ELECTORAL LANDSLIDE? MORE LIKE ELECTORAL WILDFIRE.
An Econometric Difference in Difference Analysis of Colorado Wildfires impact on U.S. Congressional Elections

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Abstract

As environmental disasters continue to rise in number and severity across the globe, electoral systems present an outlet for voters to voice their frustration and pain. Many previous authors have explored the dynamic of disaster politics and come to different conclusions on a variety of topics. This difference-in-difference analysis uses an original panel data set to identify if Junkins Wildfire had an impact on partisan vote share percentages. The results from the analysis show that the Junkins Wildfire did not have a statistically significant impact of Democratic vote share percentage but in some cases the wildfire did have a statistically significant impact on Republican vote share percentages, suggesting that natural disaster events may impact voting outcomes.

KEYWORDS: (Wildfire, Vote, Environment)
JEL CODES: (Q5, R11, D72)

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED UNAUTHORIZED AID ON THIS THESIS

Peyton J Marshak

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Signature

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Acknowledgments

I would like to thank my advisor, Professor Hoel, for being a constant source of wisdom and guidance throughout this process. Without such guidance, I don't think this Thesis would have such breadth and focus.

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1. Introduction

How do natural disasters affect partisan voting patterns in the United States? With the Earth continuing to warm at an alarming speed and natural disasters rising in frequency and intensity, the discipline of environmental disaster studies has emerged in recent decades to try and predict what the landscapes of tomorrow may look like. There is no doubt that climate change will have large impacts on political systems across the globe as governments drown in the Pacific Islands and new external challenges are posed to authoritarian and democratic actors (Barbara, 2022; Lazarev, 2014). Natural disasters have historically resulted in the creation of entirely new nation-states, lost American Presidents political support at the polls, and even supported the creation of pro-government militias (Islam 2023; Heersink 2022; Eastin, 2022). As natural disasters continue rising in severity and occur more often in communities around the globe, political systems will be put under immense pressure to respond effectively and resourcefully to these events.

On October 17, 2016, the Junkins Wildfire began in Custer County, Colorado. Over the course of a little over two weeks, 18,403 acres of land were left devastated with nine homes and 17 outbuildings reduced to ash (Harmon, 2016). The wildfire resulted in the evacuation of 257 homes and put another 1,060 under pre-evacuation warning. Lurking in the background of this environmental catastrophe was the 2016 United States General Election which took place on November 8th, three days after the fire was 100% contained (2016, Case). This paper first investigates the effect of the Junkins Wildfire on partisan behaviors in federal congressional races at the voter precinct level which were directly located within the Junkins Wildfire burn scar. Following such analysis this study then will investigate such effects on voter behavior at the county level.

This paper uses an original panel of political and wildfire data in Colorado to conduct a difference-in-difference analysis of the 2016 Junkins Wildfire's impact on Democratic vote share at the precinct and county levels. The econometric model used in this analysis includes controls for possible variances in Democrat vote share that could result from differences in racial background, history of military service, personal income, level of education, population density, and incumbency advantages between voter precincts. The analysis assigns three voter precincts located within the wildfire burn scar to a treatment group, and leaves the other 1,222 sampled precincts as a control.

This econometric analysis finds that the Junkins Wildfire has no statistically significant effect on the democratic vote shares in either the 2016 election or 2018 election. The analysis then expands its treatment group to both include Custer and Pueblo counties separately. Results from these two regressions produce a statistically significant link between Republican vote share percentage and the Junkins Wildfire. This paper also finds evidence to support previously studied socio-economic trends in American partisan voting behaviors by investigating the effects of its control variables on the constant. This analysis also adds to a growing number of research which utilizes geographic informational systems to analyze the impacts of natural disasters (Holub, 2023; Rudolph, 2017).

This paper ends with a discussion on the limits of this analysis and recommendations for other researchers hoping to continue researching related topics. Environmental disasters are forecasted to increase in severity during the coming decades (NASA, 2023). This new era will ultimately be marked by how humans adapt to living in such environments, and this response must be made to re-evaluate political

structures which are often founded on ideals of stability and measured progress. This new era will need systems that react dynamically and effectively to meet the challenges of tomorrow. Election systems are the natural beginning to paths which ensure productive change. This study shows that voters do not ultimately respond with the urgency that these disasters ultimately respect, even when these events take place in their own back yards, therefore new strategies and tactics must be tried to ensure that the world of tomorrow is adequately prepared for success.

2. Literature Review

The discipline of environmental disaster studies encompasses a broad collection of global approaches by academics to studying the effects of environmental catastrophes on specific communities. Previous literature has included research on a wide range of natural disasters and what effects these disasters have on communities around the world. This paper specifically addresses the impact of a wildfire in Colorado on partisan voting behavior within specific voter precincts in comparison to a sample of other non-affected voter precincts in the state. This research is not the first to examine such a question, and is instead a continuation of the many previous authors who have collectively built a large library of research methods and literature on the topic of environmental disaster studies.

The following literature review hopes to establish a background for this analysis of the Junkins Wildfire, and by doing so it hopes to situate itself within the ongoing global conversation about the impacts of environmental catastrophes on political outcomes. This literature review contains four main focuses. First, the review will explore and detail the blind retrospective voting theory which this paper relies on for its epistemological grounding. Second, the paper will examine previous research on environmental disasters' effects on voter turnout around the world. Third, the

paper will look at previous research on environmental disasters' effect on political incumbent's performance at the polls. Lastly, this review will investigate the previous literature looking at the effects of environmental disasters on support for left and right-wing political parties.

2.1. Blind Retrospective Voting Theory:

The basis of this paper rests on the blind retrospective voting theory (Achen, 2002). Blind retrospective voting theory is an attempt to explain why voters who have experienced a traumatic event vote differently than voters who have not. Most of blind retrospective voting theory therefore tries to understand where traumatized voters place blame for their situation(Bucher,1957; Yates, 2008). The answer blind retrospective voting theorists find is that traumatized voters will always fault the government for their feelings, and justify it in any way possible. Only in cases where no government exists or if there is no politician voicing their pain will voters find other scapegoats (Achen, 2002).

However, further research publications which have used blind retrospective voting theory to explain voter behavior in instances of environmental disaster have had mixed results. There is currently no consensus within academia on blind retrospective voting theory. This is primarily due to many of these studies being categorized as individual cases which provide great information about regional trends, but rarely do researchers attempt to incorporate multiple disaster events into a single study and make wider conclusions form their work. However, these studies do encompass a wide range of peoples, types of natural disasters, and political systems which provide a holistic overview of the previous research that has informed this study on the Junkins Wildfire.

