How Political Events Can Motivate Some Risk Mitigation Activities for Climate Change

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Authors' contributions

This work was carried out in collaboration among all authors.

Article Information

Short Research Article

ABSTRACT

Aim: To stem the risks of future climate change, more people need to be motivated to take actions that will mitigate the release of greenhouse gases into the environment. Important to this discussion was that these actions include both public and private sphere behaviors.
Duration of Study: April 2016 to March 2017.
Methodology: We surveyed individual's beliefs about climate change and their stated willingness to take different actions to mitigate the risks of climate change.
Results: Public sphere behaviors affect the environment only indirectly by influencing either public policies or other private sphere behaviors. Private sphere behaviors have direct environmental consequences but the consequences are small. Individual private sphere behaviors have environmentally significant impacts only in the aggregate when many people independently do similar things.
Conclusion: Our study replicated many of the results from the literature, in particular, that individuals are most willing to engage in small private actions to mitigate climate change, and that at least for large private acts and public acts, individuals who describe themselves as Democrats are also more willing to engage in more costly acts. Our survey also showed an important effect

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from the 2016 election of President of USA. Following the election, Democrats stated an increased willingness to engage in public sphere acts over time. If more individuals engaging in more public acts can influence public policy and can convert other individuals to engage in more private acts over time, then electing leadership who is negative toward climate change can ultimately result in motivating more individual mitigation activity for climate change.

Summary: This work shows that electing leaders who are negative toward climate change could provide a strong motivation for some individuals to be more willing to engage in public sphere acts over time to mitigate climate change.

1. INTRODUCTION

Since the journal *Risk Analysis* was founded in 1980, risk analysis research has generated a wealth of literature exploring why people take protective actions to mitigate risks and identifying many factors that can influence such decisions. For example, studies of hurricane evacuation often examine more than 30 factors [1] that affect public response to warnings including education, family size, age, ethnicity, socioeconomic status, gender, proximity to threat, time to impact, ownership of pets, etc. These studies [2-15] of people's actions in response to risks such as hurricanes, earthquakes, wildfires, and flooding tend to conclude that decisions were based on "complex relationships" [7] between individual's perceptions, personal situations and characteristics, and situational information. Research has also shown that "complex relationships" exist regarding individual's willingness to adopt mitigation actions to reduce the risks of climate change [16-18].

In an attempt to understand these "complex relationships" in risk mitigation decision making for hazards, studies [19] use different theoretical behavioral action models to explain people's protective behaviors. Bamberg [20] showed that both the theory of planned behavior [21] and the value-belief-norm theory [22,23] have predictive power for environmentally-relevant decisions. In exploring why people take mitigation actions in response to different hazards, the protective action decision model (PADM) [24,25] has been used extensively. Given its use in the natural hazards literature, we used PADM to frame our discussion here. PADM identifies critical pre-decision processes specifically the reception, attention, and comprehension of warnings and environmental and social cues. Additionally, PADM considers core perceptions such as threat perceptions, protective action perceptions, and stakeholder perceptions. These pre-decision processes and core perceptions form the basis

for decisions about how to respond to an imminent or long-term threat. This framework was used to discuss the insights gained from a survey conducted of individuals' beliefs about climate change and their stated willingness to take different actions to mitigate the risks of climate change from April 2016 to March 2017.

2. ACTIONS TO MITIGATE CLIMATE CHANGE

Possible actions to mitigate climate change are commonly categorized into individual actions or organizational actions. [26] An example of organizational actions would be corporations altering manufacturing processes to reduce the environmental impact. Because our survey was completed by individuals regarding their possible risk mitigation actions, we focused on only actions that an individual could choose to take.

Within individual actions, there are two main categories of options: public sphere behaviors and private sphere behaviors. [26] Public sphere behaviors affect the environment only indirectly by influencing public policies or by influencing more individuals to take private actions. Changes in public policy can be extremely beneficial because they can change the behaviors of many people and organizations at once. Private sphere behaviors have direct environmental consequences but the consequences are small. Individual private sphere behaviors have environmentally significant impacts only in the aggregate when many people independently do similar things.

