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This paper studies how politicians and voters respond to new information on the threats of climate change. Using data on the universe of federal disaster declarations between 1989 and 2014, we document that congress members from districts hit by a hurricane are more likely to support bills promoting more environmental regulation and control in the year after the disaster. The response to hurricanes does not seem to be driven by logrolling behavior or lobbysts' pressure. The change in legislative agenda is persistent over time, and it is associated with an electoral penalty in the following elections. The response is mainly promoted by representatives in safe districts, those with more experience, and those with strong pro-environment records. Our evidence thus reveals that natural disasters may trigger a permanent change in politicians' beliefs, but only those with a sufficient electoral strength or with strong ideologies are willing to engage in promoting policies with short-run costs and long-run benefits.

JEL Classification: D70, D72, H50, Q54

Keywords: U.S. Congress, hurricanes, legislative activity

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Hurricanes, Climate Change Policies and Electoral Accountability*

Stefano Gagliarducci† M. Daniele Paserman‡ Eleonora Patacchini§

May 2019

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This paper studies how politicians and voters respond to new information on the threats of climate change. Using data on the universe of federal disaster declarations between 1989 and 2014, we document that congress members from districts hit by a hurricane are more likely to support bills promoting more environmental regulation and control in the year after the disaster. The response to hurricanes does not seem to be driven by logrolling behavior or lobbysts' pressure. The change in legislative agenda is persistent over time, and it is associated with an electoral penalty in the following elections. The response is mainly promoted by representatives in safe districts, those with more experience, and those with strong pro-environment records. Our evidence thus reveals that natural disasters may trigger a permanent change in politicians' beliefs, but only those with a sufficient electoral strength or with strong ideologies are willing to engage in promoting policies with short-run costs and long-run benefits.

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1 Introduction

Legislators are goal-oriented actors seeking to achieve three main objectives: reelection, institutional prestige and good public policy (Fenno, 1973). But what if some of those goals are in contrast to each other? Will legislators support desirable policies even if it proves costly in the voting booth?

In this paper, we consider the case of climate change policies. There is almost unanimous consensus among scientists that climate change is occurring, and it is caused largely by human activity (IPCC, 2013). However, failure to internalize the long-run – and possibly irreversible – costs of climate change is keeping policies below the suggested optimal level (Nordhaus, 2016). It is notoriously difficult for politicians to translate a scientific consensus about global warming into public policies. Voters tend to rank climate low among their priorities,[1] and business interests have been historically organized against climate change action.[2] Natural disasters and their associated costs, however, may lead to a more vigorous debate about environmental policy, and may act as catalysts for change. Environmental catastrophes capture wide public attention, voters process information coming from flooded islands and submerged cities, and firms suffer from the negative reputation externality of being associated with global warming. Under these circumstances, firms may be more likely to accept new regulation, and voters may reward politicians that address salient concerns.

In this paper, we study how elected representatives and voters react to new information regarding the risks of climate change. In theory, several reactions are possible. If voters and politicians are already aware of the risks of climate change, the occurrence of

[1] Gallup, "Most Important Problem", `http://news.gallup.com/poll/1675/most-important-problem.aspx`, accessed on April 30, 2019.

[2] Yale Environment 360, "Why Won't American Business Push for Action on Climate?", `http://e360.yale.edu/features/why-wont-american-business-push-for-action-on-climate`, accessed on April 30, 2019.

hurricanes should not meaningfully affect their views about the optimal policy response, and we would not expect to see any response in terms of either legislation or electoral outcomes. On the other hand, if hurricanes shift views on what the optimal policy is, we would expect an increase in environmental legislation and larger vote shares for politicians endorsing "green" bills. It is also possible, however, that the effects are different for voters and politicians, if they are exposed to different information, or if they process the same information differently. Politicians are more likely to be exposed to environmental lobbying groups, and are more likely to engage with supporters of more stringent environmental regulation both inside and outside of Congress. On the other hand, the general public may fail to adequately assess the relative costs and benefits of policies aimed at mitigating the effects of global climate change; it may myopically believe that intervention at a later date would still be effective; or, even if it correctly assesses the inter-temporal decision problem, it may choose not to reward action today because it does not value sufficiently the welfare of future generations. In this scenario, we expect to see a response in terms of legislation but no response in electoral outcomes. The vote share for politicians endorsing green bills may even decrease if this is perceived as a shift of their agenda from other topics, such as jobs or health. And, because apocalyptic global-warming messages may trigger fear and backfire, politicians may also choose to decrease support for green policies (O'Neill and Nicholson-Cole, 2009; see also Moser and Dilling, 2011, and the references therein).

This paper attempts to disentangle between these competing hypotheses. We analyze United States House members' support for legislation aimed at contrasting global warming in the aftermath of hurricanes that directly impact their congressional district. Even though the scientific community is somewhat cautious in assessing a causal link from anthropogenic climate change to the frequency and intensity of hurricanes,[3] there is ample

[3]For example, the *Geophysical Fluid Dynamics Laboratory of the National Oceanic and Atmospheric*

evidence that extreme weather events are associated with an increase in the perceived threats of global climate change. For example, Leiserowtiz (2006) and Myers et al. (2012) find that personal experience with extreme weather is associated with stronger beliefs about the reality of climate change; Sisco et al. (2016) find that extreme weather increase the frequency of tweets about climate change in the local area; and Egan and Mullin (2012) find that higher-than-average temperatures are associated with stronger short-term beliefs in global warming.[4] In some cases, extreme weather events have led political personalities to explicitly call for more action to fight climate change. For example, in November 2012 New York City Mayor Michael Bloomberg surprisingly endorsed Barack Obama just days before the Presidential election, citing the fallout from Hurricane Sandy as the main reason for his decision, and arguing that the risk that extreme weather events may be the result of climate change "should be enough to compel all elected leaders to take immediate action."[5]

Going further back in time, we can also find other examples of links between environmental disasters and environmental action. The 1969 Cuyahoga River fire in Cleveland is widely believed to have contributed to the creation of the federal Environmental Protection Agency in 1970 and the Clean Water Act of 1972. The Exxon Valdez oil spill of 1989 eventually led to the Oil Pollution Act of 1990. However, the relationship between environmental disasters and subsequent legislation is not always automatic. The BP Deepwater Horizon oil spill of 2010, which was almost twenty times worse than the Exxon Valdez oil spill in terms of oil released, did not lead to the introduction of any

Administration (NOAA) states that "[i]t is premature to conclude that human activities – and particularly greenhouse gas emissions that cause global warming, have already had a detectable impact on Atlantic hurricane or global tropical cyclone activity", `https://www.gfdl.noaa.gov/global-warming-and-hurricanes`, accessed on May 17, 2017.

[4]Others find similar results outside of the U.S. (Dai et al., 2015; Blennow et al., 2012; Frondel et al., 2017).

[5]Quoted from `http://www.nytimes.com/2012/11/02/nyregion/bloomberg-endorses-obama-saying-hurricane-sandy-affected-decision.html`, accessed on April 30, 2019.)

significant environmental legislation.

We use data on the universe of federal disaster declarations collected from the Federal Emergency Management Agency (FEMA). The data contain detailed information on the counties assisted by FEMA after each event. We match counties to congressional districts and ask whether representatives of congressional districts directly affected by a hurricane are more likely to initiate environmental legislation by either sponsoring or co-sponsoring "green" bills aimed at fighting climate change. We define green bills as those that are classified by the *Congressional Bills Project* (CBP) as dealing with air pollution, global warming, and alternative and renewable energy, and use text analysis to exclude relief bills or bills that are actually anti-environmental.[6] By doing so, we are mostly focusing on bills introducing stricter regulation, i.e., on what we interpret as long-run policy. The main empirical strategy consists of regressing the number of green bills supported on a measure of hurricane incidence, controlling for a vast range of district and individual congress member characteristics, as well as district and year fixed effects. The long nature of our panel (we have data on Congressional bills going from the 101st to the 113th Congress, i.e., from 1990 to 2014) means that we are exploiting for identification the variation in hurricane occurrence within districts over time. The quasi-random trajectory of hurricanes implies that the occurrence of a hurricane in a particular district and year can be taken as exogenous.

We find that congress members are significantly more likely to support green legislation in the year after their district has been hit by a hurricane.[7] This result is robust to

[6] The results are robust to using an alternative definition of "green" bills, based on the classification of bills related to climate change by the *Center for Climate and Energy Solutions*.

[7] A concrete example of this is the MARKET CHOICE Act (H.R. 6463 in the 115th Congress), a bill that proposes to impose a tax on greenhouse gas emissions. The bill was introduced in June 2018 by Representative Carlos Curbelo of Florida's 26th Congressional District, and co-sponsored by Representative Francis Rooney of Florida's 19th congressional district and Representative Brian Fitzpatrick of Pennsylvania's 8th congressional district. Florida's 26th congressional district contains all of the Florida Keys and a portion of south-west Miami-Dade county; Florida's 19th congressional district covers an area on the West coast of Florida that includes Fort Myers and Naples. These areas suffered extensive

controlling for district and congressperson fixed effects, and for state-specific time trends. It is essentially unchanged regardless of how we measure exposure to hurricanes, and also if we restrict attention only to those hurricanes after which a major disaster declaration was issued. The effect is large in districts that are directly affected, diminishes with distance from the hurricane's centroid, and congress members representing states adjacent to a hurricane's trajectory do not exhibit any significant change in behavior.

We then look at channels mediating this effect. Our evidence reveals little support for the hypothesis that politicians use hurricanes as a mechanism to engage in logrolling (as measured by the exchange of favors between alumni from the same alma mater), and for the conjecture that their reaction is simply driven by lobbysts' pressure (as measured by the amount of campaign contributions received by political action committees (PACs) with environment-related interests).

We next look at the effect of a politician's support for green legislation in the aftermath of a hurricane on the vote share in the following election. We find that supporting green legislation in response to a hurricane carries an electoral penalty. This suggests that politicians' response cannot be explained by a simple model in which they are catering to an increase in the preference for environmental regulation by the median voter. We also find little support for the hypothesis that congress members temporarily overestimate preferences for regulation, because the increase in support for green bills persists over time, despite additional survey evidence showing that voters seem to forget about the disaster relatively soon. The only hypothesis that remains consistent with the evidence is that hurricane occurrence and hurricane damages in one's own district trigger a permanent change in beliefs. Politicians, however, do not act in a completely selfless manner, regardless of political constraints. Climate change legislation in response to a hurricane is more likely to be supported by politicians in safe districts, those with more experience,

damages from Hurricane Irma in September 2017.

and those with stronger pro-environmental records. We interpret these results as evidence that only politicians with sufficient electoral credit or with strong ideologies can engage in promoting policies with short-run costs and long-run benefits.

The existing literature has focused on the responsiveness of voters to politicians' ability to obtain short-run assistance in the form of relief funds in the aftermath of severe weather events. The traditional theoretical view is that, with rational voters, these events should not affect incumbents' electoral fortunes. However, others (Ashworth et al., 2018) have argued that exogenous shocks can still affect incumbents' electoral fortunes as voters can observe the way they prepared for or responded to a natural disaster, thus providing the opportunity to learn about the quality of the incumbent. The empirical evidence on this issue is mixed. Gasper and Reeves (2011), Healy and Malhotra (2010), and Cole (2012) find that incumbents suffer if weather events produce severe damage, but are rewarded by requesting or granting recovery funds. Similarly, Healy and Malhotra (2009), Bechtel and Hainmueller (2011), and Chen (2013) also find that incumbents are rewarded for disaster recovery spending.[8] The contribution of this paper is in looking explicitly at politicians' response in terms of long-run environmental legislation, and at voters' support for this intervention.