2.2. Environmental Disasters Effect on Voter Turnout:

Literature examining the topic of voter turnout and its relation to environmental disasters provides a wide variety previous research that ultimately comes to a fairly strong consensus which finds natural disasters do have significant impacts on voter turnout. Studies have examined voter turnout at both local (Bodet, 2016; Rudolph, 2017) and national levels (Fair, 2017; Chen, 2013) and have used a variety of analytical models and tools to reach these mixed conclusions. This study does not focus on the impact of environmental disasters on voter turn-out rates. However, by including discussion of these previous studies in this analysis, this study hopes to highlight how certain approaches to building panel data and econometric models inform this study on partisan behaviors.

Although some studies have found no effect on voter turnout rates (Bodet, 2016), multiple studies have come to the conclusion that environmental disasters have an effect on voter turnout at both national and local election levels (Chen, 2013; Fair, 2017; Rudolph, 2017). However, even within these three different studies which find an effect on voter turnout, different effects are presented in each. While two study's findings indicate that natural disasters reduce overall voter turnout and voter turnout within opposing voter groups (Rudolph, 2017; Chen, 2013) another study provides evidence that in the long-term natural disasters actually result in higher voter turnouts (Fair, 2017).

Such focus on short and long-term impacts in these studies is shared with this analysis' focus on wildfire impact which presents findings related to both the 2016 and 2018 elections. Additionally, studies which have investigated voter turnout rates utilize similar difference-in-difference models (Rudolph, 2017) and geocoded data (Fair, 2017) to derive more detailed and powerful metrics. This analysis builds upon

these previous studies to build its own difference-in-difference model using an original panel dataset which was derived from certain sets of geocoded data.

2.3. Environmental Disasters Effect on Incumbent's Performance:

Many words have been spilled on whether or not environmental disasters hinder or help political incumbents. Studies focusing on this question of environmental impact on incumbency have spanned the globe, resulting in a fairly complete consensus within academia that environmental crises help political incumbents' reelection outlooks (Gasper, 2011; Arceneaux 2006; Healy, 2010; Husted, 2022; Cooperman, 2022; Heesrsink, 2020; Chen, 2013). This study's main focus on partisan outcomes further adds to this previous research due to the use of incumbency as a control variable in the analysis model.

In the cases where there has been evidence that environmental disasters help political incumbents' outlooks, many studies look to American presidential and gubernatorial elections (Heesrsink, 2020; Husted, 2020; Healy, 2010; Chen, 2013). This focus on executive political offices allows researchers to better study the positive effects that disaster aid and management have on reelection outcomes for political incumbents (Husted, 2020; Healy, 2010; Chen, 2013). Such findings have led to recent studies which have found that political actors manipulate disaster aid to their benefit (Cooperman, 2022). Previous research has also found that voters struggle to assign blame to the correct level of government in times of a disaster, such as assigning blame to the city leader when in fact the county leader is more responsible (Arceneaux 2006).

However, there has been a small number of studies which have found that environmental crises do not help a political incumbent's outlook (Bodet, 2016; Reeves, 2011; Abney, 1966). In previous research which finds that environmental

disasters do not have an impact on incumbent reelection outcomes, studies tend to investigate local elections instead of national political races (Bodet, 2016; Abney, 1966). These two studies at the local level are presented with caution (Bodet, 2016) and make use of older analysis techniques which leads to questioning of their findings (Abney, 1966). In the one study which looked at both state and national executive elections, the findings presented indicate that although inaction by both gubernatorial and presidential actors can cause serious negative electoral consequences, however, political action in instances of natural disaster can result in positive outcomes for both state and national leaders (Gasper, 2011).

2.4. Environmental Disasters Effect on Left vs Right-Wing Candidates Performance:

In recent years, political scientists have increasingly begun to become more fascinated in understanding the factors which create support for right and left-wing political candidates. This shift in academic focus has been reflected in more recent disaster studies that have sought to ask how environmental disasters impact certain political candidates differently than others. This analysis of Junkins Wildfire is a continuation of these recent studies looking at the impact of environmental disasters on political party support as this analysis specifically focuses on the impacts that the Junkins Wildfire had on partisan support in Colorado.

Results of these studies have been relatively non-conclusive in their findings of which political parties tend to receive more support after environmental disasters. While some research has supported the idea that environmental disasters tend to result in more support for left-wing candidates (Visconti, 2022), other studies have shown that being more severely affected by an environmental disaster does not necessarily result in higher support for left-wing political candidates (Garside and Zhai, 2022). These studies do not share a consensus in their findings, but they provide two

different examples of study design and analysis. This analysis of Junkins Wildfire takes inspiration from these model designs and incorporates certain components of the difference-in-difference model (Garside and Zhai, 2022) to inform its own.

In what little studies specifically focus on environmental disaster impacts related to partisanship in national elections, previous findings have indicated that co-partisanship is a key factor in determining whether voters punish or reward a political candidate in the midst of an environmental disaster (Heersink et al, 2022). Of particular importance to this analysis is the publication of a study that links wildfire exposure to increases in "pro-environmental" measures in Democratic areas (Hazlett and Mildenberger, 2020). This study is one of the first studies which investigates the political impacts of wildfires in the American context. These two previous studies inform this analysis' design by incorporating specific control variables related to co-partisanship and in the assignment process of treatment groups.

3. Methodology

This paper uses an original panel of political and wildfire data in Colorado to conduct a difference-in-difference analysis of the 2016 Junkins Wildfire's impact on Democratic vote share at the precinct and county levels. The panel data used in this analysis is sourced from the Colorado Secretary of State's Office, U.S. Forrest Service, U.S. Census Bureau, and Princeton University. Much of the panel data used in this analysis is built within the ArcGIS program which utilized multiple geo-processing tools to create a sample of 1,225 Colorado voter precincts as seen in *Figure I.*

The treatment group used in this analysis is composed of three electoral precincts (Custer 1, Custer 2, Pueblo 16) which encompassed the entire Junkins Wildfire burn scar. Treatment groups were identified by using geographic information

system shapefiles to find where the Junkins burn scar intersected with voter precincts. The other 1,222 voter precincts were not affected by wildfires between the years of 2010 and 2018 and were therefore left untreated in this study. The sample of 1,225 voter precincts encompasses 54 out of the 64 counties in Colorado.