We considered ten public sphere behaviors identified from a previous survey by the Audubon Society of their conservative leaning members in North Carolina and Ohio.[27] These ten behaviors were: contact an elected official, vote for politicians that support climate change, speak at a public event, post climate change information on social media, send a signed letter

to a public outlet, send an anonymous letter to a public outlet, host an event about climate change at your home, speak to people you know about climate change, put a sticker/magnet on your car, and put a sign in your yard. We also considered eight private sphere behaviors, ultimately divided into two groups, low and high investment. The low investment private sphere behavior factor were: switch to a programmable thermostat with energy efficient settings, switch to energy efficient light bulbs, lower your water heater temperature, install more insulation your home, and pay for renewable energy through your electricity provider. The three high investment private sphere behaviors were: purchase an electric car or hybrid, bike to work [1] , and purchase solar panels for your home. This distinction was consistent with the literature [28] that demonstrated that as strong constraints were placed on mitigation behaviors in particular when behaviors were costly in terms of effort, money, or time, even people with strong worldviews that support environmental actions think differently about these actions than lower-cost environmental behaviors.

3. PROTECTIVE ACTION DECISION MODEL

The PADM [24,25] looks at how core perceptions of a hazard interact with situational facilitators and impediments to produce a behavioral response. Situational facilitators and impediments would include the lack of a personal vehicle for an evacuation, for example. In the case of climate change mitigation actions, many people may desire to adopt higher investment private actions but lack the financial resources to purchase an electric car, or bicycling to work may be infeasible because of distance, roadways, or personal physical conditions.

The core perceptions of the hazard in PADM consider the threat belief, the perceptions of protective actions, and the perceptions of social stakeholders. These core perceptions are influenced by environmental cues, social cues, information sources, information channels, and warning messages.

Consistent with PADM factors, as Gifford [29] explains, people are better at responding to immediate dangers in present time because of stronger environmental and social cues. The invisibility of climate change and the uncertainty

in attributing specific events and weather patterns to the broader phenomenon was challenging for many people. Also, in contrast to many other issues, people's understanding of the problem relies on expert opinion more than their own personal experiences or images they see portrayed in the media which confuses the information sources and warning messages. Additionally, most people see climate change as a distant phenomenon, occurring in the future with effects most severe in areas outside the United States.[30-33] This affects individual's threat beliefs. Consequently, in the minds of some Americans, addressing issues associated with climate change would inflict more costs than benefits on the population, and thus produce negative responses toward protective actions [29,31]. It was therefore clear that the low threat of immediate risk as well as the lack of personal experience and feelings of vulnerability of climate change explain why too few people choose climate change mitigation actions [31,34,35], and these factors are consistent with the PADM framework.

But despite the numerous challenges, many people do adopt mitigation actions for climate change. Risk research from multiple hazards has shown that effect was an important factor in individual's perceptions of risk [36,37] and subsequent action. In Wei and Lindell [38], threat perception in the PADM was measured by expected personal consequences, hazard intrusiveness and affect. They found that the measures were significantly correlated with each other and that people who expect greater personal consequences think and talk about the hazard more frequently and have greater negative affect. Given the challenges motivating behavioral changes to reduce climate change and the importance of affect in threat perception, Weber [37] raised the question "should we find ways to evoke stronger visceral reactions towards the risk of global warming in citizens, managers, or public officials" (37, p. 114)?

Weber [37] concluded that such actions could have unintended consequences but that some "attention-catching, emotionally-engaging" (37, p. 116) interventions are needed. In this paper, we explore the effect of one "attention-catching, emotionally-engaging" event that broadly evoked "stronger visceral reactions" among many Americans, the 2016 Presidential Election, and its role in changing people's intent to act to mitigate climate change. We used data collected from a survey conducted monthly between May 2016 and May 2017 on Amazon Mechanical Turk

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[1] *While biking to work may not require a significant financial investment, it will require significant effort in most cases.*

(MTurk). This time frame was chosen to examine perceptions six months before and six months after the election.

4. METHODS

The data set used in the analysis came from a data collection project on attitudes toward climate change and attitudes toward behaviors meant to mitigate climate change. Data collection was conducted on MTurk; 1000 participants were recruited each month, data collection was initiated between the 10th and 15th each month, and continued until the sample was full (typically within two days). Participants were only allowed to participate once in two 6 month windows (April – October, November to March). The mean age for the sample was 35.2 (SD = 13.7), and it was 57% female.