More broadly, our paper complements the recent literature on populism. Guiso et al. (2017), and references therein, argue that one of the key features of populism is the support of policies that pander to voters by offering short-run protection, but have no regard to long-run consequences. To the best of our knowledge, our study is the first to look at the flip side of the coin, that is, investigating a forward-looking behavior of politicians who decide to take action despite the opposition of (possibly more myopic)

[8] Other papers have focused on the economic impact of weather disasters. For example, Hsiang and Jina (2014) use cross-country data to show that extreme weather is harmful for economic growth, although the effect is smaller for rich countries (Dell et al., 2012). For the U.S., Boustan et al. (2017) find that most severe disasters increase migration rates and lower housing prices, although these effects can be mitigated by adaptation (Burke and Emerick, 2016) and aid policies (Deryugina et al., 2018).

voters.

The rest of the paper is structured as follows. Section 2 describes the data. Section 3 discusses the empirical approach. In Section 4 we present the main empirical results on green legislation, while in Section 5 we explore the mechanisms behind our results. Section 6 concludes.

2 Data

2.1 Bills

We use data from the U.S. House of Representatives for the 101st to the 113th Congress (1989-2014). We obtained data on bill characteristics, sponsorship and co-sponsorship, plus demographic and electoral characteristics for congressmen and their district of election, from the Library of Congress (`www.congress.gov`).

We identified bills aimed at fighting climate change (in short "green bills") as those classified with one of the following two minor topics, based on the *Congressional Bills Project*[9]: "Air pollution, Global Warming, and Noise Pollution", and "Alternative and Renewable Energy". The advantage of this classification is that it does not contain other categories typically included under the umbrella of environmental issues, like waste management, clean water, etc. Using text analysis (see Section A.1 for more details), we then excluded relief bills, bills on noise pollution, or bills that are actually anti-environmental. After this cleaning, we are left with a total of 868 "green bills," mostly proposing more stringent regulation on environmental standards related to greenhouse gas (GHG) emissions and global warming. The disadvantage of this classification is, however, that it may miss important climate change legislation that falls into other categories (e.g., the

[9]Adler and Wilkerson (2015), `http://www.congressionalbills.org`

ratification of international agreements).[10]

As an alternative measure, we use the list of climate change federal legislation provided by the *Center for Climate and Energy Solutions* (`www.c2es.org`), which is an environmental think tank that replaced the former *Pew Center on Global Climate Change*. The list is only available from the 106th Congress onwards, but it has the advantage of identifying major bills that are clearly addressing climate change, and whether the bills were aimed at reducing (i.e., imposing additional taxes on greenhouse gas emissions) or increasing (i.e., spurring fossil fuel development, or curtailing environmental regulations) global warming.[11] Again, we used text analysis to exclude relief bills, leaving us with a total of 365 "green bills" under this alternative definition.

Our main measure of congress members' activity is the number of bills sponsored or co-sponsored. Each bill in Congress has one primary sponsor, and can be signed by any number of co-sponsors. The sponsor is not necessarily the sole or the most important author of the bill, but he/she is identified with the bill content. The sponsor's activities include, but are not restricted to, gathering and communicating information about the bill, building coalitions, administering public relations around the bill, and shepherding the legislation through the House. co-sponsors typically help the sponsor in promoting the bill, and in attracting support within Congress. While there is some debate in the literature on the exact motives for co-sponsoring bills (Krehbiel, 1995, and Kessler and Krehbiel, 1996), we take the view that co-sponsoring is an indicator that the Congressperson wishes to be associated with a piece of legislation. Moreover, bills with a large number of co-sponsors

[10] We also checked if there were bills falling under different CBP minor topics and whose title included the words "global warming" or "climate change" (with and without the first letter capitalized). We only found 20 such bills, of which some were actually anti-environmental. Inclusion of these additional bills in the analysis does not affect any of the results in the paper.

[11] The majority of bills in the list favors climate action, with nearly half of those bills dealing with climate change adaptation and climate science. Many more bills touch on energy, environment, transportation, agriculture and other areas that could have an impact on or be affected by climate change. The list contains for the most part only those bills whose authors explicitly reference climate change or related terms, such as greenhouse gases or carbon dioxide.

have a higher probability of passing the House and becoming p ublic law (Gagliarducci and Paserman, 2016), suggesting that co-sponsorship has real effects and is not just plain position taking. [12]

Finally, we gathered detailed information on electoral results for each candidate through the *Congressional Quarterly* (`library.cqpress.com`); information on fossil production (gas, oil and coal) at the state level through the Energy Information Administration (EIA, `www.eia.gov`); information on contributions from Political Action Committees (PACs) from *OpenSecrets.org* (`www.opensecrets.org`); and information on congress members' voting history on environmental matters from the League of Conservation Voters (LCV, `www.lcv.org`).

2.2 Hurricanes

We collected federal disaster declarations for the period 1989-2014 from the Federal Emergency Management Agency (FEMA, `www.fema.gov`), which provides county-level detailed information on assisted population after each event. We focus on disasters caused by hurricanes only (no severe storms, nor typhoons), i.e., tropical storms in the Atlantic Ocean and the northeastern Pacific Ocean, and consider both Major Disaster Declarations (DR) and Emergency Declarations (EM).[13]

Since disaster declarations, and especially the intensity of assistance, could be potentially influenced by the political momentum (Garret and Sobel, 2003), we additionally

[12] By looking at sponsorship and co-sponsorship, rather than just sponsorship, we are also able to mitigate the possibility that, since a hurricane typically hits several districts, congress members elected in those districts might combine their effort around just one bill. If so, this might produce negative spatial auto-correlation, with one representative (e.g., the one from district with the most damage or higher number of deaths) sponsoring a bill, and the others none.

[13] The President can declare a major disaster for any natural event that has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A Major Disaster Declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. Emergency Declarations supplement state and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe.

collected more objective measures of hurricanes' intensity, like wind speed and trajectory, from *Weather Underground* (`www.wunderground.com`). For each county, we consider the wind speed recorded on the five points on the actual hurricane trajectory which are closest to the county centroid, and weight those values by the inverse of the distance from the county centroid. We assign the maximum of these five recorded speeds as the county's experienced wind speed.[14]

As a baseline, we classify as hit by a hurricane any county listed in a FEMA disaster declaration, conditional on the wind speed being above 19 mph, which corresponds to half of the lower threshold for a Tropical Storm (as defined by the Saffir-Simpson hurricane wind scale).[15,16] The wind cut-off helps mitigating measurement errors in the identification of the treated counties, as some counties may be included in a FEMA declaration only because they belong to a state hit by a hurricane. This is because "all requests for a declaration by the President that a major disaster exists shall be made by the Governor of the affected state" (Stafford Act, 1988). Also, we do not consider as hit by a hurricane those counties that were only indirectly affected by a hurricane (e.g., counties that took in evacuees after Hurricane Katrina, and therefore received FEMA assistance).[17]

2.3 Final sample

We collapsed the above data on green bills and hurricanes at the year/district level. The mapping of counties into districts was performed using the congressional districts

[14] This measure is somewhat less precise, because some districts are quite distant from the meteorological station with information on wind speed, and therefore the measure relies heavily on interpolation. Because of this, we prefer to use the FEMA-based measure as our baseline.

[15] All our results remain qualitatively unchanged when using different thresholds. In Section 4.1 we will also show results when using the actual wind speed as a proxy for hurricanes' incidence.

[16] Over the period 1989-2014 we observed a total of 37 hurricanes, namely: Alex, Andrew, Bertha, Bob, Bonnie, Bret, Charley, Claudette, Dean, Dennis, Dolly, Earl, Emily, Erin, Floyd, Fran, Frances, Georges, Gustav, Henri, Hugo, Ida, Ike, Iniki, Irene, Isaac, Isabel, Isidore, Ivan, Jeanne, Katrina, Lili, Opal, Ophelia, Rita, Sandy, and Wilma.

[17] We also collected data for FEMA assistance grants. However, county assistance grants are only available from 2002, while individual assistance grants (renters and owners) are only available from 2008.

relationship files available at the *Census Bureau* (`www.census.gov`).[18] When collapsing, we computed the total number of green bills sponsored or co-sponsored in a year. In the case of more than one hurricane over the same district in one year, we identified the number of counties ever hit, and highest wind intensity ever recorded.

Table 1 describes our final data set. The sample is made of 11,195 year/district observations, corresponding to 1,338 congress members and to 1,735 district combinations over the period 1989-2014. Almost 5% of the districts had at least one county that was hit by a hurricane in a certain year, with most of the disaster declarations being classified by FEMA as major (4.6%). Not surprisingly, all of the occurrences are located in the South-East (2.8%) and the North-East (2.2%) of the country, as these are the areas most exposed to the proliferous hurricane activity in the Atlantic Ocean. Similar figures can be observed when looking at the share of counties hit by a hurricane, or at the share of population.

On average, members of Congress sponsor 6.3 and co-sponsor 107.8 bills, of which only 1.3 (1.2%) can be classified as green according to our baseline classification. Figure 1 shows that climate change has received increased attention by congress members, especially after the release of the 4th Assessment Report by the *Intergovernmental Panel on Climate Change* (IPCC) in 2007, which was the first to assess that "impacts [of climate change] will very likely increase due to increased frequencies and intensities of some extreme weather events."

[18] Because of the reapportioning of congressional districts following the Decennial Census, a "district" should be interpreted throughout as a congressional district-decade pair. This means, for example, that Florida's 18th Congressional district in Congresses 108-112, which includes parts of Miami, is treated as a different district from Florida's 18th district in Congresses 113rd-114th, which does not include Miami.

3 Empirical model and identification strategy

We ask whether the raw correlation presented in Figure 1 is affected once we control for differences between districts and congress members hit by a hurricane or not. The basic estimating equation is the following:

$$GB_{sdi,t} = \alpha + \beta H_{sdi,\tau} + \gamma' X_{sdi,t} + \delta_t + \mu_z + \epsilon_{sdi,t} \tag{1}$$

where $GB_{sdi,t}$ is the number of green bills sponsored or co-sponsored at year t by congressman i, representing district d in state s; $H_{sdi,\tau}$ is a dummy for whether at least a county in district d of state s was ever hit by a hurricane at year τ, where τ is equal to either t or $t-1$; $X_{sdi,t}$ is a vector of district and individual congress member characteristics. The district characteristics include: the share of the Green and the Republican party in the previous Congressional elections; the log of population, area, and per capita income, the share of the population over 65, black, foreign born, and urban (from the Decennial Census); the ratio between the national share of coal/oil production and the national share of the population, at the state level; and a dummy for the district having received any evacuee from other districts hit by a hurricane. Individual congress member characteristics include: the number of other non-green bills sponsored or co-sponsored; 23 committee membership dummies; a dummy for belonging to the House minority party, for being House leader (speaker, minority/majority leader/whip, standing committee chair), Republican, and female; the relative margin of victory with respect to the second candidate in the previous elections; tenure (number of terms served in congress) and age (in years). Finally, δ_t are year fixed effects, while μ_z are geographic (state or district) or congress member fixed effects, depending on the specification.