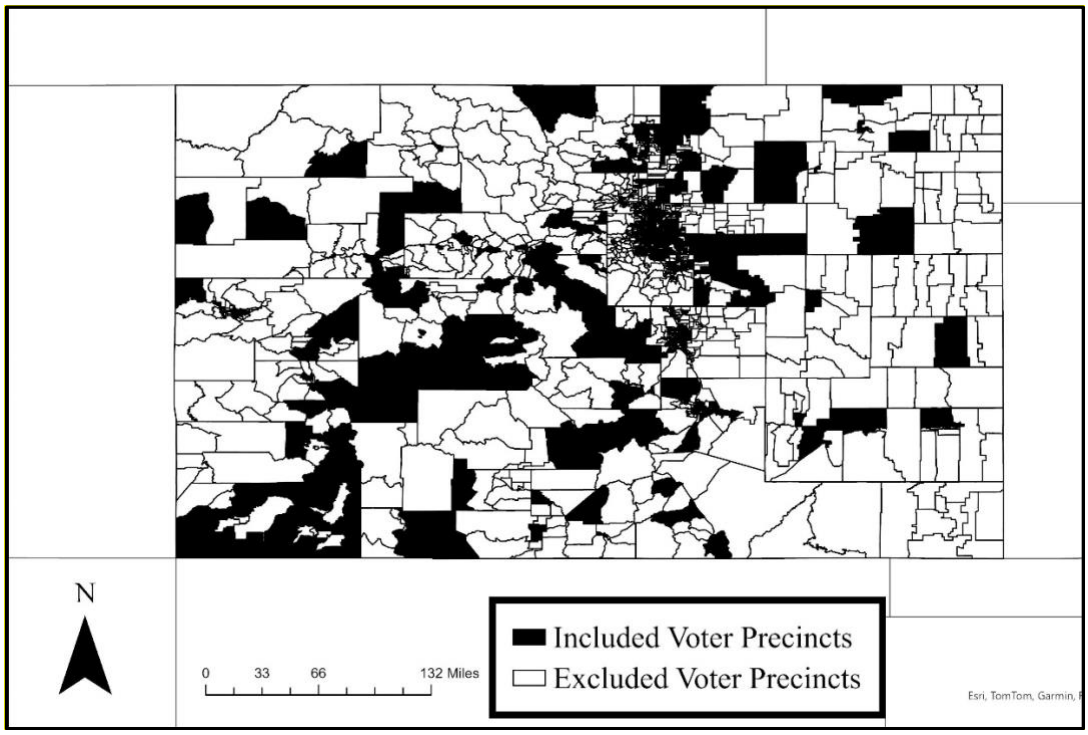

Figure I

Precincts Included in Analysis Sample

With treatment groups assigned, the analysis then utilized 2010 U.S. Census data to control for possible variance errors in the regression. Control variables in this study were used specifically to reduce variance in the Democrat vote share percentage. This analysis assigns control variables which encompass racial background, history of military service, personal income, level of education, incumbent's political party affiliation, and population density demographics to better reduce the possibility that outside factors will create variance within democratic candidates' vote share percentage.

The following sections of this methodology will discuss the process of building an original set of panel data which includes the two separate processes of collecting and cleaning the electoral data and assigning treatment groups. Control variable assignment will also be discussed including why each variable was selected for the model. Lastly, this section will provide the econometric difference-in-difference model used in this analysis.

3.1. Electoral Data Collection and Cleaning:

This study utilizes precinct electoral data from the Colorado Secretary of State, which provides vote totals for Republican, Democrat, Green, Libertarian, American Constitution, and Independent political parties from all Colorado elections between 2010 and 2018. The precinct level is the smallest unit of electoral data made available by the Colorado Secretary of State. All Colorado voter precincts consist of a minimum of 2,500 voters and, therefore, offer a more targeted approach to analysis than if this study were to use county-level data (C.R.S. Title 1 Elections).

However, Colorado precinct boundaries change over time as each Colorado county clerk and recorder can make as many voter precincts as they deem "convenient for the eligible electors of the county" (C.R.S. Title 1 Elections). Enhancing such power is the fact that Colorado's population grew by 744,518 people between 2010 and 2020, meaning that county clerks and recorders created 297 new voter precincts within this analysis' time frame (Colorado State Demography Office). This dynamic of the Colorado voter precinct system posed a large challenge to this econometric analysis. Mainly, the ever-shifting boundaries of voter precincts made completely matching a 2010 voter precinct to a 2018 voter precinct incredibly difficult.

In order to overcome this challenge of the Colorado voter precinct system, the analysis presented in this paper first joined 2010, 2012, 2014, 2016, and 2018

electoral data from the Colorado Secretary of State's Office to a Princeton University geographic shapefile of 2010 Colorado voter precincts. The 2010 precinct data was chosen due to its stronger match with corresponding electoral data from 2010 through 2018. 2010 shapefile data matched with 84% accuracy to 2010 (See *Figure* II) electoral data and 63% accuracy to 2012, 2014, 2016, and 2018 electoral data provided by the Secretary of State. The matching accuracy may seem low, but compared to a 2018 shapefile from the University of Colorado Boulder, it proves to be the most accurate option. The 2018 shapefile data matched with below 45% (See *Figure* III) accuracy to the same 2010, 2012, 2014, and 2016 electoral data. Therefore, the 2010 shapefile is used in this analysis due to its superior accuracy compared to the newer 2018 data source.

