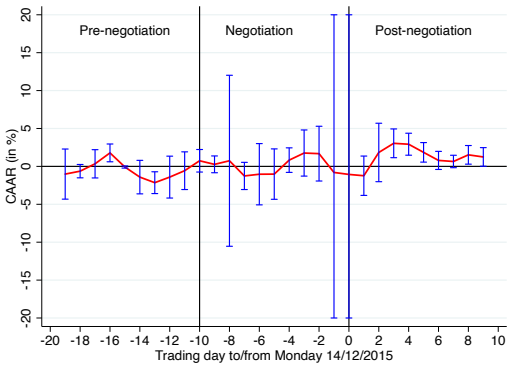
(a) Top 30% green firms



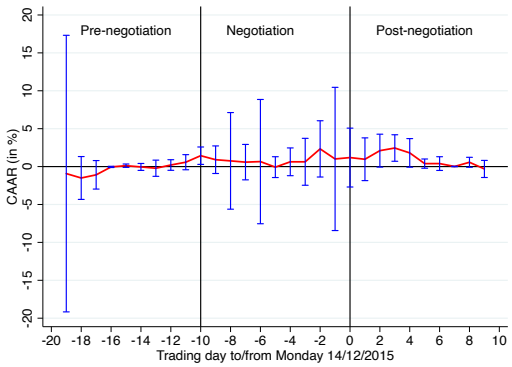
(b) Firm with 100% GR



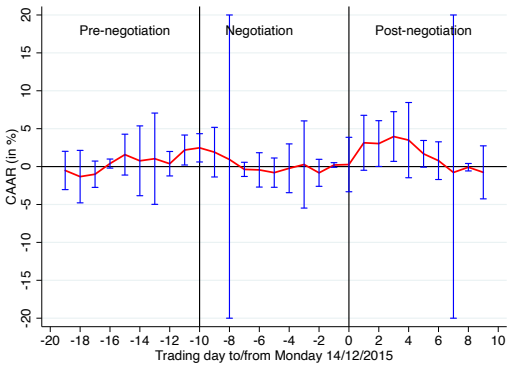
(c) Top 40% green firms



(d) Median of green firms



(e) Any green revenue (>0) between 2009-13

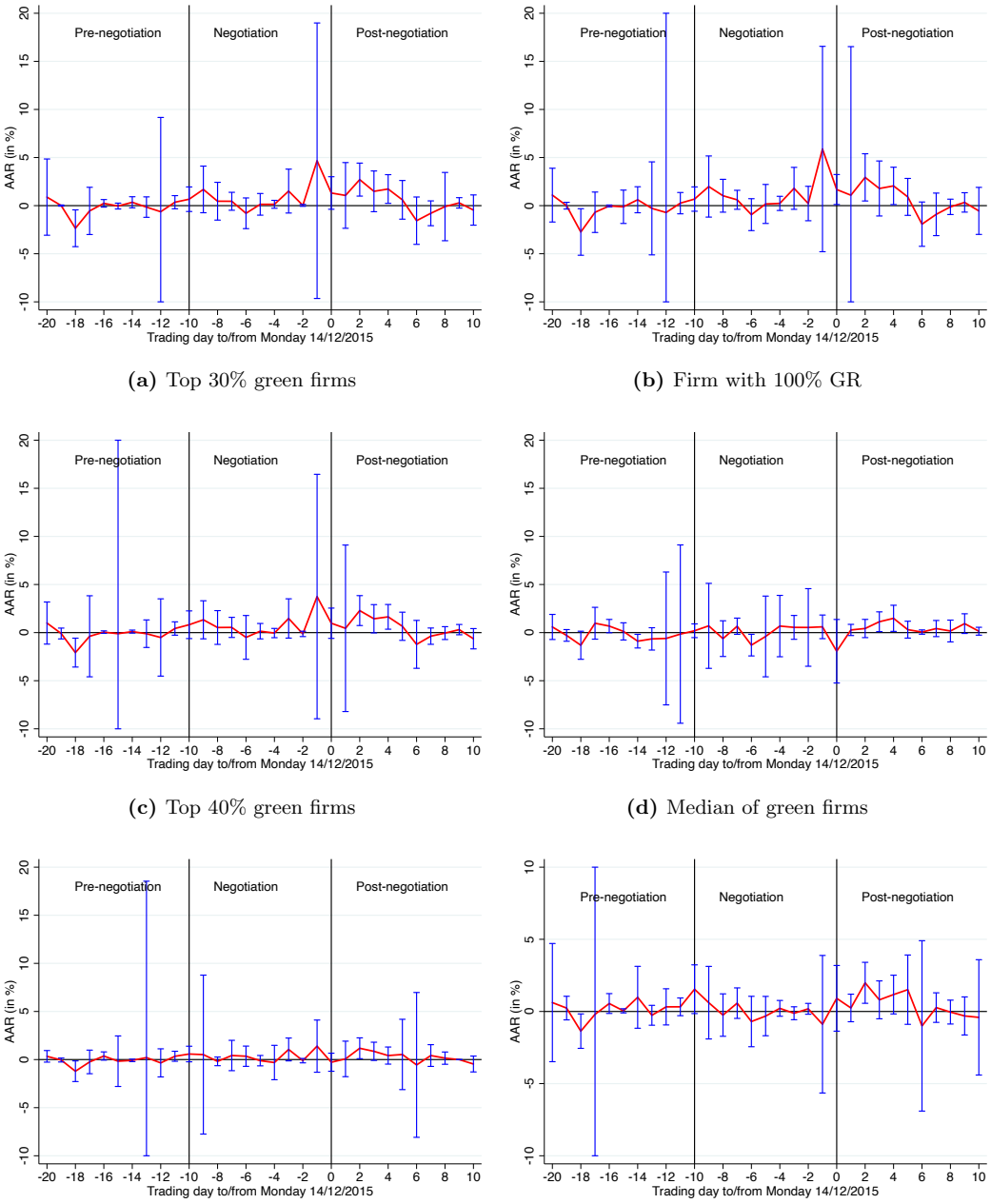


(f) Top 30% of green firms excluding electricity generation (SIC 491)

Figure E.5: Abnormal returns for top 30% green revenue firms using KP test statistic

Note: This figure shows the 3-day CAARs of the top 30% green portfolios with KP confidence intervals (Kolari and Pynnonen, 2010).

E.5 Average Abnormal Returns (AARs)



(a) Top 30% green firms

(b) Firm with 100% GR

(c) Top 40% green firms

(d) Median of green firms

(e) Any green revenue (>0) between 2009-13