Our identification strategy rests on the assumption that, within geographic units (like states, but possibly also within regions), the timing and the trajectory of a hurricane is as good as random, since it is based on aggregate natural and meteorological factors that are orthogonal to any local anthropogenic activity. This randomness is well represented in Figure 2, which reports the observed trajectory of four representative hurricanes in the last twenty years. There is no evident sign of any time or geographical pattern, besides the fact that al these hurricanes hit either the Eastern seaboard of the United States or the Gulf of Mexico. But the actual trajectory of the hurricanes is hard to predict. For example, Hurricane Sandy in 2012, after making landfall in Jamaica and Cuba, stayed largely away from the U.S. coast, only to veer sharply westward and move ashore again in New Jersey. In 2004, Hurricane Ivan made initial landfall in the United States in Alabama and continued inland before losing tropical characteristics while crossing Virginia. However, remnants of the storm completed an anticyclonic loop and moved over Florida, regaining strength as it crossed the Gulf of Mexico, and it made a second landfall in Louisiana. It is also interesting to notice that the mapping of actual hurricane trajectories into counties included in FEMA declarations is quite accurate (see Figure 3), which is reassuring against the possibility that FEMA declarations might be subject to political influence (Garret and Sobel, 2003).

Following the above discussion, we could include in our baseline specification state×year fixed effects, thus directly exploiting the random path of a hurricane within a given state and year. However, given that hurricane trajectories are quite broad (see again Figure 3), we would be left with quite a small variability in the incidence of hurricanes within state and year. This problem is further exacerbated by the presence of spillover effects across neighboring districts (see results in Section 4.2). For these reasons, our preferred specification includes year fixed effects and geographic fixed effects (either state or congressional district fixed effects) separately. That is, we exploit the variation in the incidence of hurricanes over time within a geographic area, where the randomness of a hurricane across geographical areas and over time guarantees that the timing of a disaster is orthogonal to any time-specific district characteristics.

Table 2 tests the validity of this assumption by looking at whether pre-determined congress member and district characteristics are balanced between districts hit by a hurricane or not, after controlling for state and year fixed effects.[19] Of the 14 balancing tests reported in the table, only two are statistically significant at the 10% level. It is reassuring that, even with a relatively coarse geographic fixed effect, most of the covariates are balanced. None of the individual characteristics is unbalanced. The two remaining imbalances at the district level might simply reflect the fact that the incidence of hurricanes is higher in districts close to the coast. Specifications that include district fixed effects are likely to address this potential confounder.

4 Main results

The main results are presented in Table 3. The top panel of the table shows results from a regression of the number of green bills on contemporaneous hurricane incidence, while in the bottom panel the key right hand side variable is lagged one period.

Since hurricanes tend to hit in the second part of the year, it is unlikely that congress members have sufficient time to introduce new legislation in the same year as the hurricane. And in fact, while the coefficients in both panels have the same sign, the ones in the top panel tend to be attenuated relative to the ones in the bottom panel, where we measure hurricane incidence lagged one year. We therefore concentrate our comments on the results from the bottom panel, even though they are based on slightly smaller samples, as observations from the first year of the sample and the first year after the

[19] We do not control here for district fixed effects, as district characteristics come from the Decennial Census and are therefore constant within a congressional district-decade.

reapportionment of congressional districts are dropped.

Column (1) shows the simple correlation between hurricane incidence and sponsorship of green bills, controlling only for year effects. The correlation is negative and statistically significant, probably reflecting the fact that most hurricanes hit the Southeastern United States, which in recent years have become solidly Republican and generally opposed to environmental regulation.

The picture changes immediately in column (2), with the inclusion of state fixed effects and the full set of control variables. Now the coefficient on lagged hurricane incidence becomes positive and statistically significant at the 1% level. This implies that congress members representing a district hit by a hurricane are significantly more likely to sponsor green legislation in years following a hurricane than in other years, even relative to members of their own state's delegation representing districts not hit by a hurricane. The results are similar even when we include district fixed effects (column 3), with the point estimate becoming even larger. When at least one county in the district is hit by a hurricane the average number of sponsored or co-sponsored bills rises by about 0.2, an almost 15% increase relative to the sample mean of about 1.3.

The results are qualitatively and quantitatively unchanged if instead of controlling for district fixed effects we control for individual congress member fixed effects (column 4), or if we control for state-specific linear trends in addition to district fixed effects (column 5) to rule out the presence of other underlying unobservable trends. We conclude that there is strong evidence that the occurrence of hurricanes causally affects the behavior of elected politicians, and induces them to initiate and support more environmental legislation.

4.1 Robustness checks

In Table 4 we assess the robustness of our results to alternative definitions of hurricane incidence and climate change legislative activity. We follow our preferred specification, which controls for all individual and district characteristics and district fixed effects (i.e., specification (3) in Table 3).

In column (1) we use as the key right hand side variable the share of counties affected by the hurricane (instead of a binary variable indicating whether any county in the district was affected by a hurricane). In column (2), instead, we use the share of the population affected by the hurricane. Both specifications show that moving from zero to one-hundred percent of the district being hit by a hurricane increases the number of green bills by about 0.3. Considering that the average share of a district which is hit by a hurricane is around 0.7, the results of these specifications are essentially indistinguishable from those of the previous table (an estimated effect of 0.2).

One concern with all these measures of hurricane incidence is that they are based on FEMA disaster declarations. These declarations, as well as the intensity of FEMA assistance, may be themselves affected by the political environment, and therefore not completely exogenous. Therefore, in column (3) we replace the key right hand side variable with the highest wind speed recorded across all counties affected by the hurricane. As discussed previously, this is a potentially more "objective" measure of hurricane incidence, even though it may suffer from some measurement error because of the way wind speed is measured (see footnote 14). Reassuringly, the coefficient is still positive and statistically significant. The magnitude of the coefficient is in line with previous ones: the average hurricane has a maximum wind speed of about 45 miles per hour, meaning that going from no hurricane to an average hurricane raises the number of bills by about 0.2. In column (4), we restrict attention only to hurricanes that were declared Major Disasters. The point estimate is essentially indistinguishable from the one in the baseline specification.

We next experiment with alternative measures of green bills. In column (5) we use the C2ES classification of green bills. The sample becomes noticeably smaller (we lose about 15% of observations), because we only have data from the 106^{th} Congress onwards. Nevertheless, even with this quite different definition, we find an almost 25% increase (relative to the sample mean of about 0.7) in the number of green bills sponsored or co-sponsored.

Another concern is that co-sponsorship may not necessarily indicate active engagement with the bill, and instead may be simply a way to signal to constituents and other congress members support for a specific legislation. We note, however, that expressing support for a bill through co-sponsorship is actually part of the effect that we intend to measure. In any case, to assuage some of these concerns, in column (6) we count only the co-sponsorships that were listed at the time of the bill's introduction, for which one could presumably assume some active participation in the drafting of the bill. Compared to the sample average, the estimated effect using only original co-sponsorships is very similar to the baseline results (about 20%).

Next, in Table 5 we look at whether congress members' legislative activity is also tied to other types of extreme weather events. Snowfalls, storms and tornadoes are typically not associated with global climate change, in contrast to hurricanes.[20] Climate change legislation is not affected by these other types of events. Columns (1) to (3) of Table 5 show no association between these other extreme weather events and the number of green bills, suggesting that the response in climate change legislation is specific to hurricanes.

As a final robustness test, we test whether hurricane incidence is associated with a higher level of legislative activity, not specifically linked to climate change regulation, perhaps because of the higher visibility of congress members representing districts hit by

[20]See also the bottom three panels of Table 10.

hurricanes. This does not seem to be the case: Table 6 shows that the occurrence of a hurricane, while boosting legislative activism on climate change issues, seems to have, if anything, some displacement effect on other policies. While it does not reduce effort on non-environmental legislation (column 1), it reduces by about 6% the number of other environmental bills (column 2). Not surprisingly, we find a positive effect of hurricanes on *relief* bills (bills providing short-run economic and logistic assistance in the aftermath of a hurricane, column 3), although this effect is not statistically significant.[21]

4.2 Spillovers

So far, we have focused on the response by representatives from districts hit by a hurricane. However, if information about the disaster spreads through media outlets, or because of evacuation operations over a larger area, one might also expect a response by representatives in nearby districts. In Table 7 we test this hypothesis by looking at whether there is an increases in the number of green bills in districts close to those hit by a hurricane.

Column (1) shows that there is a significant response to hurricanes also in neighboring districts. This effect looks smaller than the one observed in the district which is actually hit by the hurricane, although we cannot reject that the two coefficients are statistically the same. Similar results can be found in column (2) when we look at districts in a state where at least one other district was hit by a hurricane, with the effect in this case being statistically significant at the 10% level only. Importantly, the effect disappears when we look at the effect of an adjacent state being hit by a hurricane, as we do in column (3).

Taken together, these results reveal that the largest effect of a natural disaster arises when the damages of an extreme event are experienced directly. There is some effect

[21] Relief bills are identified from the *Library of Congress* as any bill whose title contains the name of a specific hurricane.

from being close to the disaster area, as neighbouring districts might still acquire information about its potential effects. However, the effect diminishes with distance from the hurricane's centroid, and congress members representing states adjacent to a hurricane's trajectory do not exhibit any significant change in behavior.

5 Exploring the pathways

In this section we explore the possible channels underlying our finding of an important increase of politicians' environmental legislation in the aftermath of a hurricane. We consider three main channels: a) "logrolling" (i.e., the exchange of favors between politicians); b) the influence of lobbying groups; and c) the role of voter preferences as expressed in electoral results.

5.1 Logrolling

One possibility is that politicians in districts hit by a hurricane may be in a position to leverage the increased visibility of their district to extract policy concessions from their peers, in a *quid pro quo* bargain. We hypothesize that these exchanges of favors may be more prevalent among representatives that share a tight connection with other congress members with strong environmental preferences. If this hypothesis is correct, we would expect to see that the response to hurricanes is stronger for representatives who have stronger social ties to a large number of other "green" legislators. Following Battaglini and Patacchini (2018), we measure social ties using the network of alumni connections, i.e., those who graduated from the same institution within four years of one another.[22] The advantage of this approach is that it measures social ties that are likely

[22]While Patacchini and Battaglini (2018) construct networks for the 109th-113rd Congresses, we have extracted new information on the educational institutions attended by all congress members from the 101st to the 113th Congress. The data source is the *Biographical Directory of the United States Congress*

predetermined, and not influenced by shared geography, expertise (as, for example, if we had used networks based on committee membership), or political preferences. We then identify as "green friends" the alumni whose *League of Conservation Voters* (LCV) lifetime environmental score at time $t-2$ was above the median of the Congress.[23] Based on this measure, more than 40% of the representatives have at least 1 "green friend" and a maximum of 16. Table 8 reveals that the estimated coefficient on the interaction with the number of "green friends" (column 1) is small and not statistically significant.