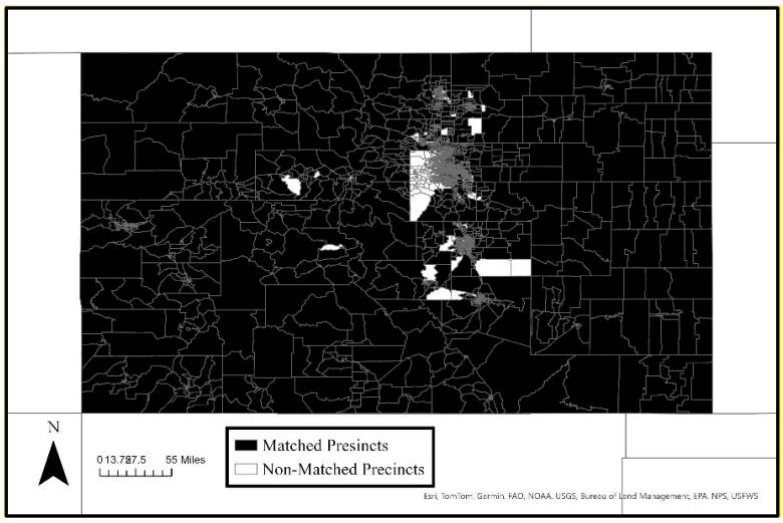

Figure II

2010 Shapefile Matched Precincts to 2010 Voter Data

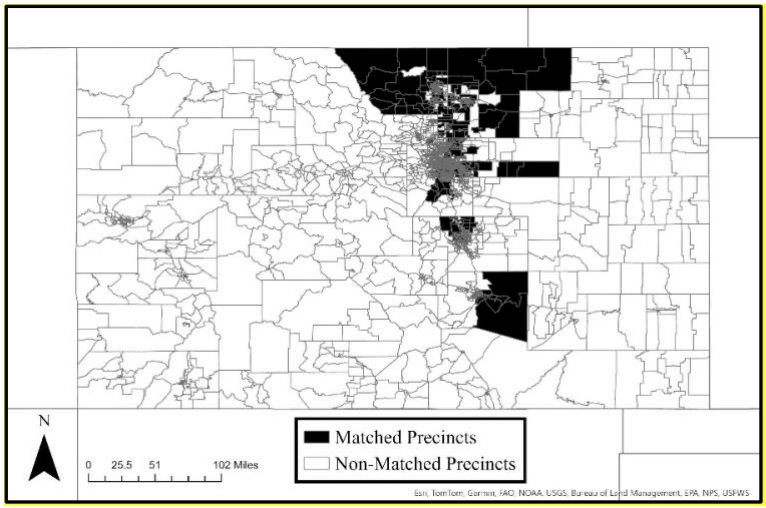

Figure III

2018 Shapefile Matched Precincts to 2010 Voter Data

With this in mind, the study then transposed a 2010 U.S. Census block group shapefile on top of the Colorado precinct shapefile. The census shapefile contained demographic information related to population density, wealth, racial composition, and military history for Colorado's 3,532 block group census tracts. There are more census tracts than voter precincts in Colorado because census tracts do not incorporate population data into their calculations. Instead, census tracts use "roads, streams, and railroad tracks" and institution boundaries such as "city, township, school district" delineations to create their block groups (Rossiter, 2011). The result of this process means that there are often multiple U.S. Census block group tracts within one voter precinct.

In order to then join precinct data to census data, this study uses the "Central Feature" tool within ArcGIS Pro software to create a point at the geographic center of each Colorado voter precinct in the 2010 shapefile. With these points plotted on the map, it was then possible to match precincts with their corresponding U.S. Census Block groups using the "Spatial Merge" feature within ArcGIS Pro. By matching precincts to U.S. Census block geographies, the analysis was able to build a panel

data set that incorporated both electoral and demographic data. This study does not use voter precincts containing more than one census block due to time constraints.

3.2. Treatment Grouping:

The wildfire data used in this study is from the United States Forest Service. The shapefile from the United States Forest Service included every documented wildfire in the continental United States from 1878 until 2019. Wildfire projections were then transposed on the precinct shapefile to identify which precincts had been affected by the Junkins Wildfire. The burn scar burned across three voter precincts identified as Custer 1, Custer 2, and Pueblo 16. These three precincts were then subsequently assigned to the treatment group.

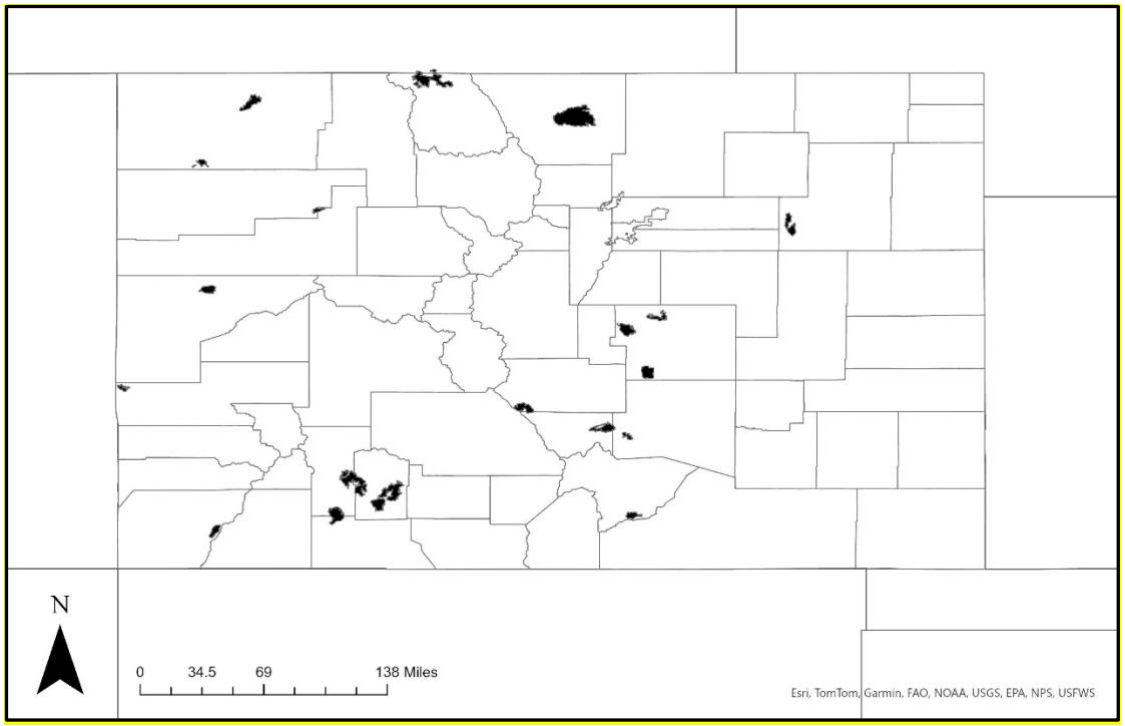

Figure IV

Wildfires 5,000 Acres of Larger between 2012 and 2018

Of additional importance to the study, certain precincts were removed from the study due to also being impacted by large wildfires between 2012 and 2018 (See *Figure IV*). The reason why these precincts were removed was due to these precincts

having had a similar natural treatment as those of the Junkins Wildfire, and therefore could impact the results of the model. In total 15 precincts were removed from the sample. These 15 wildfires were selected due to also having been impacted by wildfires larger than 5,000 acres between 2012 and 2018. The marker of 5,000 acres was chosen due to wildfires, 5,000 acres or larger, accounting for 87% of total acres burned from 2012 to 2018. In making such a decision, this study follows a previous study design which determined that wildfires under the 5,000-acre threshold did not pose enough risk to the public to suffice a noticeable electoral response (Hazlett, 2020).

3.3. Control Variables:

The control variables for this study include the percentage of the precinct population who identify as white (POPWHPER), population density in thousands of people per square mile (POPDENSITY), percentage of people within a precinct who have received a bachelor's degree or higher (PERBACHPLUS), percentage of the population 18 years and older who identify as a veteran (PERVET), per capita income in thousands of dollars adjusted for 2022 value (PERCAPIN2022), and whether or not the precinct had a Democratic incumbent in 2016 (DEMINC2016). These variables were all chosen to reduce variance in the democratic vote share percentage variable (DEMVSHARE).