Participants answered multiple questions in the MTurk survey, many of them not relevant to this study, but here we discuss their responses to the questions regarding their general belief in climate change and their likelihood to engage in the 18 different climate change activities described above considering time relative to the election and their stated party affiliation. Three factors based on the previously defined groups of climate change activities showed good internal reliability (public sphere behaviors, α= .84, low investment private sphere behaviors, α= .84, and high investment private sphere behaviors, α= .71).

5. RESULTS

Fig. 1 showing the responses for general belief regarding the existence of climate change over the study period separated by party affiliation. Comparing the means of each political party for the six months before the election and for the six months after the election, the election did not change people's beliefs that the climate is changing and the changes are a problem ($M_{\text{Democrat pre}}$ = 6.0, $M_{\text{Democrat post}}$ = 6.0; $M_{\text{Independent pre}}$ = 5.3, $M_{\text{Independent post}}$ = 5.4; $M_{\text{Republican pre}}$ = 4.5; $M_{\text{Republican post}}$ = 4.4). Univariate F statistics show that political party has a significant effect on belief ($F_{2,10323}$ = 1064.5, $p < .001$) but month does not ($F_{12,10323}$ = .939, n.s.; see Fig. 1).

A regression was run to assess the effect of the 2016 presidential election and participants' political party and political orientation on their likelihood to engage in each of the three types of climate change mitigation behaviors. The regressions tests individuals' likelihood to engage in climate change mitigation actions over time, as a function of political party affiliation (or political orientation [Liberal – Conservative]) and the 2016 presidential election. A dummy variable was created to represent responses from before (May 2016 - October 2016) and after (November 2016 - May 2017) the election (Event Election). Political affiliation responses were collected. Using a seven-point scale
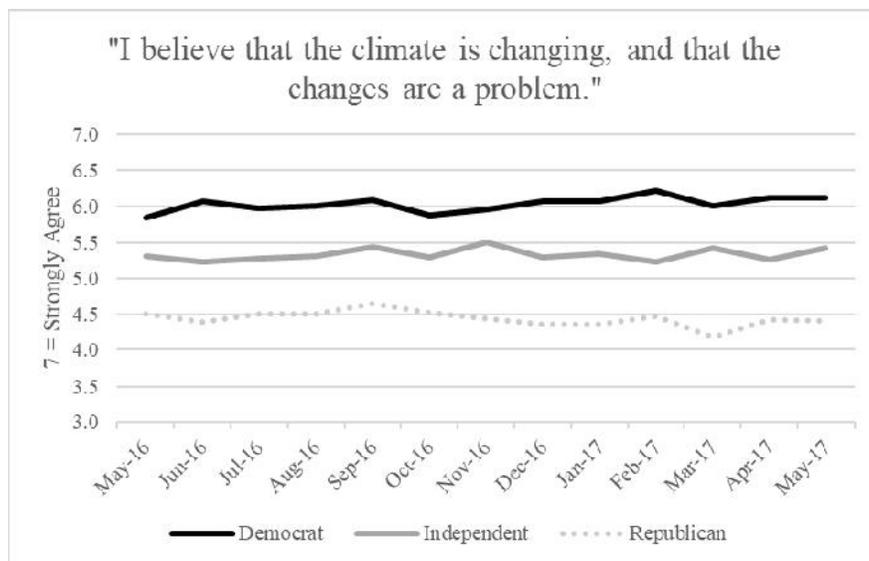

Fig. 1. Climate change beliefs

(Democrat – Republican) were collapsed into three levels (1-3 Democrat, 4 Independent, 5-7 Republican) for ease of interpretation. A separate set of regressions was run using political orientation (seven-point scale, Liberal – Conservative), without collapsing scale levels. Time was input into the regression as month of data collection (May 2016 – May 2017). We additionally controlled for age and gender.