In column (2), we repeat the analysis, but look at ties between congress members representing the same state (e.g., see Cohen and Malloy, 2014). This network definition is slightly less preferred, as other districts in the state may also have been hit by the hurricane, so a positive interaction coefficient may simply represent a coordinated effort to promote more green legislation, rather then an exchange of favors. Indeed, there is some evidence here that a larger number of green same-state congress members is associated with a stronger response to hurricanes (the coefficient on the interaction between hurricane incidence and the number of same-state green congress members is positive and significant), but the coefficient on the main effect remains essentially unchanged. Overall, therefore there appears to be little support for the "exchange of favors" hypothesis.

5.2 Lobbying influence

We next explore whether politicians' response to hurricanes is merely driven by capture from lobbying groups with a direct stake in environmental legislation. For this purpose, we collected data from *OpenSecrets.org* on the yearly sum of campaign contributions to individual representatives received from environmental PACs, and PACs related to the

(`bioguide.congress.gov`).

[23]The LCV lifetime score assigns to each congress member a score between 0 and 1, equal to the share of pro-environment votes cast out of the total number of votes scored.

automotive and energy industry.[24] We identified as environmental all PACs classified by the *Center for Responsive Politics* (CRP) as "Environmental"; as automotive those classified as "Transport"; and as energy those classified as "Oil & Gas", "Electric utilities" and "Coal mining".[25] In columns (3) and (4) of Table 8 we use campaign contributions as the dependent variable and show that representatives of districts hit by a hurricane do receive more "green" contributions. Perhaps surprisingly, we do not find a similarly strong reaction for contributions from energy and automotive PACs. In columns (5), we use the number of green bills sponsored and co-sponsored as dependent variable and we include in the regression an interaction between the "hit by hurricane" dummy and log(1+contributions) from each of the three sources (environmental, energy and automotive, and others).[26] According to the capture theory, we should observe a stronger response to hurricanes in terms of green bills for representatives who received large amounts of campaign contributions by environmental PACs. While we do find a positive point estimate, the effect is modest and statistically insignificant. Contributions from the energy and automotive industries do instead reduce the support from green legislation, but this effect reflects in large part the fact that representatives who receive large contributions from the energy and automotive industry are also less likely to have supported environmental causes in the past. In fact, when controlling for the politician's pro-environmental score (as measured by the LCV score) in column (6) and its interaction with the "hit by hurricane" dummy, the coefficient on the interaction term becomes insignificant. On the whole, we conclude that there is only limited support for the hypothesis that politicians'

[24]We only consider contributions in favor of a candidate, i.e.: coordinated expenditures, independent expenditures for the candidate, communication costs for the candidate, and direct contributions.

[25]This definition excludes other subcategories of the energy and natural resources sector, such as the "Miscellaneous Energy" sector, which includes many PACs associated with wind, solar and other renewable energy sources.

[26]We use the log transformation because contributions from PACs sum to zero for many representatives (from 80% for the environmental contributions, to 10% for the energy and automotive contributions) but they are often very large for some others (up to about 1 million dollars per year for environmental contributions, and to about half million dollars per year for the energy and automotive contributions).

response to hurricanes is driven by lobbying capture.

5.3 Electoral results

Our next line of investigation is whether politicians' responses to climate change threats are aligned to voters' interest or not. To this purpose, we analyze whether voters reward or penalize politicians for engaging in green legislation, by looking at the electoral vote share in elections following a hurricane.

We consider in particular three main hypotheses: (i) environmental catastrophes capture voters' attention over salient issues, and politicians respond to voters' desire for environmental regulation (ii) the general public fails to understand the importance of the global warming signals, but politicians miscalculate voters' interests (iii) the general public fails to understand the importance of the global warming signals, but politicians perceive the increasing risks of climate change and endorse green bills irrespective of the voters' views.

For this analysis, we collapse the original data at the Congress level, and separate green bills sponsored or co-sponsored before (or in the absence of) a hurricane, from those sponsored or co-sponsored after a hurricane. We then run the following regression:

$$\begin{aligned} VoteShare_{sd,t+1} =& \alpha + \beta_1 H_{sd,t} + \beta_2 GBBefore_{sd,t} + \beta_3 GBAfter_{sd,t} + \\ & \gamma' X_{sd,t} + \delta_t + \mu_i + \epsilon_{sd,t} \end{aligned} \tag{2}$$

Each observation represents a congress member-Congress pair (e.g., the representative of Massachusetts' 1^{st} congressional district in the 109^{th} Congress). We exclude uncontested races and races where the incumbent is not running for re-election. We also exclude Congresses in which it was not possible to compute the vote share for the incumbent in the following election (i.e., the 102^{nd}, 107^{th}, and 112^{th} Congresses, which preceded the reapportionment of districts; and the 114$^{\text{th}}$ Congress, the last one in our data). We also control for the time from the hurricane to the end of the Congress, which is set to two years in the absence of a hurricane. Finally, we include individual congress member fixed effects (μ_i), as in column (4) of Table 3, to control for unobservable systematic differences among those who support more or less climate change legislation.

The key parameter of interest is β_3, which tells us the the effect of supporting an additional green bill after the occurrence of a hurricane on the vote share in the subsequent election, holding constant the number of green bills supported prior to the hurricane. The inclusion of individual effects implies that identification is obtained from variation within congress member over time in electoral support and green legislation in response to hurricanes. This at least in part assuages concerns that we are picking up a spurious effect, whereby representatives who are consistently more or less popular also systematically sponsor more green legislation.

Table 9 presents the main results from regressing the number of green bills sponsored or co-sponsored before and after a hurricane on the vote share in the following election. Column (1) shows that each green bill sponsored or co-sponsored after a hurricane reduces the vote share by almost 1.7 percentage points.[27] This effect represents only a 2.5% reduction in the average vote share of an incumbent politician (68 percentage points), but almost a 10% reduction in the average vote margin necessary to secure reelection (17 percentage points). At first glance, it appears that supporting environmental legislation is not popular with voters.

Following the rest of the literature (e.g., Cole et al., 2012) in column (2) we also control for the number of relief bills sponsored or co-sponsored in the aftermath of a hurricane. We view these as measures of short-run response to a natural disaster (see the discussion

[27]There is no significant effect of hurricanes on the probability of running for re-election. There is also no effect of the number of green bills supported after a hurricane on the probability of running for re-election. Results available upon request.

in Section 4.1). Not surprisingly, we find that these variables are positively associated with subsequent vote share, even though the point estimate for the number of relief bills supported after a hurricane fails to hit conventional level for statistical significance. Importantly, the inclusion of these additional controls does not change the main result on the number of green bills, which remain negative and statistically significant at the 1% level.

We may be concerned, however, that the relationship in columns (1) and (2) is biased, if politicians' response to hurricanes is itself affected by the expected re-election probability, which is unobservable. The bias could go in either direction: politicians who are aware of their declining popularity may engage in more environmental regulation, leading to a negatively biased estimate; but it is also possible that only popular politicians can afford to support green bills, in which case the bias would be positive. The inclusion of congress member fixed effects is ineffective in addressing this potential source of bias.

We address this issue here by using an original instrumental variable approach. In columns (3) and (4) we instrument the number of green bills sponsored or co-sponsored after a hurricane with the number of green bills already introduced by other congress members of one's same party at the time a district is hit. The exclusion restriction is likely to be satisfied, because the number of other green bills introduced to Congress prior to the occurrence of a hurricane is orthogonal to the timing of a hurricane hitting a certain district. The relevance condition is also likely to be satisfied, because a representative willing to engage in environmental legislation after a hurricane is more likely to co-sponsor a bill that had already been introduced, rather than drafting a new one from scratch. Column (3) indeed shows that the number of green bills sponsored or co-sponsored after the hurricane is positively correlated with the total number of green bills that had been introduced before a hurricane. The first stage is moderately strong, with a first-stage

F-statistic of 15.8. The 2SLS estimates in column (4) show that, once we account for the potential endogeneity of legislative activity, the effect of supporting green bills on the subsequent vote share remains negative and of similar magnitude, but is estimated imprecisely. [28]

On the whole, there is little evidence that voters reward politicians for engaging in green legislation. If anything, politicians appear to be penalized for supporting more green bills, even though the evidence from the 2SLS analysis is somewhat inconclusive. However, one would need a large correlation between unobserved politician popularity and the propensity to support green bills to overturn the conclusion that environmental legislative activity carries an electoral penalty. Specifically, we would need weak and unpopular politicians to be the ones most likely to engage in climate legislation as a last-ditch move to prevent a decline in electoral support. We document in Section 5.5 that this is actually not the case.

The results run counter to the notion that politicians act in response to voters' desire for more environmental regulation in the aftermath of a hurricane (hypothesis (i) above). The remaining possibilities are that politicians either overestimate the public's desire for environmental regulation (hypothesis (ii)) , or that they decide to go ahead and promote green legislation in spite of their constituents' preferences (hypothesis (iii)). We attempt to disentangle these alternative possibilities in the following section.

5.4 Short-run vs. long-run response

To assess whether politicians overestimate voters' willingness to support environmental regulation, we look at whether the response is temporary or permanent. A temporary effect would be aligned with hypothesis (ii): politicians are originally misled by interest

[28]Weak-instrument robust inference also indicates that one cannot reject the null hypothesis that $\beta_3 = 0$.

groups' activities or media coverage regarding the true interest of voters, but soon realign their legislative activity. A more persistent effect instead signals a change of view that cannot be easily explained, given voters' apparent hostility towards climate environmental regulation.

We investigate this issue by implementing an event-study analysis. In doing so, we restrict attention to districts ever hit by a hurricane. As districts can experience multiple hurricanes over time, we focus on "clean" episodes without any other occurrence within a -4/+4 year symmetric window (for a total of nine years) around the event, dropping any other observation outside this window.

In practice we use the same model as in Equation (1), augmented with lags and leads of the event. Denoting by t_0 the year in which a hurricane hits district d, we estimate the following equation:

$$GB_{sdi,t} = \alpha + \sum_{t=t_0-4}^{t_0+4} \beta_{t-t_0} H_{sdi,t_0} + \gamma' X_{sdi,t} + \delta_t + \mu_z + \epsilon_{sdi,t}. \tag{3}$$

As we can only identify eight coefficients out of nine, we restrict the coefficient in the year before the hurricane ($t_0 - 1$) to zero.

Absent anticipation effects, we should expect the effects at all leads ($t = t_0-4, ..., t_0-1$) to be equal to zero. Instead, there should be a positive effect in years t_0 and $t_0 + 1$, as we have already seen in Section (4). Our main interest is in the coefficients on the subsequent lags, which are informative about the persistence of the effect.

Estimated coefficients, together with 95 percent confidence intervals, are reported in Figure 4. A vertical line refers to the year of the hurricane (time t_0). One can verify that, prior to entry, there is no trend in green legislation. This evidence rules out that anticipation effects are driving our results. One can also see that the estimated coefficients become positive exactly at the time of a hurricane, they increase after one year and then remain steadily positive throughout the following years, even though confidence intervals become wider.[29]

We interpret the persistence of the effect as evidence that climate change permanently shapes congress members' beliefs about the optimal policy, irrespective of the voters' views (hypothesis (iii)). This is indeed a surprising result, which is difficult to reconcile with standard models of electoral accountability (Barro, 1973; Ferejohn, 1986) in which politicians choose an action not because it is right for society, but because it is popular (Maskin and Tirole, 2004). It is instead reminiscent of a framework where politicians are also motivated by the desire to implement good public policy. Moreover, they are more likely than the average citizen to have the experience, judgment, and information to evaluate the costs and benefits of alternative policies, and they are willing to lose electoral support in order to implement policies that are unpopular in the short-run, but may have long-run benefits.