All data for these variables are collected from American Community Survey 5-year estimates which are administered by the U.S. Census Bureau and were grouped by block group census tracts. The process of constructing the racial composition control variable began by calculating the percentage of individuals within the precinct identified as white. This variable is included in the analysis because previous research supports that white-identifying individuals tend to vote for republican candidates

(Agadjanian, 2021; Knuckey, 2020; Fording, 2023). Therefore, by taking into account the number of white-identifying individuals in a precinct, this study was able to control for possible variance in democratic candidate vote share due to racially homogenous samples within precincts.

Population density is measured in this analysis by thousands of people living within a one square mile located in the precinct. The purpose for assigning population density as a control variable in this study is due to previous literature finding that people who live in cities tend to vote for Democratic candidates in higher proportions than those that live in more rural communities(Gimpel, 2020; Munis, 2022). Population density is included in this study to control for possible variance that would impact a democratic candidate's vote share, given the urban-rural political divides in America.

This study's source of measuring education level by the percent of people within a precinct who have received a Bachelor's Degree or higher degree. The study chose to use a Bachelor's Degree as a measure of education due to the previous literature that discovers links between receiving a college degree and an increase in the likelihood of voting for a Democratic candidate (Hinckley, 1980; Burden, 2009; Marshall, 2019; Arceneaux, 2023). Controlling for the educational level was vitally important because, as of 2024, Colorado has the highest educational attainment levels of any state in the nation (Colorado Department of Higher Education, 2024). By controlling for education level, this study was able to minimize the amount of variation that could occur within a democratic candidate's vote share due to differences in education level between precincts.

Military history is measured by calculating the percentage of the population over 18 who identify as military veterans. The model uses veteran identity as a control

variable because veterans tend to vote for republican candidates (Endicott, 2023; Foy, 2018; Robinson, 2020). Including veteran demographics in the model allows this study to minimize possible variance within democratic candidate vote shares due to higher or lower numbers of veterans residing in certain voter precincts.

Wealth measurements in this model use U.S. per capita income adjusted for 2022 thousands of dollars to help correct for possible variations related to correlations between wealth and voter behavior. Specifically, previous literature investigating the correlation between wealth and partisan voter behaviors between the years of 2010 and 2016 has found that wealthier individuals in the United States tend to vote for republican candidates over democratic candidates (Peterson, 2016; Bartels, 2018). Therefore, by including per capita income in the model, this analysis controls for possible variation in Democrat vote chare percentage due to difference in wealth between voter precincts.

Lastly, the model takes into account the party of the 2016 incumbent as a control variable by using Colorado Secretary of State data to create a dummy variable. The dummy variable is activated when a precinct has a Democratic incumbent running in the 2016 election. The purpose of including this variable is to correct for possible influence on Democrat vote share percentage due to historic political sentiment. Recent literature has focused on how increasing partisanship in the United States has led to an advantage for republicans who are benefiting from voters not splitting their ballot (Cox, 1996; Fouirnaies, 2014). By including the whether or not the incumbent is a Democrat in the 2016 election, this model hopes to capture some of the variability that is created by voters' historical political preferences.

3.4. Econometric Model:

This study estimates the effect of the Junkins wildfire on the Democratic and Republican party's vote share in the three directly affected voter precincts where the burn scar resided by using the model

$$\text{PartyVoteShare}_{it} = \beta_0 + p_i + y_t + \beta_1*\text{Wildfire}_{it} + \beta_2*\text{AfterFire}_{it} + \beta_3*\text{Wildfire}_{it}*\text{AfterFire}_{it} + \beta_4*\text{PercentageVeterans}_{it} + \beta_5*\text{PerCapitaIncome}_{it} + \beta_6*\text{Education}_{it} + \beta_7*\text{RacialComposition}_{it} + \beta_8*\text{PopulationDensity}_{it} + \beta_9*\text{2016DemocratIncumbentDummy}_{it} + \eta_{it}$$

Where $\text{PartyVoteShare}_{it}$ is either the Republican or Democratis vote share percentage i among sampled precincts in the year t congressional race. β_0 is the intercept of the regression and represents the 2010 party vote share percentage if the Junkins Wildfire had never happened and without taking into account differences in precinct socio-economic composition. p_i are precinct fixed effects, y_i are election-year fixed effects, and β_1 is the effect on every precinct's party vote share percentage before the Junkins Wildfire. Wildfire_{it} is the dummy variable associated with determining the precincts that Junkins Wildfire directly affected. β_2 is the effect on every precinct's party vote share after the Junkins Wildfire. AfterFire_{it} is the dummy variable associated with determining the precinct's that were affected after the Junkins Wildfire. β_3 is the variable of interest as it provides after effects of the Junkins Wildfire on the party vote share percentage in the directly affected precincts, and η_{it} is the error term.

As for the control variables, β_4 represents the effect that an 100% increase in veteran population would have on party vote share percentage in 2010. β_5 is the effect that an increase in $1000 in per capita income would have on party vote share percentage in 2010. β_6 represents the effect that an 100% increase in people with a Bachelor's Degree or higher degree would have on party vote share percentage in 2010. β_7 shows what the effect of a 100% increase in white identifying individuals would have on party vote share percentage in 2010. β_8 is the effect that a 100% increase in population density would have on party vote share percentage in 2010.

Lastly, β_9 shows the effect of having a Democrat as an incumbent in the 2016 election has on political party vote share in 2010.

4. Results

This study finds that a congressional democratic candidate's vote share within a voter precinct which was located within the Junkins Wildfire burn scar have a 1.7 percentage point larger vote share in the 2016 general election immediately after the wildfire on October 17, 2016 compared to the vote share in 2010 (t = .37, 95% CI [-.07, .1]). The study also notes that in the 2018 election following the Junkins Wildfire in 2016, Democratic vote share drastically decreased by 6.4 percentage points (t = -1.68, 95% CI [-.14, .01]). Both of these results are not statistically significant due to both confidence intervals including a zero value.