Public Actions: The regression testing the effect of time on likelihood to engage in public acts as a function of political party and election revealed a three way interaction, (p < .01) (see Table 1). To understand the interaction, we then examined the effect time had on likelihood to engage as a function of time and political party before and after the election. Before the election and after, the results revealed a significant interaction of time (p < .05) and political party (p < .01), see Table 1. Accordingly, we then examined each of these interactions by looking at the effect time had on likelihood to engage in public actions, before and after the election for Democrats, Independents, and Republicans. The results reveal that before the election, Republican's likelihood to engage in public actions were increasing as a function of time (β = .04, p < .05), but there was no effect of time on Independents or Democrats likelihood to engage in public actions before the election (ps > .1). The results reveal that after the election, Democrats' likelihood to engage in public actions were increasing as a function of time (β = .04, p < .01), but there was no effect of time on Independents' or Republicans' likelihood to engage in public

actions after the election (ps > .1). Fig. 2 shows the average willingness to engage in public acts by political party. While there was increasing willingness on the part of Republication before the election, the overall level was still much lower than other political groups, and while the willingness on the part of Democrats was higher throughout the study period, these individuals seem to be emboldened by the election to increase further their social sphere acts.

Small Private Act: The regression testing the effect of time on likelihood to engage in a small private sphere act as a function of political party and election revealed a three way interaction, (p < .05) (see Table 2). To understand the interaction, we then examined the effect time had on likelihood to engage in a small private sphere acts as a function of time and political party before and after the election. Neither before nor after the election did the results reveal a significant interaction of time and political party (ps > .1) (see Table 2). The results did reveal a main effect of political party before the election, (β = -.34, p < .01), but not after the election (ps > .1). However, there was no effect of time before/after the election, at any level of political party (ps > .1). As can be seen in Fig. 3, the lack of an effect here for the election was actually a positive finding because we found that generally across parties people were willing to take small private actions. Their willingness to engage in small acts was significantly greater than public acts (M $_{public\ acts}$ = 2.8, SD = 1.4, M $_{small\ private\ acts}$ = 4.1, SD = 1.6, p < .001).
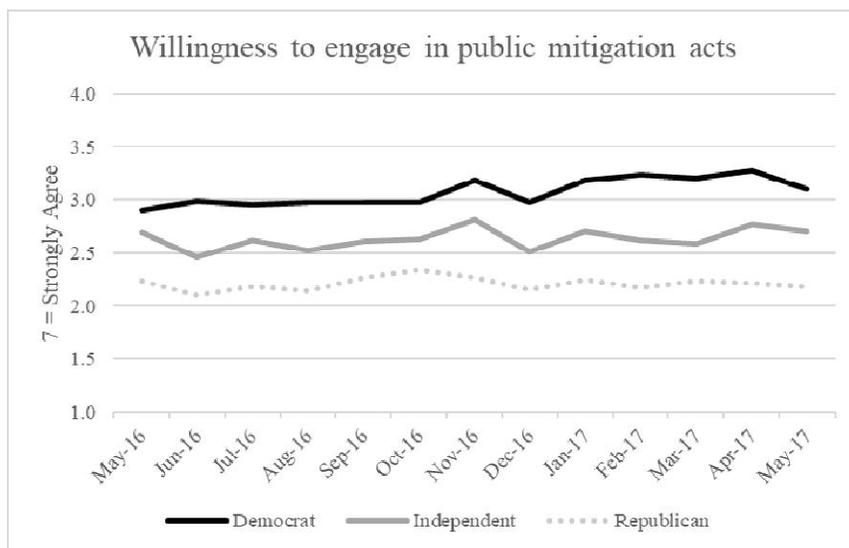