This interpretation is further corroborated by the evidence we present in Table 10. Here we use data from the 2014 and 2016 waves of Yale University's survey *Climate Change in the American Mind*. The survey specifically tracks public understanding of climate change and support for climate policies. We aggregate county level data into population-weighted district averages of the principal component estimate for three groups of related answers on global warming: "Support regulation" (which groups support to limit to coal-fire, support for CO_2 regulation, and support for renewable sources), "Believe climate change is happening" (which groups belief in global warming, belief that it is caused by humans, belief in science, and expression of worry about climate change), and "Climate change will harm us" (which groups belief that climate change will harm you, will harm the U.S., will harm poor countries, will harm future generations, and will harm in 10

[29] We have fewer observations for higher-order lags and leads when hurricanes occur at the end or at the beginning of the census decade.

years). We then merged these data with the disaster declarations' data from FEMA.

In line with other studies we described in Section 1, the main results in columns (1), (3) and (5) show that voters living in districts hit by a hurricane are somewhat more likely to believe that climate change is happening (a 4% increase compared to the average), and are especially more likely to support climate change regulation (a 17% increase). This is not the case for voters living in districts hit by snowfalls, storms or tornadoes, events that are typically not associated with global climate change, in contrast to hurricanes. [30]

This result might seem at odds with the hypothesis that voters penalize politicians for promoting climate change policies in the aftermath of a hurricane. However, further evidence presented in columns (2), (4) and (6) shows that this effect is only temporary. Actually, there is some evidence of a rebound effect, with voters in districts hit by a hurricane who become less supportive of climate change intervention in less than two years.[31] This short-sighted behavior is in contrast with what we observed for politicians in Figure 4, and might help explain the electoral penalty we document in Table 9.[32]

5.5 Heterogeneous responses

To learn more about the underlying motives behind the patterns uncovered above, we now look at whether the politicians' response to hurricanes and the electoral penalty associated with environmental regulation differs by congress member characteristics or political circumstances.

In Table 11 we investigate heterogeneity in the politicians' response to hurricanes by interacting our measure of hurricane incidence with district and individual characteristics. We first look at whether the response to hurricanes has changed over time. Column

[30] Results using the original county level data are qualitatively identical, and are available upon request.

[31] We could only estimate the effect of a hurricane hitting a district at time $t-2$, but not at time $t-1$, as there were no recorded hurricanes between 2012 and 2015.

[32] Additionally, it is also possible that survey respondents support more regulation in the abstract, but voters, who face the full set of tradeoffs implied by regulation, are more lukewarm.

(1) shows that the response to hurricanes has become substantially stronger after the publication of the 4th IPCC Assessment Report in 2007. This is the first IPCC report that stated in unequivocal terms that Earth's climate is warming, and that the increase in global temperatures is very likely caused by human activity. The report also noted an increase in hurricane intensity that correlates with increases in sea surface temperatures, and predicted that there will be an increase in hurricane intensity during the 21st Century. The finding of a stronger response after the publication of the report lends support to the hypothesis that awareness of the risks of global climate change is one of the main drivers behind the relationship between hurricanes and green legislation.

We next look at heterogeneity by party and by previous support for environmental causes. The response to hurricanes is weaker for Republican congress members (column 2). This is not surprising, as the Republican party has traditionally been less likely to embrace environmental regulation, because of its pro-business orientation. In recent years, contributions to Republican candidates from the energy and automotive sectors, two industries likely to be particularly affected by environmental regulation, have outstripped those to Democrats by a factor of about 3 to 1. Nevertheless, the sum of the coefficients in column (2) is positive and significant at the 10% level, implying that, *ceteris paribus*, Republican congress members do respond to hurricanes with more support for environmental legislation, albeit in a more limited manner.

Column (3) looks instead at whether the response to hurricanes depends on congress members' own lifetime environmental record. We collected the *League of Conservation Voters* (LCV) lifetime score for each member of Congress. The LCV assigns to each congress member a score between 0 and 1, equal to the share of pro-environment votes cast out of the total number of votes scored since their first election. To obtain an *ex-ante* measure not influenced by hurricanes per se, we focus on the lifetime score measured at $t-2$.[33] The results are again consistent with those of column (2): the response to hurricanes is more pronounced among congress members who were already inclined to support environmental causes. This suggests that hurricanes do not necessarily cause climate skeptics to suddenly overturn their long-held position. Rather, politicians who were already inclined to support environmental causes become more forceful in their support for environmental regulation.

In column (4) we investigate whether there might be different behaviors depending on congress members' experience, as proxied by tenure in office.[34] There is a positive interaction term, i.e., the response to a hurricane increases with time served in Congress. This result may be telling us that supporting unpopular policies is more viable for more experienced politicians, who possibly also enjoy more electoral credit. Following this argument, in column (5) we look specifically at whether support for green legislation following a hurricane depends on whether the representative is facing a competitive re-election or not. In the spirit of Dal Bó et al. (2009), to minimize reverse causality issues we define a district as safe if the average margin of victory of the incumbent *party* at the state level in the following election is larger than 15 percentage points. This variable is not defined for inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}) and Congress 114^{th}, which explains why we end up with fewer observations.[35] In this case, the whole effect seems to be driven by representatives holding a safe seat. This evidence is evocative of the fact that voters might dislike more environmental regulation, and representatives only engage on it when their seat is not at risk. Accordingly, while we find a negative effect of the number of green bills sponsored or co-sponsored after a hurricane on the vote

[33] This variable is by construction not available for congress members in their first term, which explains why we have a fewer observations than in the rest of the table.

[34] Results are essentially identical if we use age rather than tenure as the proxy for experience.

[35] We also experimented with other thresholds (10 or 30 percentage points), and other definitions (incumbent's own margin of victory in the following election), but results were qualitatively very similar. These results available upon request.

share in the following election (see Section 5.3), there is no significant impact on the re-election probability: in a regression where the dependent variable is a dummy for whether a congress member is reelected (similar to that of Table 9, column 1), the coefficient on the interaction between hurricane incidence and the number of green bills supported after a hurricane is 0.0059, with a standard error 0.0089.

We conclude from the evidence in Table 11 that the legislative response to hurricanes is driven by awareness of the risks of global climate change, and it is stronger among congress members who were already inclined to support environmental regulation. However, political constraints matter – only politicians with sufficient experience and electoral credit may engage in forward-looking policies.[36]

In Table 12 we look at whether there is heterogeneity in the electoral penalty suffered by politicians that support green policies in the aftermath of a hurricane. For each dimension of heterogeneity considered in Table 11, we compare the effect of the number of green bills sponsored or co-sponsored on politicians' vote shares before and after the hurricane. Given the lack of precision of the 2SLS estimates in Table 9, we focus exclusively on the OLS specification, keeping in mind the potential concerns about endogeneity discussed previously. Columns (1) and (2) show that there is a sizeable electoral penalty both before and after the publication of the 4^{th} IPCC Assessment Report, even though the coefficient is larger and more precisely estimated in the latter period. This suggests that as the risks of climate change become more salient, the issue itself becomes more polarizing, and politicians who actively engage in this subject may suffer a larger electoral penalty.

The next two columns look at heterogeneity by party and by previous environmen-

[36]In Section A.2 we show that more green legislative activity results in more green bills that are ultimately enacted into public law, although there is a considerable amount of heterogeneity. This allows us to rule out that the increase in support for green bills after a hurricane is pure signaling, with representatives having no real intent to push through new legislation. There is no evidence, however, that bills supported in the aftermath of a hurricane are *more* effective, or that affected representatives devote *more* effort to ensure passage of their bills.

tal record. Perhaps surprisingly, Republicans and Democrats suffer a similar electoral penalty (columns 3 and 4), but the effect for the former is more precisely estimated. On the other hand, there are large differences in the size of the electoral penalty by previous environmental record. Congress members with an environmental score above the median ("green") do not suffer an electoral penalty, and may in fact even benefit from engaging in more climate change legislation in the aftermath of a hurricane. On the other hand, congress members with an environmental score below the median do suffer a statistically significant (at the 10% level) electoral penalty, similar in size to that of the average congress member. It therefore appears that the electoral penalty is mostly concentrated among politicians who deviated from previously held views. Columns (7) and (8) show that the electoral penalty is of similar magnitude for experienced and inexperienced congress members, but it is estimated more precisely for the former.

Finally, the last two columns of the table look separately at safe and unsafe districts. the effect of supporting green bills in the aftermath of a hurricane appears to be more pronounced in unsafe districts, consistent with the previous finding that representatives in unsafe districts are less likely to support green legislation. However, the estimates are quite noisy because of the small sample size.

6 Concluding remarks

Climate change legislation represents an ideal context to understand the making of long-run oriented but unpopular policies. While the recent and unprecedented wave of populism in some countries portrays politicians as short-sighted policy makers who neglect the future cost of policies to please voters, our work reveals that there are circumstances under which politicians may adopt a forward-looking behavior and decide to take action despite the electoral penalty that comes with it.

Using data on the universe of federal disaster declarations between 1989 and 2014, we document that congress members from districts hit by a hurricane are more likely to support bills promoting more environmental regulation and control in the year after the disaster. This response to hurricanes does not seem to be driven by logrolling behavior or lobbysts' pressure, and it is associated with an electoral penalty in the following elections. The change in legislative agenda is persistent over time, unlike voters' support which is only temporary, and it is prompted by the direct experience of the hurricane's damages, and mainly promoted by representatives in safe districts, those with more experience, and those with strong pro-environment records.

Our evidence reveals that extreme events can trigger a permanent change in politicians' beliefs. However, when the appropriate political response to the disaster is unpopular, not all politicians are willing to bear the electoral costs: only those with a sufficient electoral strength or with strong ideologies are willing to promote policies with short-run costs and long-run benefits. More broadly, our findings suggest that electoral accountability may be counter-productive when policy making needs to be forward-looking. This raises the question of whether some institutions, such as two-year legislatures, are appropriate under circumstances that require instead a less short-sighted approach.

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Figures and Tables

Table 1: Descriptive statistics

	Mean	S.d.	Min	Median	Max
Hurricanes:					
Hit by hurricane	0.050	0.219	0	0	1
Hit by hurricane - SE	0.028	0.165	0	0	1
Hit by hurricane - NE	0.022	0.146	0	0	1
Major disaster	0.046	0.209	0	0	1
Share counties	0.036	0.175	0	0	1
Share population	0.037	0.178	0	0	1
Wind intensity	0.025	0.110	0	0	1.344
Legislative activity:					
N. bills sponsored	6.328	6.420	0	5	106
N. bills co-sponsored	107.778	70.999	0	92	643
N. green bills sponsored	0.075	0.334	0	0	7
N. green bills co-sponsored	1.248	1.726	0	1	22
N. of green bills	1.323	1.817	0	1	22
N. year/districts			11,195		
N. decade/districts			1,735		
N. individual congress members			1,338		

Notes. *N. of green bills* is the number of green bills sponsored and co-sponsored, as defined by the CBP. *Hit by hurricane* is a dummy equal to 1 if at least one county in the district was hit by a hurricane, conditional on wind intensity being at least 18 mph. *SE* includes Alabama, Florida, Georgia, Kentucky, Louisiana, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, while *NE* includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. *Major disaster* only includes FEMA major disaster declarations (not emergency declarations). *Wind intensity* in 100 mph.