TABLE 1
DIRECT EFFECT PRECINCT TREATMENT

VARIABLES	DEMVSHARE	REPVSHARE
Overall Impact of Wildfire	0.036*	-0.009
On Vote Share Percentage	(0.019)	(0.018)
Vote Share Percentage in	-0.033***	-0.015***
2012 compared to 2010	(0.004)	(0.003)
Vote Share Percentage in	-0.022***	0.025***
2014 compared to 2010	(0.004)	(0.003)
Vote Share Percentage in	-0.040***	0.022***
2016 compared to 2010	(0.006)	(0.007)
Vote Share Percentage in	0.046***	-0.042***
2018 compared to 2010	(0.004)	(0.004)
2012 Wildfire Effect on Direct	0.027	-0.003
Precinct Partisan Vote Percentage	(0.058)	(0.063)
2014 Wildfire Effect on Direct	0.003	-0.045
Precinct Partisan Vote Percentage	(0.060)	(0.068)
2016 Wildfire Effect on Direct	0.017	-0.042
Precinct Partisan Vote Percentage	(0.046)	(0.049)

2018 Wildfire Effect on Direct Precinct Partisan Vote Percentage	-0.064*	0.024
	(0.038)	(0.050)
Veteran Effect	-0.594***	0.478***
	(0.061)	(0.059)
Population Density Effect	-0.219***	0.221***
	(0.035)	(0.033)
Education Effect	0.259***	-0.250***
	(0.027)	(0.027)
Racial Composition Effect	-0.204***	0.206***
	(0.026)	(0.026)
Wealth Effect	-0.001***	0.002***
	(0.000)	(0.000)
2016 Democratic Incumbent Effect	0.138***	-0.127***
	(0.008)	(0.008)
Constant	0.663***	0.295***
	(0.022)	(0.022)
Observations	6,123	6,123
R-squared	0.351	0.321

However, when looking towards the outcomes of the control variables in this analysis we are able to report findings that are consistent with previous studies. This analysis of directly affected voter precincts finds that voter precincts with a higher percentage of veterans will result in a lower vote share for a Democratic candidate and a higher voter share for a Republican candidate, which supports previous studies on the veteran voter behavior (Endicott, 2023; Foy, 2018; Robinson, 2020). The results also support previous research which found that democratic candidate vote shares decreasing in areas with larger white communities and areas of higher median household income (Agadjanian, 2021; Knuckey, 2020; Fording, 2023). These results provide significant evidence that the sample of 1,225 voter precincts in Colorado reflect greater voting trends throughout the United States, and is therefore a satisfactory sample upon which to draw conclusions from.

In addition to looking specifically at the precincts (Custer 1, Custer 2, Pueblo 16) which were affected by the Junkins Wildfire, this study also ran regressions on the effect of the Junkins Wildfire on Pueblo and Custer counties to see if the wildfire had

larger implications outside of the precincts in the immediate burn scar. This study finds that in the case of Pueblo County, democratic vote share percentage in county precincts was 23 percentage points lower immediately after the fire in 2016 (t = -6.49, 95% CI [-.3, -.16]). Such a finding is further confounded by the finding that democratic vote share in Pueblo county precincts was 17 percentage points lower on average than untreated precincts in the next election cycle in 2018 (t = -8.11, 95% CI [-.22, -.13]). Both of these results proved to be statistically significant.

TABLE 2
PUEBLO COUNTY TREATMENT

VARIABLES	DEMVSHARE	REPVSHARE
Overall Impact of Wildfire On Vote Share Percentage	0.246***	-0.212***
	(0.021)	(0.020)
Vote Share Percentage in 2012 compared to 2010	-0.033***	-0.016***
	(0.004)	(0.003)
Vote Share Percentage in 2014 compared to 2010	-0.018***	0.023***
	(0.004)	(0.003)
Vote Share Percentage in 2016 compared to 2010	-0.030***	0.013*
	(0.006)	(0.007)
Vote Share Percentage in 2018 compared to 2010	0.053***	-0.046***
	(0.003)	(0.003)
2012 Wildfire Effect on Pueblo Partisan Vote Percentage	-0.014	0.021
	(0.022)	(0.021)
2014 Wildfire Effect on Pueblo Partisan Vote Percentage	-0.094***	0.028
	(0.022)	(0.022)
2016 Wildfire Effect on Pueblo Partisan Vote Percentage	-0.232***	0.211***
	(0.036)	(0.038)
2018 Wildfire Effect on Pueblo Partisan Vote Percentage	-0.175***	0.109***
	(0.022)	(0.022)
Veteran Effect	-0.595***	0.479***
	(0.059)	(0.057)
Population Density Effect	-0.197***	0.201***
	(0.034)	(0.033)
Education Effect	0.279***	-0.269***

	(0.027)	(0.027)
Racial Composition Effect	-0.190***	0.192***
	(0.025)	(0.025)
Wealth Effect	-0.001***	0.002***
	(0.000)	(0.000)
2016 Democratic Incumbent Effect	0.151***	-0.140***
	(0.008)	(0.008)
Constant	0.629***	0.326***
	(0.022)	(0.022)
Observations	6,127	6,127
R-squared	0.379	0.348

In comparison to Pueblo County, this study finds that democratic vote share in Custer County precincts was 4.7 percentage points higher immediately after the Junkins Wildfire in 2016 (t = 0.82, 95% CI [-.07, .16]). The analysis further finds that democratic vote share in Custer County precincts was 10.7 percentage points lower following 2018 election cycle (t = -5.41, 95% CI [-.15, .07]). The 2018 finding proves to be statistically significant, but the 2016 finding is not statistically significant.

TABLE 3
CUSTER COUNTY TREATMENT

VARIABLES	DEMVSHARE	REPVSHARE
Overall Wildfire Impact on Vote Share Percentage	0.027	0.005
	(0.025)	(0.021)
Vote Share Percentage in 2012 compared to 2010	-0.033***	-0.015***
	(0.004)	(0.003)
Vote Share Percentage in 2014 compared to 2010	-0.022***	0.024***
	(0.004)	(0.003)
Vote Share Percentage in 2016 compared to 2010	-0.040***	0.022***
	(0.006)	(0.007)
Vote Share Percentage in 2018 compared to 2010	0.046***	-0.042***
	(0.004)	(0.004)
2012 Wildfire Effect on Custer Partisan Vote Percentage	-0.044***	0.073***
	(0.005)	(0.009)
2014 Wildfire Effect on Custer Partisan Vote Percentage	-0.055	0.013
	(0.055)	(0.073)

2016 Wildfire Effect on Custer Partisan Vote Percentage	0.047 (0.057)	-0.078 (0.057)
2018 Wildfire Effect on Custer Partisan Vote Percentage	-0.108*** (0.020)	0.084*** (0.013)
Veteran Effect	-0.591*** (0.061)	0.475*** (0.059)
Population Density Effect	-0.217*** (0.035)	0.219*** (0.033)
Education Effect	0.259*** (0.027)	-0.250*** (0.027)
Racial Composition Effect	-0.204*** (0.026)	0.206*** (0.026)
Wealth Effect	-0.001*** (0.000)	0.002*** (0.000)
2016 Democratic Incumbent Effect	0.138*** (0.008)	-0.127*** (0.008)
Constant	0.663*** (0.022)	0.295*** (0.022)
Observations	6,123	6,123
R-squared	0.351	0.322

5. Discussion

The results of these analyses ultimately do not support the conclusion that the Junkins Wildfire increased vote share percentage for democratic candidates at both the voter precinct level and county level. The analysis does find some instances where Republican vote share increased as a result of the Junkins Wildfire, specifically in Pueblo County over the periods of 2016 and 2018 as well as Custer County in 2018.