Fig. 2. Public mitigation acts

Table 1. Likelihood to engage in public mitigation act

	Time* party* election	Pre-election* party	Dems pre-election	Indeps pre-election	Reps pre-election	Post-election*	Dems post-election	Indeps post-election	Reps post-election
Time	-0.093*	-0.093**	-0.012	0.009	0.043**	0.108**	0.039***	-0.006	-0.004
	-0.048	-0.046	-0.014	-0.02	-0.02	-0.049	-0.015	-0.022	-0.02
Party	-0.658***	-0.661***				-0.373**			
	-0.071	-0.069				-0.146			
Election	-1.066*								
	-0.616								
Age	-0.007***	-0.004**	0.002	-0.010***	-0.009***	-0.009***	-0.001	-0.012***	-0.021***
	-0.001	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002	-0.003	-0.003
Gender	-0.086***	-0.098***	-0.06	-0.190***	-0.074	-0.073**	-0.148***	-0.123*	0.102
	-0.025	-0.035	-0.049	-0.07	-0.068	-0.036	-0.052	-0.074	-0.07
Time: Party	0.027**	0.027**				-0.024*			
	-0.012	-0.012				-0.013			
Time: Election	0.199***								
	-0.067								
Party: Election	0.279*								
	-0.159								
Time: Party: Election	-0.050***								
	-0.017								
Constant	5.640***	5.626***	3.509***	3.138***	2.417***	4.574***	3.419***	3.271***	2.666***
	-0.276	-0.271	-0.112	-0.172	-0.165	-0.568	-0.19	-0.281	-0.262
Observations	12,519	6,284	2,995	1,623	1,666	6,235	2,964	1,594	1,677
R2	0.121	0.098	0.001	0.009	0.009	0.139	0.005	0.009	0.035
Adjusted R2	0.12	0.097	0.0001	0.007	0.007	0.138	0.004	0.007	0.0333
Residual Std. Error	1.381	1.345	1.297	1.390	1.376	1.417	1.379	1.473	1.402
	(df=12509)	(df=6278)	(df=2991)	(df=1619)	(df=1662)	(df=6229)	(df=2960)	(df=1590)	(df=1673)
F Statistic	190.971***	126.246***	1.089	4.873***	4.831***	200.928***	4.946***	4.589***	20.333***
	(df=9,125090)	(df=5,6278)	(df=3,2991)	(df=3,1619)	(df=3,1662)	(df=5,6229)	(df=3,2960)	(df=3,1590)	(df=3,1673)

*Note: *p<0.1; **p<0.05, ***p<0.01*

Table 2. Likelihood to engage in small private act

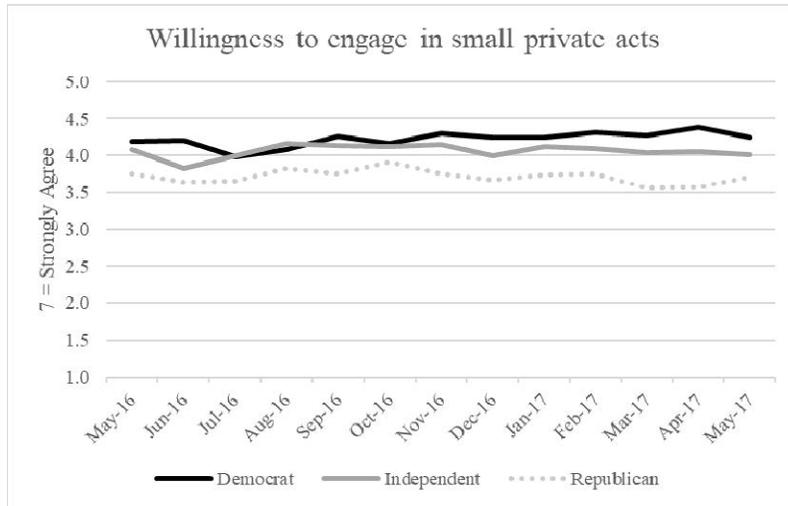|	Time* party* election	Pre-election* party	Dems pre-election	Indeps pre-election	Reps pre-election	Post-election*	Dems post-election	Indeps post-election	Reps post-election
Time	-0.057	-0.057	-0.003	0.029	0.037	0.068	0.006	-0.005	-0.034
	-0.054	-0.054	-0.016	-0.024	-0.024	-0.054	-0.016	-0.024	-0.024
Party	-0.340***	-0.342***				-0.105			
	-0.081	-0.081				-0.162			
Election	-0.652								
	-0.703								
Age	0.003**	0.004**	0.010***	0.003	-0.004	0.001	0.007***	-0.001	-0.006*
	-0.001	-0.002	-0.002	-0.004	-0.003	-0.002	-0.002	-0.004	-0.003
Gender	-0.249***	-0.266***	-0.162***	-0.479***	-0.244***	-0.233***	-0.237***	-0.448***	-0.047
	-0.029	-0.041	-0.056	-0.083	-0.083	-0.041	-0.056	-0.083	-0.082
Time: Party	0.02	0.02				-0.02			
	-0.014	-0.014				-0.014			
Time: Election	0.124								
	-0.077								
Party: Election	0.231								
	-0.181								
Time: Party: Election	-0.039**								
	-0.02								
Constant	5.565***	5.568***	4.314***	4.527***	3.980***	4.901***	4.497***	4.808***	4.275***
	-0.315	-0.317	-0.129	-0.203	-0.2	-0.632	-0.205	-0.311	-0.31
Observations	12,519	6,284	2,995	1,623	1,666	6,235	2,964	1,594	1,677
R2	0.03	0.024	0.009	0.023	0.007	0.037	0.01	0.019	0.003
Adjusted R2	0.03	0.023	0.008	0.021	0.005	0.036	0.009	0.017	0.002
Residual Std. Error	1.576 (df=12509)	1.576 (df=6278)	1.484 (df=2991)	1.640 (df = 1619)	1.662 (df=1662)	1.576 (df=6229)	1.490 (df=2960)	1.632 (df=1590)	1.655 (df=16730
F Statistic	43.657*** (df=9,12509)	30.841*** (df=5,6278)	9.324*** (df=3,2991)	12.827*** (df=3,1619)	3.853*** (df=3,1662)	47.817*** (df=5,6229)	9.829*** (df=3,2960)	10.005*** (df=3,1590)	1.930 (df=3,1673)

