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Temperature shocks and corporate environmental policies

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Motivation

- Extreme temperature shifts are salient climate events.
- Salient climate events increase attention to (and belief in) global warming (Borick & Rabe 2014; Howe et al. 2013; Li et al. 2011; Zaval et al. 2014)
- Increased attention to global warming manifests in greater intent to act
 - Household donations (Broomell et al. 2015; Li et al. 2011; Zaval et al. 2014)
 - Retail investors (Choi et al., 2020)

What about firms? Do firms invest more effort into global warming mitigation if there is more attention to global warming?

Based on **upper echelon theory** and the **attention-based view of the firm** as well as previous empirical work, we hypothesize:

1. Temperature shocks (a) trigger behavioral changes in corporate environmental policies, in particular with respect to global warming. This relationship is moderated by attention.

Data: Sources

- **Abnormal temperatures at HQ:** Average surface temperatures from PRISM (4km x 4km) between 1997 and 2017, adjusted for average annual temperatures (based on past 120 months) and average deviation of monthly temperatures from annual mean (see Choi et al., 2020)
- **Environmental performance:** Annual greenhouse gas emissions from US EPA Greenhouse Gas Reporting Program
- **Financial controls:** Quarterly corporate financial data from Compustat

Data: Descriptives (sample means by year)

year	firm count	totassets	sales	GHG_emissions	carbon_intensity	tobinsq
2010	424	27417.17	10974.79	4380911.91	1719.37	0.99
2011	435	27811.32	12205.57	4362720.31	1660.76	0.89
2012	441	28839.67	11674.99	4062593.46	1697.27	0.91
2013	442	29450.53	11783.09	4090148.83	1664.03	1.07
2014	450	30103.24	11744.64	4030644.72	1367.67	1.01
2015	446	29599.71	10252.85	3838761.94	1619.14	0.86
2016	433	31077.80	10128.82	3729483.65	1629.61	1.02
2017	424	33738.42	11295.72	3726799.88	1697.05	1.01

Data: Firm locations

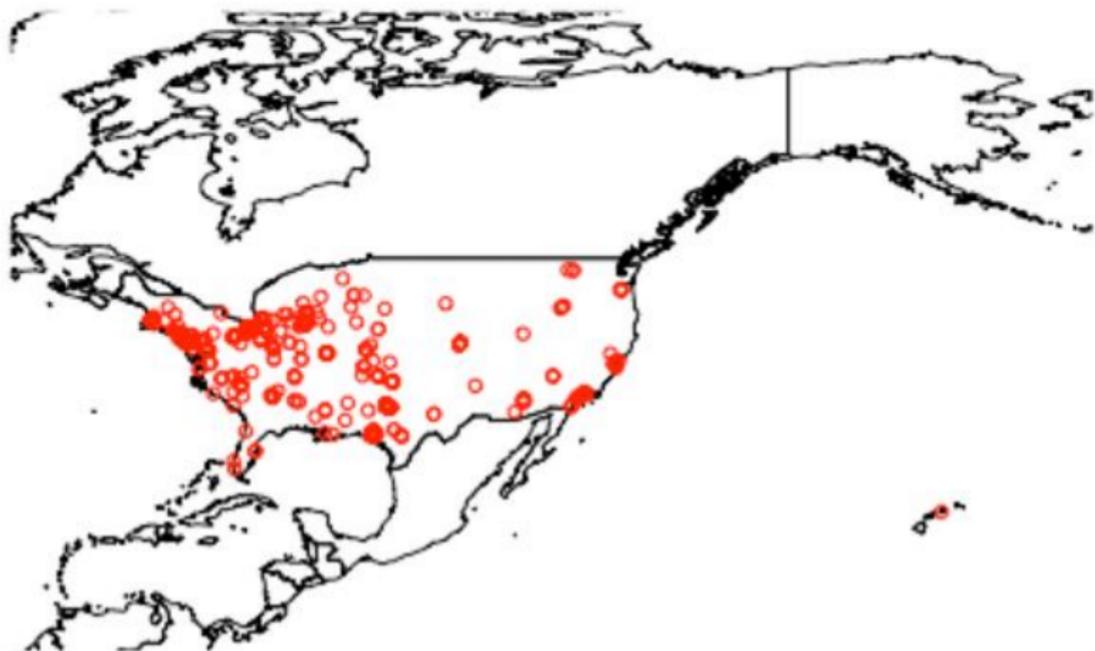


Figure: Caption

Methodology: Regression strategy

To test our hypotheses, we estimate the following first difference panel regression models for log carbon intensities and log GHG emissions with fixed effects for firms and sector-years

$$\Delta \log CI_{i,t} \sim Ab_Temp_{i,t-1} + abs(Ab_Temp_{i,t-1}) + \epsilon_i + \epsilon_{s,t} + \epsilon \quad (1)$$

$$\Delta \log CI_{i,t} \sim Avg_Temp_{i,t-1} + stdev(Temp_{i,t-1}) + \epsilon_i + \epsilon_{s,t} + \epsilon \quad (2)$$

$$\Delta \log GHG_{i,t} \sim Ab_Temp_{i,t-1} + abs(Ab_Temp_{i,t-1}) + \epsilon_i + \epsilon_{s,t} + \epsilon \quad (3)$$

$$\Delta \log GHG_{i,t} \sim Avg_Temp_{i,t-1} + stdev(Temp_{i,t-1}) + \epsilon_i + \epsilon_{s,t} + \epsilon \quad (4)$$

Results

	$\Delta(\log_win_carbon_intensity)$			
	(1)	(2)	(3)	(4)
lag(abnormal, 1)	0.0003 (0.003)	-0.0003 (0.003)		
lag(abnormal_abs, 1)	0.001 (0.001)	0.001 (0.003)		
lag(mean, 1)			-0.003 (0.003)	-0.019 (0.021)
lag(stdev, 1)			-0.007 (0.007)	-0.053** (0.024)
Observations	2,721	2,721	2,714	2,714
Firm FE	no	yes	no	yes
Sector-Year FE	yes	yes	yes	yes
R ²	0.0001	0.00003	0.001	0.002
Adjusted R ²	-0.027	-0.244	-0.026	-0.242
F Statistic	0.148	0.034	0.664	2.384*

Note:

*p<0.1; **p<0.05; ***p<0.01

Results

	$\Delta\log(\text{GHG_emissions})$			
	(1)	(2)	(3)	(4)
lag(abnormal, 1)	-0.002 (0.003)	-0.003 (0.003)		
lag(abnormal_abs, 1)	0.002* (0.001)	0.003 (0.003)		
lag(mean, 1)			-0.006** (0.003)	-0.023 (0.020)
lag(stddev, 1)			-0.021*** (0.007)	-0.062*** (0.023)
Observations	2,721	2,721	2,714	2,714
Firm FE	no	yes	no	yes
Sector-Year FE	yes	yes	yes	yes
R ²	0.001	0.001	0.003	0.003
Adjusted R ²	-0.025	-0.243	-0.023	-0.240
F Statistic	1.893	1.088	4.518**	3.643**

Note:

*p<0.1; **p<0.05; ***p<0.01

Preliminary conclusions

- Lagged abnormal temperatures do not systematically affect corporate environmental strategies with respect to greenhouse gas emissions.
- However, lagged temperature volatilities are negatively related to differences in both carbon intensities as well as log emissions. This is in line with our hypothesis that salient weather can induce firms to improve their GHG footprint.
- Further analyses and robustness checks are required to solidify these claims - What would be suitable further tests?