Table 2: Balancing tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
District characteristics:	Pop. (log)	Income (log)	Land area (log)	Over 65 (share)	Black (share)	Foreign (share)	Urban (share)
Hit by hurricane	0.001	0.015	-0.042	-0.171	1.024*	1.215*	0.976
	(0.003)	(0.015)	(0.077)	(0.115)	(0.556)	(0.618)	(1.150)
Avg. outcome	13.30	10.19	14.26	13.32	11.78	9.128	72.16
Individual characteristics:	House leader	Republican	Majority	Margin victory	Female	Tenure (terms)	Age (years)
Hit by hurricane	0.005	-0.023	0.017	-2.908	-0.016	0.091	0.195
	(0.004)	(0.021)	(0.032)	(1.987)	(0.012)	(0.212)	(0.518)
Avg. outcome	0.0110	0.486	0.446	37.85	0.133	4.481	55.06
N. year/districts				11,195			
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. *Hit by hurricane* is a dummy equal to 1 if at least one county in the district was hit by a hurricane. *House leader* is a dummy for being speaker, minority/majority leader/whip, or standing committee chair. *Margin victory* is the relative margin of victory w.r.t. the second candidate. *Tenure* is the number of terms served in Congress. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 3: Hurricanes and support for green bills - Baseline estimates

	(1)	(2)	(3)	(4)	(5)
	N. green bills				
Hit by hurricane	-0.257***	0.067	0.111*	0.119**	0.134*
	(0.062)	(0.050)	(0.066)	(0.056)	(0.072)
Avg. outcome	1.323	1.323	1.323	1.322	1.323
N. year/districts	11,195	11,195	11,193	11,180	11,193
Hit by hurricane (t-1)	-0.151*	0.171**	0.236***	0.247***	0.231***
	(0.082)	(0.081)	(0.076)	(0.083)	(0.076)
Avg. outcome	1.262	1.262	1.280	1.270	1.280
N. year/districts	9,472	9,472	9,039	9,313	9,039
Year FE	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes
State FE		Yes			
District FE			Yes		Yes
Individual FE				Yes	
State trends					Yes

Notes. *Hit by hurricane* is a dummy equal to 1 if at least one county in the district was hit by a hurricane. *N. of green bills* sponsored and co-sponsored, as defined by the CBP. *Controls* include the n. of relief bills and the n. of other non-green bills sponsored/co-sponsored; 23 dummies for the committee membership; the share of the Green and the Republican party in the previous election; the log of population, area, and per capita income; the share of population over 65, black, foreign born, and urban; the ratio between national share of coal/oil production and the national share population, at State level; a dummy for belonging to the House minority party; being House leader (speaker, minority/majority leader/whip, standing committee chair), republican, in the first session, female, and the relative margin of victory w.r.t. the second candidate; tenure (terms) and age (years). State linear trends in column (5). Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 4: Robustness analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	N. green bills				N. green bills (C2ES)	N. original green bills
Hit by hurricane (t-1)					0.167***	0.112***
					(0.043)	(0.037)
Share counties (t-1)	0.315***					
	(0.112)					
Share population (t-1)		0.307***				
		(0.107)				
Wind intensity (t-1)			0.455***			
			(0.148)			
Major disaster (t-1)				0.235***		
				(0.073)		
Avg. outcome	1.280	1.280	1.280	1.280	0.668	0.508
N. year/districts	9,039	9,039	9,039	9,039	7,745	9,039
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes. *N. of green bills* sponsored and co-sponsored, as defined by the CBP (or C2ES). *N. of original green bills* includes sponsored and originally co-sponsored bills only. *Wind intensity* in 100 mph. *Major disaster* only includes FEMA major disaster declarations (not emergency declarations). For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 5: Other disasters

	(1)	(2)	(3)
		N. green bills	
Hit by snow (t-1)	0.065		
	(0.068)		
Hit by storm (t-1)		-0.052	
		(0.056)	
Hit by tornado (t-1)			-0.004
			(0.121)
Avg. outcome	1.280	1.280	1.280
N. year/districts	9,039	9,039	9,039
Year FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. *Snow* includes snowfalls, freezings and severe ice storms. *Storm* includes severe storms and coastal storms. For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 6: Other bills

	(1)	(2)	(3)
	N. other non-env. bills	N. other env. bills	N. relief bills
Hit by hurricane (t-1)	0.834	-0.470**	0.131
	(1.466)	(0.204)	(0.150)
Avg. outcome	101.7	7.511	1.047
N. year/districts	9,039	9,039	9,039
Year FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes. *N. green bills*, *N. other non-env. bills* and *N. other env. bills* sponsored and co-sponsored, as defined by the CBP. *N. relief bills* sponsored or co-sponsored, according to the bill's title. For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 7: Spillover effects

	(1)	(2)	(3)
	N. green bills		
Hit by hurricane (t-1)	0.256***	0.270***	0.264***
	(0.075)	(0.075)	(0.078)
Adjacent district hit by hurricane (t-1)	0.142**		
	(0.061)		
District in state hit by hurricane (t-1)		0.200*	
		(0.108)	
Adjacent state hit by hurricane (t-1)			0.128
			(0.081)
Avg. outcome	1.280	1.280	1.280
N. year/districts	9,039	9,039	9,039
Year FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. *Adjacent district*, *District in state* and *Adjacent state* are dummies equal to 1 if at least one adjacent district, or one non-adjacent district in the state, or one district in an adjacent state was hit by a hurricane (but not the district itself), respectively. For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 8: Logrolling and lobbyists' pressure

	(1)	(2)	(3)	(4)	(5)	(6)
			Contributions (log)			
	N. green bills		Green	Oil	N. green bills	
Hit by hurricane (t-1)	0.236***	0.297***	0.444***	-0.168	0.220***	0.243***
	(0.076)	(0.078)	(0.138)	(0.166)	(0.068)	(0.075)
Hit by hurricane (t-1) ×:						
N. green friends	-0.021					
	(0.028)					
N. green same-state		0.021***				
		(0.007)				
Green contributions (log)					0.024	-0.002
					(0.023)	(0.020)
Energy contributions (log)					-0.060***	-0.036
					(0.022)	(0.024)
Other contributions (log)					0.021	0.021
					(0.029)	(0.033)
Avg. outcome	1.280	1.280	1.363	8.934	1.280	1.292
N. year/districts	9,039	9,039	9,039	9,039	9,039	7,607
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Green score (t-2)	No	No	No	No	No	Yes

Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. *N. green friends* is the number of representatives who graduated from the same university and whose LCV lifetime environmental score, as observed at $t-2$, was above the median of the corresponding year. *N. green same-state* is the number of representatives from the same state whose LCV lifetime environmental score, as observed at $t-2$, was above the median of the corresponding year. *Green contributions (log)* and *Energy contributions (log)* are the log of the yearly amount of campaign funds, in thousand dollars, received from PACS classified as environmental or as energy and automotive industry by the CRP, respectively. *Other campaign funds (log)* is the residual of the campaign funds not classified as either green or oil. All continuous interaction variables are demeaned. *Green score (t-2)*, *Green score (t-2)* is the LCV lifetime environmental score as observed at $t-2$, and it not available for rookies. Column (5) also controls for the interaction of *Green score (t-2)* with *Hit by hurricane (t-1)*. In all columns *Controls* include the level of the corresponding interacted variable. For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 9: Electoral outcomes

	(1)	(2)	(3)	(4)
			IV estimates	
			First Stage	2SLS
	Vote share next	Vote share next	N. green bills	Vote share next
Hit by Hurricane	-0.588	-0.463		-0.512
	(1.006)	(1.102)		(2.521)
N. cumulative green bills before			0.005***	
			(0.001)	
Hit by hurricane ×:				
N. green bills before	0.007	0.010		0.002
	(0.083)	(0.084)		(0.085)
N. green bills after	-1.690***	-1.718***		-1.901
	(0.527)	(0.535)		(7.425)
N. relief bills before		0.238**		
		(0.097)		
N. relief bills after		0.148		
		(0.269)		
F-test			15.761	
Avg. outcome	68.19	67.78	0.027	68.19
N. congress/districts	3,023	3,369	3,018	3,018
Congress FE	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes. *Vote share next* is the vote share of the incumbent ion the subsequent election. Uncontested races, inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}), and Congress 114^{th} excluded. *N. cumulative green bills before* is the the number of green bills already introduced by other congress members of one's same party at the time a district is hit. *N. green bills before* and *N. relief bills before* is the number of green and relief bills sponsored and co-sponsored before (or in the absence of) a hurricane. *N. green bills after* and *N. relief bills after* equal to zero if no hurricane. *Vote share next* only defined if the incumbent is running for re-election. All continuous interaction variables are demeaned. In all columns *Controls* include the time (in days) to the end of the Congress (two years if no hurricane). For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 10: Attitudes on climate change

	(1)	(2)	(3)	(4)	(5)	(6)
	Support regulation		Believe is happening		Will harm us	
Hit by hurricane	0.091***	0.092***	0.016**	0.017**	0.015	0.016
	(0.019)	(0.019)	(0.008)	(0.008)	(0.010)	(0.010)
Hit by hurricane (t-2)		-0.035*		-0.016*		-0.013*
		(0.018)		(0.008)		(0.008)
Hit by snow	-0.036	-0.006	-0.007	0.007	-0.004	-0.004
	(0.022)	(0.026)	(0.006)	(0.009)	(0.011)	(0.012)
Hit by snow (t-2)		0.053		0.024*		0.000
		(0.034)		(0.015)		(0.017)
Hit by storm	-0.001	-0.004	-0.003	-0.003	0.010	0.014
	(0.019)	(0.022)	(0.010)	(0.013)	(0.010)	(0.012)
Hit by storm (t-2)		-0.006		-0.001		0.009
		(0.014)		(0.009)		(0.008)
Hit by tornado	0.012	-0.013	0.012	-0.001	0.015	0.029***
	(0.011)	(0.013)	(0.018)	(0.005)	(0.021)	(0.003)
Hit by tornado (t-2)		-0.033		-0.017		0.019
		(0.028)		(0.027)		(0.027)
Avg. outcome	0.535		0.416		0.433	
N. year/districts	870					
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Each outcome represents the (county) population-weighted district average of the principal component estimate for three groups of related answers, standardized between 0 and 1, to the *Climate Change in the American Mind* survey (waves 2014 and 2016). *Snow* includes snowfalls, freezings and severe ice storms. *Storm* includes severe storms and coastal storms. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 11: Heterogeneous responses - Congress members

	(1)	(2)	(3)	(4)	(5)
	N. green bills				
Hit by hurricane (t-1)	0.083	0.345***	0.261***	0.244***	-0.079
	(0.091)	(0.104)	(0.067)	(0.073)	(0.121)
Hit by hurricane (t-1) ×:					
Post-2007	0.538***				
	(0.188)				
Republican		-0.208*			
		(0.109)			
Green score (t-2)			0.405*		
			(0.202)		
Tenure				0.040**	
				(0.017)	
Safe district					0.317**
					(0.120)
Avg. outcome	1.280	1.280	1.292	1.280	1.383
N. year/districts	9,039	9,039	7,607	9,039	6,019
Year FE	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

