Hurricanes, Climate Change and Political Accountability *

Stefano Gagliarducci† M. Daniele Paserman‡ Eleonora Patacchini§

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Abstract

In this paper we study how politicians and voters respond to new information on the threats of climate change. We investigate how members of the U.S. House of Representatives change their support for bills aimed at contrasting climate change in the aftermath of a hurricane. In the year after the disaster, Congress members from districts hit by a hurricane are more likely to support bills supporting more environmental regulation and control, as predicated by the vast majority of the scientific community. The effect appears to be substantial and persistent, which is consistent with a permanent change in beliefs. Congress members who hold a safer seat are those who engage more in climate change legislation, which in turn reduces electoral support in the following election. We interpret this as evidence that only politicians with a sufficient electoral credit can engage in promoting good but unpopular policies.

Keywords: U.S. Congress, Climate Change, Hurricanes, Accountability.

JEL codes: D70, D72, H50, Q54.

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† Tor Vergata University, EIEF and IZA

‡ Boston University, NBER, CEPR and IZA

§ Cornell University, EIEF, CEPR and IZA

1 Introduction

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. 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] However, journalistic accounts and political commentators are portraying the recent distressing hurricanes as opportunities for moving the climate debate further. The portrayed opportunity lies in the fact that 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. Such firms may be more likely to accept new regulation, and voters may reward politicians that address salient concerns.

Yet, very little is known about how voters and their representatives react to new information regarding the risks of climate change. The existing literature has focused on the responsiveness of voters to politicians' ability to obtain relief funds in the aftermath of severe weather events. Gasper and Reeves (2011), Healy and Malhotra (2010), and Cole (2012) note 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.[3] Politicians' response in terms of environmental

[1] Gallup, "Most Important Problem", http://news.gallup.com/poll/1675/most-important-problem.aspx, accessed on November 20, 2017.

[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 November 20, 2017.

[3] Other papers have focused on the economic impact of weather disasters. For example, Hsiang and

legislation, and voters' support for this kind of intervention, however, have never been investigated before.[4]

In theory, several reactions are possible. If voters and politicians are already fully aware of the risks of climate change, the occurrence of 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; 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

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., 2017).

[4]A notable exception is 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.

backfire, politicians may also choose to decrease support for green policies.

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 global warming to the frequency and intensity of hurricanes,[5] there is ample evidence that extreme weather events are associated with an increase in the perceived threats of global climate change.[6] 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."[7] Our analysis can shed light on whether, how and why elected politicians do in fact take action in response to changes in the perceived risks of climate change.

We use data on the universe of federal disaster declarations between 1953 and 2014 collected from the *Federal Emergency Management Agency* (FEMA). The data contain

[5]For example, the *Geophysical Fluid Dynamics Laboratory of the National Oceanic and Atmospheric Administration* 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.)

[6]Leiserowtiz (2006) and Myers et al. (2012) use surveys of the U.S. population to determine the factors influencing beliefs in climate change. They note that, among other factors, personal experience with extreme weather is associated with stronger beliefs about the reality of climate change. Sisco, Bosetti and Weber (2016) examine Twitter comments, finding that extreme weather increase the1 frequency of tweets about climate change in the local area. Egan and Mullin (2012) find that higher-than-average temperatures are associated with stronger short-term beliefs in global warming. Others find similar results outside of the U.S. (Dai et al., 2015; Blennow et al., 2012; Frondel et al., 2017).

[7]Quoted from http://www.nytimes.com/2012/11/02/nyregion/bloomberg-endorses-obama-saying-hurricane-sandy-affected-decision.html, accessed on May 17, 2017.)

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 cosponsoring "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. By doing so, we are mostly focusing on bills introducing stricter regulation , i.e., on what we interpret as long-run policy. The empirical strategy consists of regressing the number of green bills supported on a measure of hurricane intensity, 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 ensures that the occurrence of a hurricane can be thought of 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. This result is robust to controlling for district and congressperson fixed effects, and for state-specific time trends. The result is essentially unchanged regardless of how we measure exposure to hurricanes (a dummy for whether any county was affected, the share of counties affected, the share of the population affected, and the hurricane's wind intensity) and also if we restrict attention only to those hurricanes after which a major disaster declaration was issued, or we use the classification of the *Center for Climate and Energy Solutions* (C2ES) to identify bills related to climate change. Interestingly, we find that the effect is long-lived, i.e.,

there is a permanent change in beliefs, and that there is a positive but significantly lower response to hurricanes in neighboring districts, i.e., the effect is very much driven by the contingency of the event.

We finally look at the effect of supporting green legislation on the vote share in the following election. To achieve identification, we instrument the number of green bills cosponsored after a hurricane with the number of green bills already submitted to Congress at the time of the hurricane, the latter being reasonably orthogonal to the timing of a disaster. We find that voters reward politicians supporting relief bills, but penalize those supporting green bills. This evidence is consistent with the idea of myopic voters who only care about interventions with short run effects and do not value sufficiently highly policies with longer run effects. Congress members, on the other hand, appear to internalize the long-run costs of climate change. This interpretation is compatible with the finding that Congress members elected in less competitive districts are more likely to support green legislation in the aftermath of a hurricane, which might explain why they can bear the electoral cost of forward-looking policy making.