*Note: *p<0.1; **p<0.05, ***p<0.01*

Large Private Act: The regression testing the effect of time on likelihood to engage in a large private sphere act as a function of political party and election did not reveal an interaction ($p < .05$), however, there was a significant effect of political party on likelihood to engage in large private act ($\beta = -.34$, $p < .01$), suggesting Democrats were more likely to engage in large private acts than Republicans (see Table 3). This difference in willingness to act for large public acts between Democrats and Republicans could be seen in Fig. 4, but the willingness for all individuals were far lower for large privateacts than small private acts (mean small private acts = 4.1, SD = 1.6, mean large private acts = 2.6, SD = 1.5, p < .001). A

second set of regression using political orientation as a scaler variable reveals a similar pattern of results.

6. DISCUSSION

Our study replicated results from the literature [26,28] which demonstrated that individuals were most willing to engage in small private actions to mitigate climate change, and that at least for large private acts and public acts, individuals who describe themselves as Democrats were also more willing to engage in these more "costly" acts. Interestingly, the results reveal that following the 2016 election, Democrats became more likely to engage in climate change

Fig. 3. Small private mitigation acts
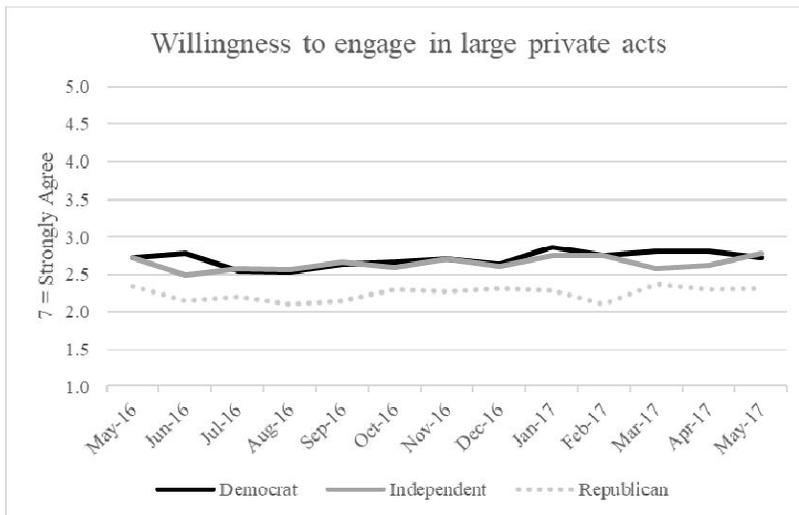
Fig. 4. Large private mitigation acts