Explanations for such findings support previous work focusing on the key role that co-partisanship plays in voter's assignment of blame (Heersink et al, 2022). The variable used in this study to control for co-partisanship, 2016 Democrat Incumbent Effect, reflects the still influential impact that incumbents have on vote share percentage. This analysis finds that Democrat vote share percentage in a precinct which has a Democrat incumbent will have an increase of 13 points compared to

precincts that do not (t=.17.46, CI [.12, .15). Therefore, it would seem that incumbency still remains a large factor in vote share percentage tallies in Colorado federal congressional elections, despite other publications finding opposite patterns (Stonecash, 2008).

Another possible explanation for such findings is due to possible issues with the study's design. Specifically, the study cannot entirely control for variances in vote share percentage due to the difficulty of controlling for changing political sentiment over a period of eight years. The model attempts to control for such variance by including economic measures (Wealth Effect) and past political sentiment (2016 Democratic Incumbent Effect), but these two variables cannot entirely control for such a large range of possible factors which influence voters.

Adding to this complication of controlling for political sentiment is this analysis' focus on the 2016 and 2018 elections. Both of these elections did not produce outcomes that many predicted, and further complicated views of what exactly influences American voters (Monogan, 2020; Howell, 2020).These two elections make controlling for political sentiment even more challenging than in previous voting cycles, and certainly could impact the results of this study.

However, it should also be noted that the results presented in this analysis do add further complications to Hazlett and Mildenberger's recent findings that wildfires do not impact Republican areas as much as Democratic areas. In fact, results presented in this work show that the Junkins Wildfire had large negative impacts on Democrat vote share percentages. Such findings should be explored further by using a larger treatment group to understand if this pattern continues outside just the context of the Junkins Wildfire in Colorado. Future findings on this topic could provide important insights into how to better understand modern disaster politics.

This study also makes use of new techniques in building panel data by using geocoded data in the process of building its dataset. Geocoded data allowed for this analysis to match electoral data to census demographic data that would've been impossible if it used more traditional methods for building panel data. Geographic analysis also made for more precise data cleaning, allowing for certain precincts to be excluded without having to throw out entire counties. The same can be said for treatment group assignment, which took a fraction of the time that it would have without the GIS software. As a result of using ArcGIS Pro to build this original dataset, this analysis was able to provide more precise and accurate results.

Future researchers should be sure to make use of this software to help them better conceptualize environmental disaster impacts on communities while also utilizing its incredibly powerful tools to build complex and nuanced datasets. There is a mountain of geocoded data that is made publicly available by government offices, and much of it has to do with environmental data that has been untouched by economists or political scientists. This analysis would strongly push future researchers to build upon the GIS processes presented in this paper to further unlock the potential of this software.

This study also recommends that future researchers design their studies to account for more possible variables that could influence voting outcomes. As discussed earlier, fully controlling for such changes in political sentiment is an incredibly challenging task, however, the use of lagged variables could present better controls for changing political sentiment and weren't used in this study. With stronger control variables, clearer and more powerful conclusions can be drawn from analyses like this one.

6. Conclusion

Overall, the amount of academic literature focusing on the interactions between the environment and political systems has grown exponentially in the past decade as global warming increases the frequency and severity of these disaster events across the globe(NASA, 2023). Currently, the Earth just concluded a summer where Greek and Canadian wildfires consumed both countries, historic flooding killed thousands in Libya, and all the while recording the hottest summer on record(Marshall, 2023; Tugwell, 2023; Luhn, 2024). It is important to study the political and economic impacts of these events because environmental disasters like these will continue to occur and the impacts that these events have on economic and political systems are vital to understanding what the world of tomorrow will look like.

This difference-in-difference analysis on the Junkins Wildfire utilizes an original set of panel data to try and understand what the politics of tomorrow might look like. The conclusion that this analysis reaches is that Junkins Wildfire ultimately has no statistically significant impact on Democratic vote share percentage. Instead, it finds that Republican vote share increases in certain instances after the Junkins Wildfire. Such a finding may just present a glimpse into the future of American politics, where partisan politics outweigh the environmental disaster right outside your home.

This is a future where incumbents continue to have large advantages over new comers, and support for Democrats and Republicans can still be predicted with fairly good accuracy by how much money you make, if you have served in the military, where you live, what you look like, or whether you finished to college. Such a system will not solve the monumental challenges we face in the world today, the time has come to implement new strategies and techniques to build a better future.

References

Abney, F. G., & Hill, L. B. (1966). Natural Disasters as a Political Variable: The Effect of a Hurricane on an Urban Election. The American Political Science Review, 60(4), 974–981.

Achen, C. H., & Bartels, L. M. (2002). Blind Retrospection: Electoral Responses to Drought, Flu, and Shark Attacks. Conference Papers -- American Political Science Association, 1.

Agadjanian, A., & Lacy, D. (2021). Changing Votes, Changing Identities? Racial Fluidity and Vote Switching in the 2012–2016 US Presidential Elections. Public Opinion Quarterly, 85(3), 737–752.

Arceneaux, K., & Stein, R. M. (2006). Who is Held Responsible When Disaster Strikes? The Attribution of Responsibility for a Natural Disaster in an Urban Election. Journal of Urban Affairs, 28(1), 43–53.

Arceneaux, K., & Vander Wielen, R. J. (2023). Do voters prefer educated candidates? How candidate education influences vote choice in congressional elections. Electoral Studies, 82.

Baccini, L., & Leemann, L. (2021). Do natural disasters help the environment? How voters respond and what that means. Political Science Research & Methods, 9(3), 468–484.

Barbara, J., Howard, E., & Baker, K. (2022). The domestic politics of climate change in the Pacific Islands. Asia Pacific Viewpoint, 63(2), 250–261.

Bartels, L. M. (2018). Partisanship in the Trump Era. The Journal of Politics, 80(4), 1483–1494.

Bodet, M. A., Thomas, M., & Tessier, C. (2016). Come hell or high water: An investigation of the effects of a natural disaster on a local election. Electoral Studies, 43, 85–94.

Bucher, R. (1957). Blame and Hostility in Disaster. American Journal of Sociology, 62(5), 467–475.

Burden, B. (2009). The Dynamic Effects of Education on Voter Turnout. Electoral Studies, 28, 540–549.

Case, A. (2016). 5 Homes, 13 Other Buildings Destroyed in Junkins Fire. FOX21 News Colorado.

C. Christine Fair, Patrick M. Kuhn, Neil Malhotra and Jacob N. Shapiro (2017), "Natural Disasters and Political Engagement: Evidence from the 2010–11 Pakistani Floods", Quarterly Journal of Political Science: Vol. 12: No. 1, pp 99-141.