(f) Top 30% of green firms excluding electricity generation (SIC 491)

Figure E.6: Average Abnormal Returns (AARs)

Note: This figure shows the Average Abnormal Returns (AARs) of the green portfolios with Corrado-Cowan confidence intervals.

E.6 Robustness check using a random sample of firms without any green revenues

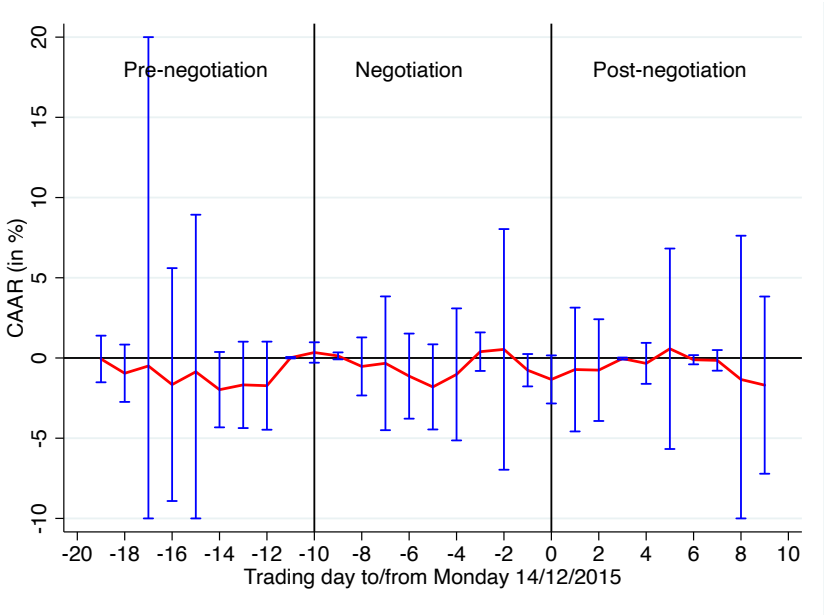


Figure E.7: Abnormal returns for random non-green firms

Notes: This figure presents the event path using rolling 3-day CAARs of the random sample of 96 firms without any green revenues.

E.7 Robustness check using a value-weighted returns

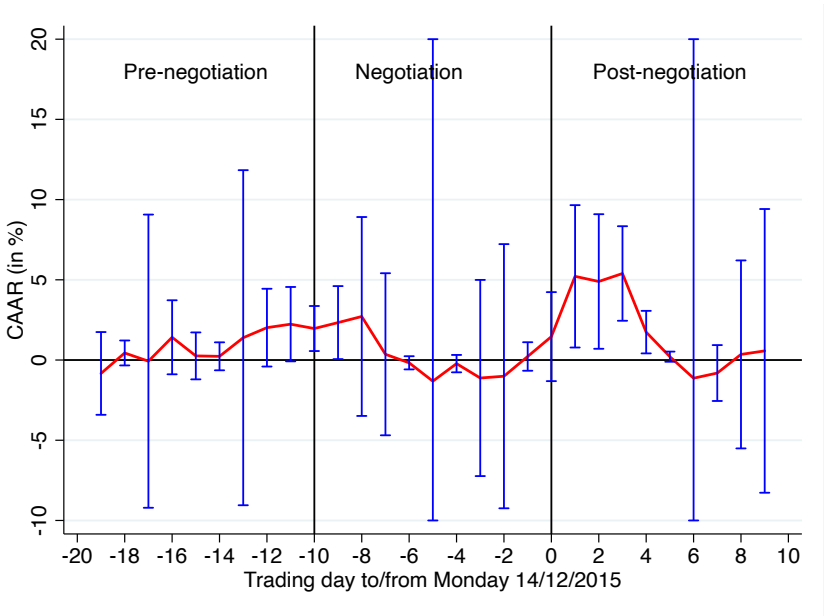


Figure E.8: Abnormal returns for to 30% green revenue share firms with value-weighted portfolio