Table 3. Likelihood to engage in large private act

	Time* party* election	Pre-election* party	Dems pre-election	Indeps pre-election	Reps pre-election	Post-election*	Dems post-election	Indeps post-election	Reps post-election
Time	-0.065	-0.065	-0.029*	-0.0002	-0.001	0.034	0.013	-0.012	0.002
	-0.052	-0.052	-0.026	-0.022	-0.02	-0.052	-0.016	-0.023	-0.021
Party	-0.276***	-0.276***				-0.119			
	-0.077	-0.076				-0.155			
Election	-0.617								
	-0.669								
Age	-0.019***	-0.018***	-0.015***	-0.020***	-0.022***	-0.020***	-0.015***	-0.022***	-0.025***
	-0.001	-0.002	-0.003	-0.004	-0.003	-0.002	-0.002	-0.003	-0.003
Gender	0.272***	0.240***	-0.291***	0.127*	0.250***	0.303***	0.413***	0.027	0.352***
	-0.027	-0.039	-0.057	-0.077	-0.069	-0.039	-0.057	-0.078	-0.072
Time: Party	0.014	0.014				-0.008			
	-0.013	-0.013				-0.013			
Time: Election	0.098								
	-0.073								
Party: Election	0.155								
	-0.173								
Time: Party: Election	-0.022								
	-0.019								
Constant	3.609***	3.642***	2.683***	2.786***	2.292***	2.953***	2.296***	3.173***	2.275***
	-0.3	-0.301	-0.132	-0.189	-0.168	-0.606	-0.21	-0.293	-0.27
Observations	12,519	6,284	2,995	1,623	1,666	6,235	2,964	1,594	1,677
R2	0.047	0.042	0.023	0.024	0.044	0.051	0.033	0.026	0.065
Adjusted R2	0.046	0.042	0.022	0.022	0.043	0.05	0.032	0.024	0.063
Residual Std. Error	1.501 (df=12509)	1.493 (df=6278)	1.524 (df=2991)	1.526 (df=1619)	1.396 (df=1662)	1.509 (df=6229)	1.526 (df=2960)	1.535 (df=1590)	1.442 (df=1673)
F Statistic	68.350*** (df=9,12509)	55.469*** (df=5,6278)	23.839*** (df=3,2991)	13.201*** (df=3,1619)	25.768*** (df=3,1662)	66.550*** (df=5,6229)	33.381*** (df=3,2960)	14.141*** (df=3,1590)	38.789*** (df=3,1673)

*Note: *p<0.1; **p<0.05, ***p<0.01*

mitigating public sphere acts over time. In contrast, Republicans had actually been increasingly likely to engage in climate change mitigating social sphere acts over time prior to the election but at a much lower level than Democrats. The results reveal that the election did not have a similar effect on private sphere acts.

Considering these findings in the context of the PADM framework, the election did not change situational facilitators or impediments. It also did not change environmental cues or information sources. One could argue that the warning messages could be lesser since the President's claims not to believe in climate change have been widely covered by the news media.[39] Since we only see increases in actions (or no change), we may assume that the media coverage of the President's denial of climate change was not convincing more individuals to ignore the warnings. We also see from Fig. 1 that individual beliefs about climate change did not change, so there is no detectable increase in threat perception.

Therefore, while we cannot from the data collected test a cause for the change in perceptions of the protective actions, given that only the public sphere actions increased significantly, one could argue that the election of a President with negative attitudes toward climate change mitigation increases some individuals' perception of the benefits from the public sphere activities ('protective actions') relative to its costs. The reasoning being that if the election of the President was changing other factors in the PADM framework besides a factor unique to one mitigation effort, than willingness to adopt would change for other actions too. Since we only see the change in willingness to embrace public actions, the influence of the election needs to impact an action related factor, i.e., its benefits relative to its costs. Further research would be needed to specifically test changes in the perception of the benefits or importance of public sphere activities when the countries executive leadership switches from sympathetic toward climate change mitigation activities to hostile, but anticipating that change in advance is not easy. That was why this data set was unique.

7. CONCLUSIONS

In order to reduce climate changing behavior, individuals need to be motivated to engage in

both small and large acts. Part of what would motivate individuals to engage in private acts would be other individuals engaging in public acts. We confirmed what others have found, i.e., that more individuals are willing to engage in small private acts and more Democrats than Republicans are willing to engage in large private acts, and that the levels of willingness were very consistent over a year period. Interestingly though, we found that the election of President of USA in 2016 caused more Democrats to state a willingness to engage in public acts. If more individuals engaging in more public acts can convert other individuals to engage in private acts over time, then electing leadership who was negative toward climate change can actually motivate more mitigation actions for climate change. This could be explained by rationalizing that if the government is concerned about climate change such as was the case with former President, then individuals (in particular Democrats) feel less need to take public actions. The 2016 election of President of USA could be the "attention-catching, emotionally-engaging" event that Weber (37, p. 116) described to motivate more people to engage in risk mitigation decisions toward climate change, where those willing to take additional action see an increase in the benefit of this particular protective action.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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