C.R.S. Title 1 Elections. Colorado Secretary of State Jena Griswold. (n.d.).

Chen, J. (2013). Voter Partisanship and the Effect of Distributive Spending on Political Participation. American Journal of Political Science, 57(1), 200–217.

Colorado Department of Higher Education. (2024). Colorado leads all 50 states in educational attainment: Colorado Governor Jared Polis.

Colorado State Demography Office. (2022). Demographic Summary.

Cooperman, A. (2022). (Un)Natural Disasters: Electoral Cycles in Disaster Relief. Comparative Political Studies, 55(7), 1158–1197.

Cox, G. W., & Katz, J. N. (1996). Why Did the Incumbency Advantage in U.S. House Elections Grow? American Journal of Political Science, 40(2), 478–497.

Elliott RJR, Nguyen-Tien V, Strobl EA, Tveit T. Climate-Related Natural Disasters and Voting Behavior: Evidence from Environmental Legislation in the US Senate. Journal of the Association of Environmental and Resource Economists. 2023;10(3):753-786. Accessed November 14, 2023.

Endicott, T. W. (2023). Veteran social identity, partisanship, and political behavior. Politics, Groups & Identities, 11(4), 813–833

Fording, R. C., & Schram, S. F. (2023). Pride or Prejudice? Clarifying the Role of White Racial Identity in Recent Presidential Elections. Polity, 55(1), 106–136.

Fouirnaies, A., & Hall, A. B. (2014). The Financial Incumbency Advantage: Causes and Consequences. The Journal of Politics, 76(3), 711–724.

Foy, S. L., & Restifo, S. J. (2018). Reliably Republican? Shifts in U.S. Veterans' Political Party Affiliation from 1974 to 2016. Sociological Spectrum, 38(3), 174–193.

Garside, S., & Zhai, H. (2022). If not now, when? Climate disaster and the Green vote following the 2021 Germany floods. Research & Politics, 9(4), 1–8.

Gasper, J. T., & Reeves, A. (2011). Make It Rain? Retrospection and the Attentive Electorate in the Context of Natural Disasters. American Journal of Political Science, 55(2), 340–355.

Gimpel, J. G., Lovin, N., Moy, B., & Reeves, A. (2020). The Urban–Rural Gulf in American Political Behavior. Political Behavior, 42(4), 1343–1368.

Harmon, T. (2016, October 30). Junkins Fire Mop-Up Works Includes Flood Assessment. Pueblo Chieftain. https://www.chieftain.com/story/news/local/2016/10/30/junkins-fire-mop-up-works/9210289007/

Hazlett, C., & Mildenberger, M. (2020). Wildfire Exposure Increases Pro-Environment Voting within Democratic but Not Republican Areas. American Political Science Review, 114(4), 1359–1365.

Healy, A., & Malhotra, N. (2010), "Random Events, Economic Losses, and Retrospective Voting: Implications for Democratic Competence", Quarterly Journal of Political Science: Vol. 5: No. 2, pp 193-208.

Heersink, B., Jenkins, J. A., Olson, M. P., & Peterson, B. D. (2022). Natural Disasters, “Partisan Retrospection,” and U.S. Presidential Elections. Political Behavior, 44(3), 1225–1246.

Heersink, B., Peterson, B. D., & Jenkins, J. A. (2017). Disasters and Elections : Estimating the Net Effect of Damage and Relief in Historical Perspective. Political Analysis, 25(2), 260–268.

Hinckley, B. (1980). The American Voter in Congressional Elections. American Political Science Review, 74(3).

Holub F, Schündeln M (2023) Pro-environmental voting when climate change is made salient: Evidence from high-resolution flooding data. PLOS Clim 2(8): e0000219.

Howell, J. L., & O’Mara, E. M. (2020). Political behavior, perceived similarity to the candidates, and defensiveness: The curious case of a group of first-time voters in a bellwether-swing-state in 2016. Self & Identity, 19(2), 164–180.

Husted, T., & Nickerson, D. (2022). Governors and Electoral Hazard in the Allocation of Federal Disaster Aid. Southern Economic Journal, 89(2), 522–539.

Islam, M. M., Chatterjee, N., & Basar, M. A. (2023). The final straw? Bhola cyclone, 1970 election, disaster politics, and the making of Bangladesh. Contemporary South Asia, 31(2), 236–250.

Knuckey, J., & Kim, M. (2020). The Politics of White Racial Identity and Vote Choice in the 2018 Midterm Elections. Social Science Quarterly (Wiley-Blackwell), 101(4), 1584–1599.

Lazarev, E., Sobolev, A., Soboleva, I. V., & Sokolov, B. (2014). Trial By Fire: A Natural Disaster’s Impact on Support for the Authorities in Rural Russia. World Politics, 66(4), 641–668.

Luhn, A. (2024). 2023 was officially the world’s hottest year on record. New Scientist, 261(3473), 9.

Lukas Rudolph & Patrick M. Kuhn (2018) Natural Disasters and Political Participation: Evidence from the 2002 and 2013 Floods in Germany, German Politics, 27:1, 1-24.

Marshall, J. (2019). The Anti-Democrat Diploma: How High School Education Decreases Support for the Democratic Party. American Journal of Political Science, 63(1), 67–83.

Marshall, M. (2023). Libya floods: how climate change intensified the death and devastation. Nature: International Weekly Journal of Science, 621(7979), 452–453.

Monogan III, J. E. (2020). Anxious Voters in the 2016 U.S. Election: An Analysis of How They Decided from the ERPC2016. Political Behavior, 42(1), 189–212.

Munis, B. K. (2022). Us Over Here Versus Them Over There...Literally: Measuring Place Resentment in American Politics. Political Behavior, 44(3), 1057–1078.

NASA. (2023). The Effects of Climate Change. NASA: Global Climate Change.

Peterson, E. (2016). The Rich are Different : The Effect of Wealth on Partisanship. Political Behavior, 38(1), 33–54.

Robinson, G. L., Amoroso, J., Wilson, I. (Ike), & Yon, R. M. (2020). Veterans and Bipartisanship. Armed Forces & Society, 46(1), 132–162.

Rossiter, K. (2011). What Are Census Blocks?. U.S. Census Bureau.

Stonecash, J. M. (2008). *Reassessing The Incumbency Effect*. Cambridge University Press.

Tugwell, P. (2023). Greek Wildfires Displace 19,000 in Country's Biggest Evacuation. Bloomberg.com.

Visconti, G. (2022). After the Flood: Disasters, Ideological Voting and Electoral Choices in Chile. Political Behavior, 44(4), 1985–2004.

Yates, S. (1998). Attributions about the Causes and Consequences of Cataclysmic Events. Journal of Personal & Interpersonal Loss, 3(1), 7–24.