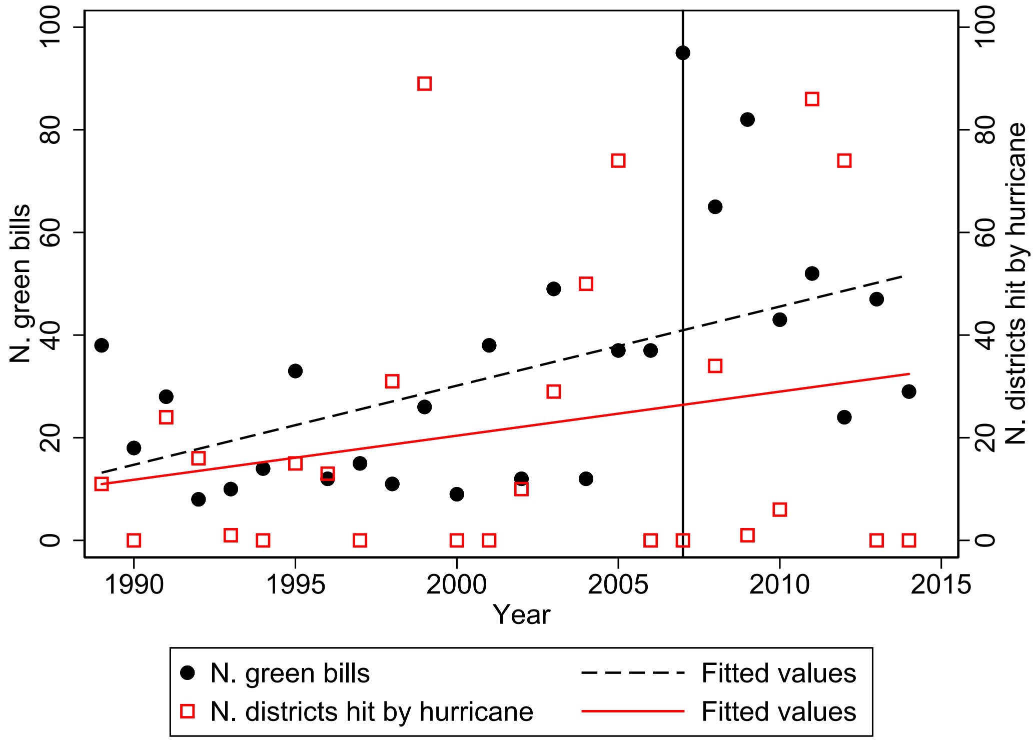
Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. *Post-2007* is a dummy equal to one for all Congresses after the release of the 4$^{\text{th}}$ IPCC Assessment Report in 2007. *Green score (t-2)* is the LCV lifetime environmental score as observed at $t-2$, and it is not available for rookies. *Tenure* is the number of terms served in Congress. *Safe district* is dummy equal to one if the average margin of victory of the incumbent party at state level in the following election is larger than 15 percentage points, and it is not defined for inter-census races (Congress 102nd, 107$^{\text{th}}$, and 112$^{\text{th}}$) and Congress 114$^{\text{th}}$. All continuous interaction variables are demeaned. In column (3), *Controls* also include the *Green score (t-2)*. For a description of all other interaction variables and *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 12: Heterogeneous responses - Voters

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Vote share next									
	Post-2007	Pre-2007	Republican	Democrat	Green	Not-green	Exp.	Unexp.	Safe district	Unsafe district
Hurricane	2.513	-1.405	-0.840	0.681	-1.153	0.816	0.761	-1.905	-1.370	9.649**
	(1.581)	(1.190)	(1.494)	(1.689)	(1.681)	(2.097)	(2.533)	(1.427)	(1.659)	(4.128)
Hit by hurricane ×:										
N. green bills before	0.002	0.140	-0.033	0.025	0.016	-0.188	-0.066	-0.066	0.116	-0.068
	(0.124)	(0.127)	(0.108)	(0.089)	(0.094)	(0.143)	(0.141)	(0.137)	(0.099)	(0.201)
N. green bills after	-2.204***	-1.439	-1.394*	-1.522	0.532	-1.454*	-1.606**	-1.412	-1.292	-2.679
	(0.773)	(0.966)	(0.724)	(1.136)	(0.814)	(0.809)	(0.793)	(0.989)	(1.117)	(4.002)
Avg. outcome	66.79	68.15	65.86	69.56	70.04	66.86	69.42	66.58	69.58	59.01
N. congress/districts	923	2,446	1,622	1,747	1,482	1,385	1,426	1,943	2,659	467
Congress FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

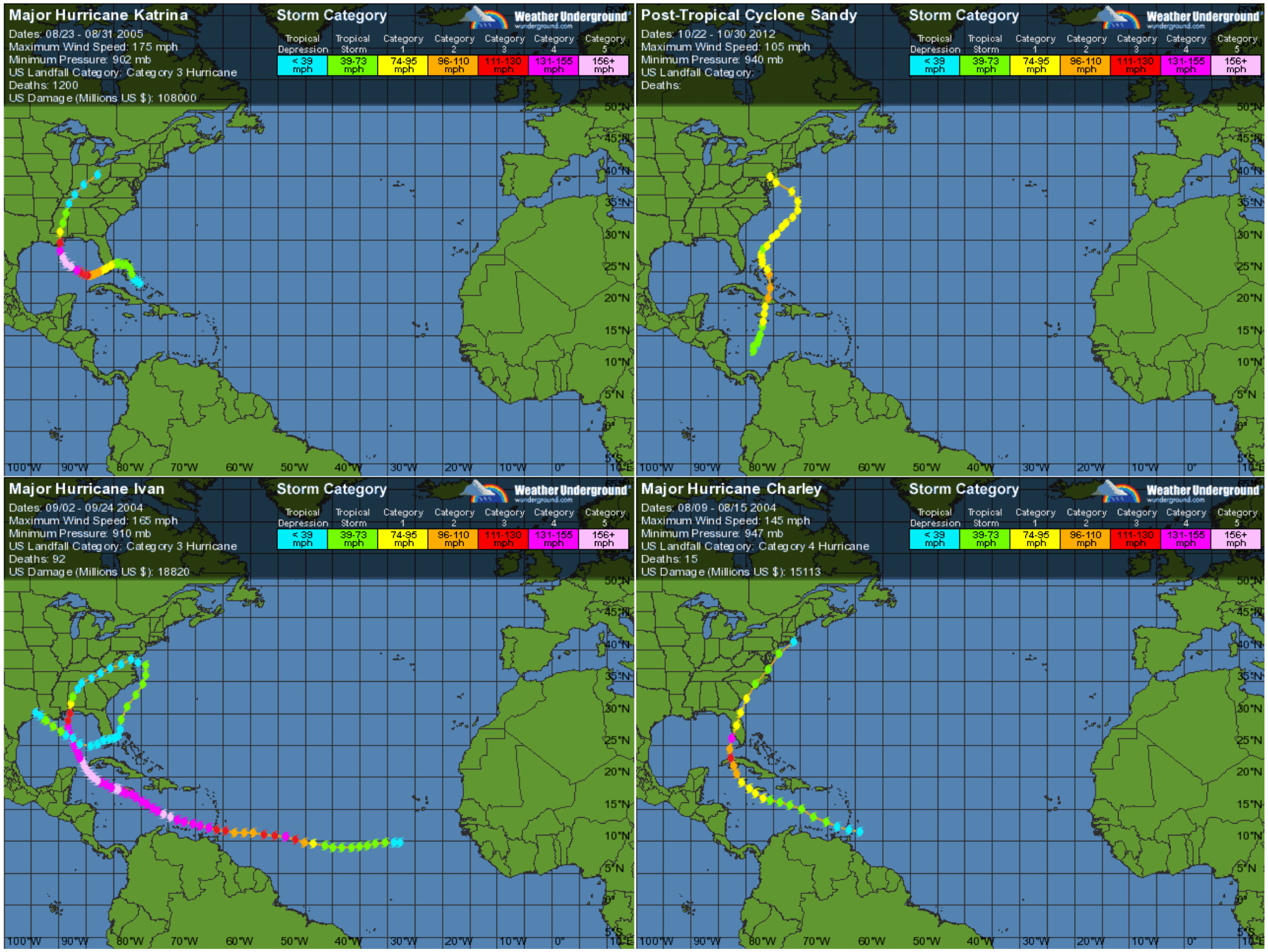
Notes. *Vote share next* is the vote share of the incumbent ion the subsequent election. Uncontested races, inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}), and Congress 114^{th} excluded. *N. green bills before* is the number of all green bills sponsored and co-sponsored before (or in the absence of) a hurricane. *N. green bills after* equal to zero if no hurricane. *Vote share next* only defined if the incumbent is running for re-election. *Post-2007* is a dummy equal to one for all Congresses after the release of the 4^{th} IPCC Assessment Report in 2007. *Green* is dummy equal to one if the LCV lifetime environmental score as observed at $t-2$ was above the median of the corresponding Congress. *Exp.* is a dummy equal to one for congress members with more than the median tenure (4 terms). *Safe district* is dummy equal to one if the average margin of victory of the incumbent party at state level in the following election is larger than 15 percentage points, and it is not defined for inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}) and Congress 114^{th}. All continuous interaction variables are demeaned. *Controls* additionally include the time to the end of the Congress (two years if no hurricane). For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Figure 1: Hurricanes and green bills over time



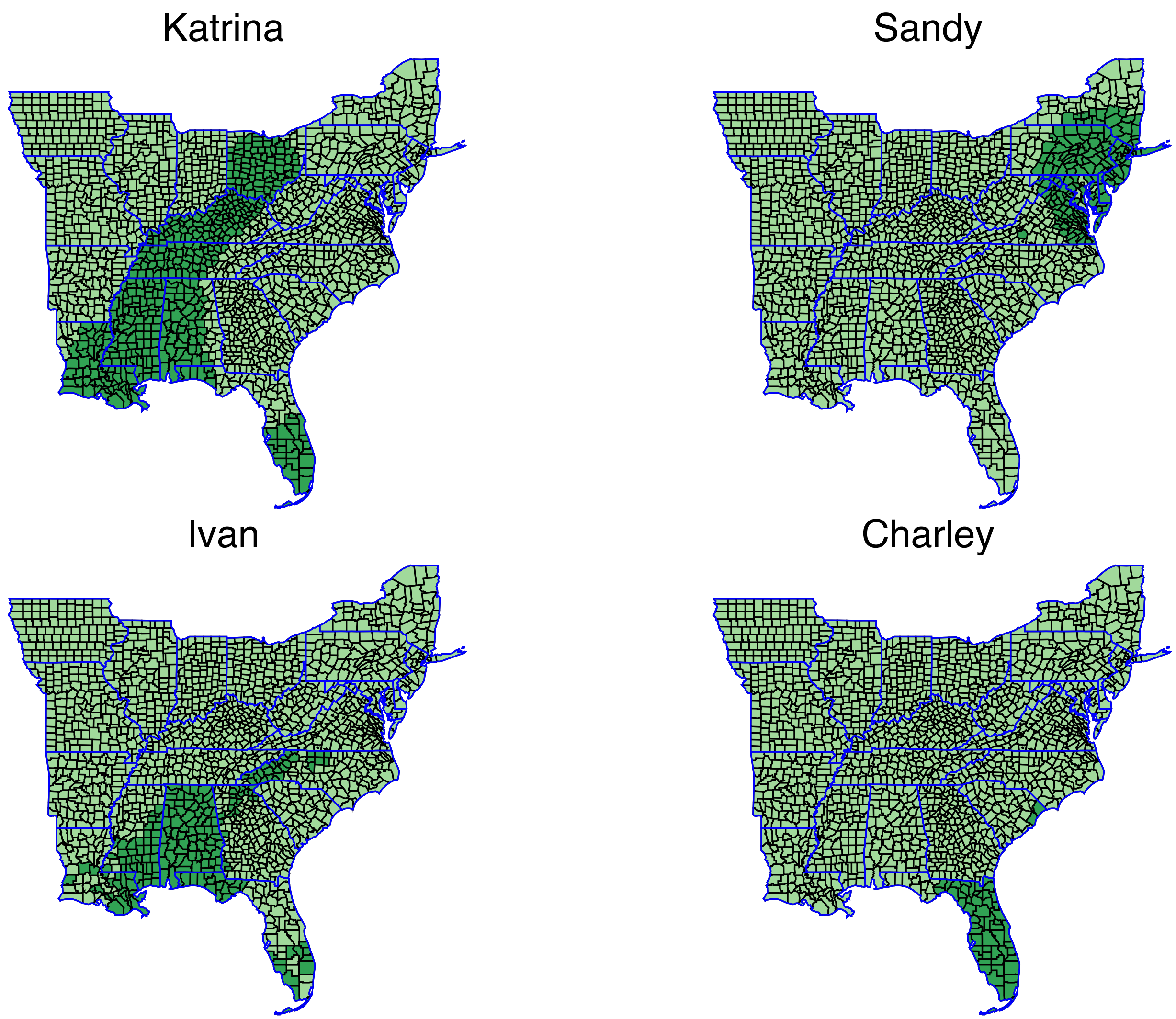
Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. The vertical line corresponds to the release of the 4^{th} IPCC Assessment Report in 2007.