Notes: This figure presents the event path using rolling 3-day CAARs of the baseline sample weighted by their market capitalization in 2013.

E.8 Alternative estimator - Difference-in-Difference

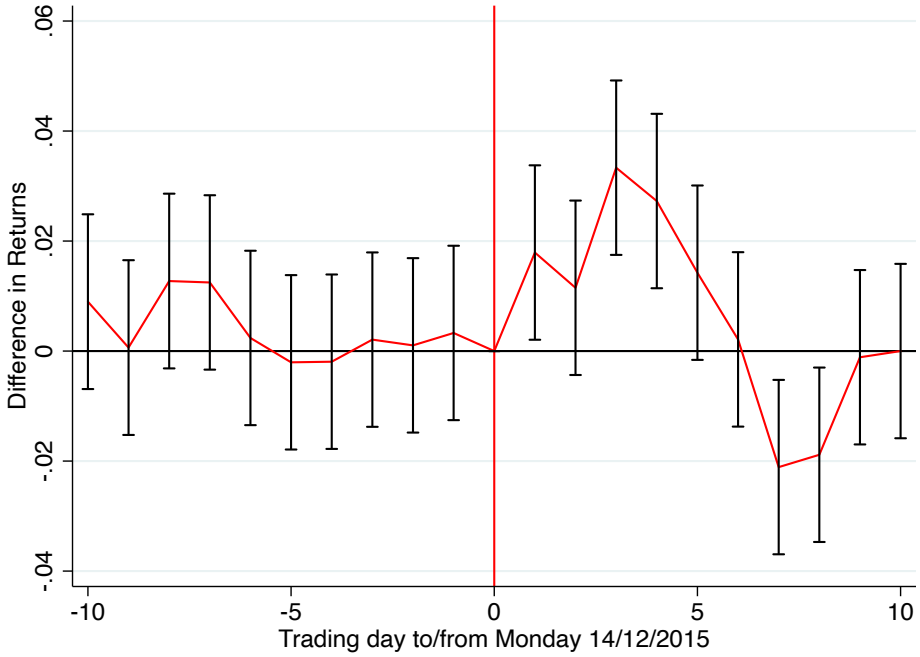


Figure E.9: 97-100% green revenue vs. Emissions intensive firms (scope 1 and 2 emissions)

Notes: This figure shows the treatment effect of the top green firms with 97-100% green revenue compared to emission intensive firms around the Paris Agreement, along with the 95% confidence intervals.

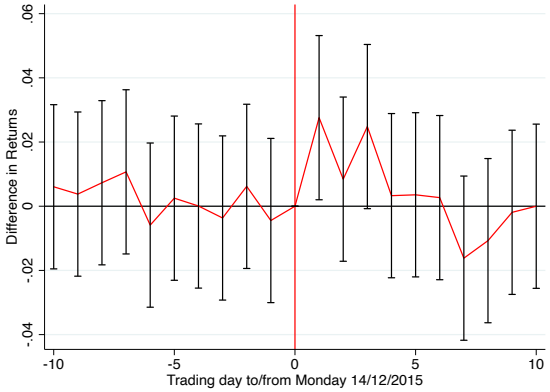


Figure E.10: 97-100% green revenue vs. 25-42% green revenue

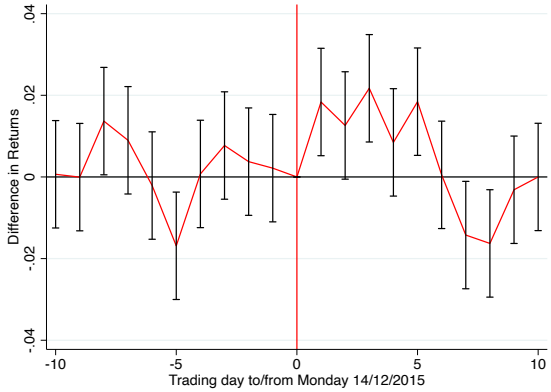


Figure E.11: 97-100% green revenue vs. positive min green revenue

Notes: These figures show the treatment effect of the firms with 97-100% green revenue compared to 25-42% and positive min. green revenue around the Paris Agreement, along with the 95% confidence intervals.

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