Figure 2: Hurricane trajectories



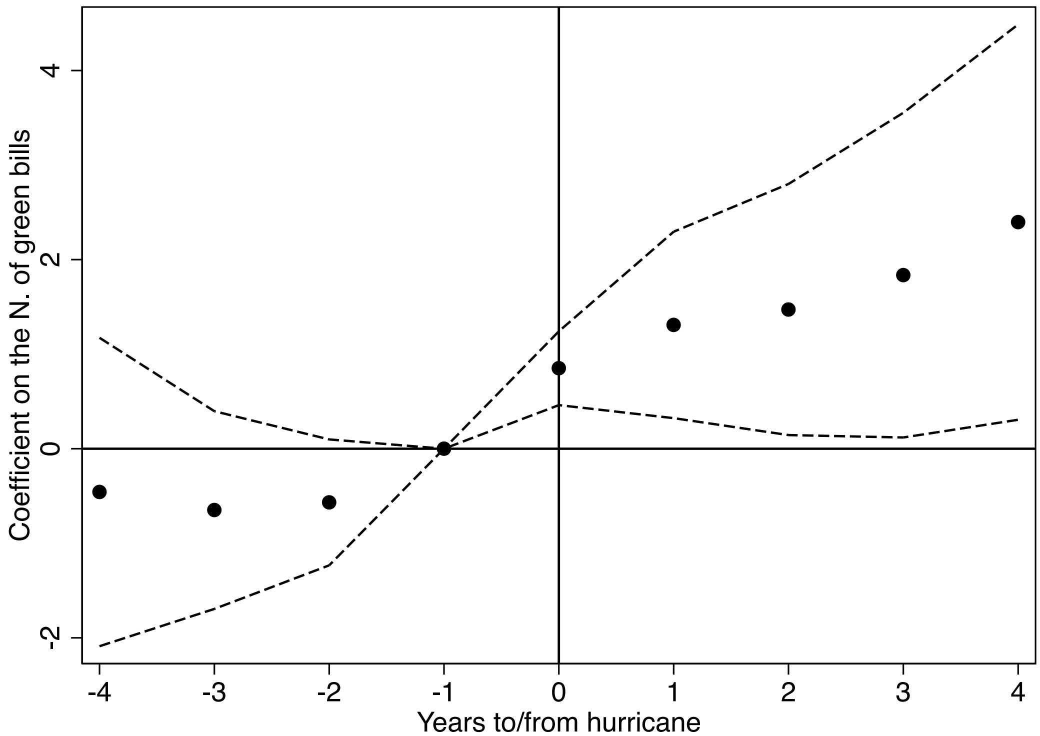
Notes. Source: *Weather Underground.*

Figure 3: Hurricane FEMA declarations



Notes. Source: FEMA. Counties hit by a hurricane in dark green. Blue lines denote state boundaries.

Figure 4: Event-study analysis



Notes. The figure displays the estimated coefficient on the *N. green bills* sponsored and co-sponsored, as defined by the CBP, at different lags and leads since a hurricane hit the district (denoted by a vertical line). Estimates include all the controls as in column (3) of Table 3. Sample: districts experiencing one hurricane within a decade (1,205 year/district observations). 95 percent confidence intervals reported in dash lines (standard errors clustered by state).

A Appendix

A.1 Bills' text analysis

The bills' text analysis was conducted as follows. A research assistant read the content of all bills identified either by the CBP or by the C2ES (see Section 2) as aimed at contrasting climate change, and classified each of them according to the following (non mutually exclusive) flags: "against the environment", related to "noise pollution", providing "relief funds".

Specifically, a bill was considered as "against the environment" if:

- it prohibits, limits or delays the authority of Federal agencies or other U.S. authorities to issue regulations, decrees or orders to implement international protocols or agreements;
- it prohibits or limits U.S. contributions to international programs aimed protecting the environment;[37]
- it prohibits, limits or delays the use of Federal funds to implement environmental friendly regulation (e.g. limitation of carbon dioxide emissions, greenhouse gas emission reductions) or finance grant programs;[38]
- it prohibits, limits or delays subsidies or credit to household or firms for using renewable energy or environmentally friendly goods;

[37]Examples of international programs are: the *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, and the *Intergovernmental Panel on Climate Change*.

[38]Examples of environmentally friendly regulation are: limitation of carbon dioxide emissions, greenhouse gas emission reductions, ozone standards, greenhouse gas emissions from mobile sources, emissions from fossil fuel-fired electric utility generating units. Examples of grant programs are: EPA *National Clean Diesel Campaign*, EPA *Environmental Justice Program*, *Greenhouse Gas Reporting Program*, *Global Methane Initiative*, *Climate Resilience Fund*, *Climate Resilience Evaluation Awareness Tool*, *Green Infrastructure Program*, *Climate Ready Water Utilities Initiative*.

- it prohibits, limits or delays the introduction of programs to reduce the effects of emissions;
- it prohibits, limits or delays the introduction of taxes or fees on emissions (e.g. carbon dioxide emissions);
- it waives the requirements introduced by previous regulation;
- it waives temporarily taxes on traditional energy sources to decrease the price of energy;
- it simplifies the implementation of the Keystone pipeline, against which there was a strong campaign by environmentalist associations;
- it expresses the sense of Congress against taxes or tax increases on traditional energy source;
- it expresses skepticism on research documenting global warming or climate change.

Finally, a bill was considered as providing "relief funds" if it introduces additional relief funds to the victims of a natural disaster, and related to "noise pollution" if it introduces special regulations or taxes against noise pollution, mainly related to aviation and aeronautic regulations.

Of the initial 968 bills identified by the CBP as aimed at contrasting climate change, 94 turned out to be "against the environment", 2 providing "relief funds", and 6 related to "noise pollution". Of the initial 449 bills identified by the C2ES as aimed at contrasting climate change, none turned out to be either "against the environment", providing "relief funds", or related to "noise pollution".

A.2 Bill outcomes

In Table A.1 we investigate whether the increase in politicians' activity in support of green bills translates into more laws that are actually enacted. In the top panel of the table, we estimate models analogous to Equation (1), but the dependent is the number of bills that become public law. Column (1) shows that on average representatives of districts hits by hurricanes are not successful in promoting more legislation that becomes public law. This negative result, however, masks a considerable amount of heterogeneity: there is an effect after 2007 (column 2), for bills sponsored by Democrats and by green representatives (columns 3 and 4). Note that the characteristics also predict increased sponsorship and co-sponsorship of bills (from Table 11). As a result, this evidence is not very surprising: more legislative activity results in more bills that are ultimately enacted into public law. However, this allows us to rule out that the increase in support for green bills after a hurricane is pure signaling, with representatives having no real intent to push through new legislation.

There is no evidence, however, that bills supported in the aftermath of a hurricane are *more* effective, or that affected representatives devote *more* effort to ensure passage of their bills. The bottom panel of the table shows that the fraction of green bills that are enacted into law is not correlated with whether a district was hit by a hurricane, nor with any of the other characteristics. The combined evidence indicates that hurricanes lead to an increase in the volume of support for green legislation, but with no effect on the probability that those bills become laws. One possible explanation for this evidence is provided by Kahn (2007) who studies politicians' pro-environment voting after environmental disasters (such as oil spills). He shows that representatives are less likely to vote the pro-environment position on legislation tied to catalytic events, possibly because green bills proposed after a natural disasters are more ambitious.

Table A.1: Bill outcomes

	(1)	(2)	(3)	(4)	(5)
	N. green bills that became law				
Hit by hurricane (t-1)	0.002	-0.000	0.020***	0.003	0.002
	(0.003)	(0.003)	(0.005)	(0.003)	(0.016)
Hit by hurricane (t-1) ×:					
Post-2007		0.007*			
		(0.004)			
Republican			-0.035***		
			(0.006)		
Green score (t-2)				0.043***	
				(0.009)	
Safe district					-0.000
					(0.017)
Avg. outcome	0.0238	0.0238	0.0238	0.0209	0.0317
N. year/districts	9,039	9,039	9,039	7,607	6,019
	Fraction of supported green bills that became law				
Hit by hurricane (t-1)	-0.001	-0.003	0.006	-0.003	0.041
	(0.003)	(0.005)	(0.006)	(0.003)	(0.028)
Hit by hurricane (t-1) ×:					
Post-2007		0.006			
		(0.006)			
Republican			-0.015		
			(0.011)		
Green score (t-2)				0.012	
				(0.012)	
Safe district					-0.048
					(0.029)
Avg. outcome	0.0263	0.0263	0.0263	0.0216	0.0354
N. year/districts	4,944	4,944	4,944	4,117	3,409
Year FE	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes. *N. green bills* sponsored and co-sponsored, as defined by the CBP. *Post-2007* is a dummy equal to one for all Congresses after the release of the 4$^{\text{th}}$ IPCC Assessment Report in 2007. *Green score (t-2)* is the LCV lifetime environmental score as observed at $t-2$, and it not available for rookies. *Safe district* is dummy equal to one if the average margin of victory of the incumbent party at state level in the following election is larger than 15 percentage points, and it is not defined for inter-census races (Congress 102nd, 107$^{\text{th}}$, and 112$^{\text{th}}$) and Congress 114$^{\text{th}}$. All continuous interaction variables are demeaned. In column (4), *Controls* also include the *Green score (t-2)*. For a description of *Controls* see Table 3. Standard errors clustered by state in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.