The interpretation that better aligns with our findings is that natural disasters lead to a persistent update of Congressmen's beliefs about the risks of climate change. A way to modeling this type of learning can be found in the model proposed by Kozlowski et al. (2015) in the context of macroeconomic fluctuations. Their model considers a flexible specifications for beliefs, where new observations lead to updates of the density around those observations. Because extreme events are typically infrequent, their influence on that region of the distribution of beliefs is highly persistent. As a result, extreme shocks (the Great Recession in their context) can lead to highly persistent changes in beliefs and in the outcomes affected by those beliefs.[8]

[8] A similar explanation is proposed by Abadie and Dermisi (2008) in the analysis of the demand for downtown office space in Chicago following the 9/11 attacks.

Finally, our findings reconcile two strands of literature from different fields. First, they relate to the psychological literature showing that objective experience rather than reported experience shapes attitudes. The long standing tradition in this literature recognizes that direct experiences are effective catalysts for changing people's attitudes. For example, racial and gender biases can be reduced when people bond with atypical role models (Rudman et al., 2001; Young et al., 2013). Second, our paper relates to the literature in economics examining the role of exposure on beliefs. From a theoretical perspective, Fudenberg and Levine (1993), Piketty (1995), and Levy and Razin (2017) develop models to explain the perpetuation of different beliefs between groups (even when one group's beliefs are incorrect). The investigation of the factors affecting changes in agents' preferences from an empirical point of view, however, is a notoriously difficult exercise since it would request the availability of a treatment distributed at random across agents and a measurement of their behavior before and after.[9] One area where some progress has been made is the effect of daughters on father's attitudes and opinions on gender-related issues. Washington (2008) shows that politicians with more daughters exhibit a higher propensity to vote liberally, particularly on reproductive rights issues; and Glynn and Sen (2015) note that the presence of daughters causes judges to give more female-friendly rulings. Our study leverages on another context where the role of exposure on beliefs can be investigated.[10]

There is A context where such an analysis has proven to be especially successful is the investigation of how exposure to females in the form of daughters affects the father's attitudes and opinions on gender-related issues.

The rest of the paper is structured as follows. Section 2 describes the data. Section 3

[9]Some evidence can be found in Dustmann and Preston (2001), who highlight that neighborhood segregation can affect views toward minorities, and Boisjoly et al. (2006) and La Ferrara et al. (2016), who note that living in racially diverse housing can decrease discriminatory views.

[10]Luca et al. (2016) find that experiences with mass shootings lead to a significant increase in the number of firearms bills in a State.

discusses the empirical approach. In Section 4 we present the main empirical results on green legislation, while in Section 5 we look at the impact over electoral outcomes and 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 101^{st} to the 113^{th} Congress (1989-2014). We obtained data on bill characteristics, sponsorship and cosponsorship, plus demographic and electoral characteristics for congressmen and their district of election, from the *Library of Congress* (www.congress.gov).

We identify 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* (www.congressionalbills.org): "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, we also excluded relief bills, bills on noise pollution, or bills that are actually anti-environmental, so we are mostly left with bills proposing more stringent regulation on environmental standards related to 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 ratification of international agreements).

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 environmen-

tal think tank that replaced the former *Pew Center on Global Climate Change*. The list is only available from the 106^{th} 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.

Our main measure of Congress members' activity is the number of bills sponsored or cosponsored. Each bill in Congress has one primary sponsor, and can be signed by any number of cosponsors. 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. Cosponsors 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 cosponsoring bills (Krehbiel, 1995, and Kessler and Krehbiel, 1996), we take the view that cosponsoring is an indicator that the Congressperson wishes to be associated with a piece of legislation.

Finally, we gathered detailed information on electoral results and campaign finance for each candidate through the *Federal Election Commission* (www.fec.gov), and information on fossil production (gas, oil and coal) at State level through the *Energy Information Administration* (www.eia.gov).

[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.

2.2 Hurricanes

We collected federal disaster declarations for the period 1953-2014 from the *Federal Emergency Management Agency* (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 northeastern Pacific Ocean, and consider both Major Disaster Declarations (DR) and Emergency Declarations (EM).[12]

Since disaster declarations, and especially the intensity of assistance, could be potentially influenced by the political momentum (Garret and Sobel, 2003), we additionally 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, weight those values by the inverse of the distance from the county centroid, and assign to the county the highest value.

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).[13] 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 an hurricane. This is because "all requests for a declaration by the President that a major disaster exists shall be made by the Governor

[12]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.

[13]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.

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 not hit by a hurricane (e.g., counties that took in evacuees after Hurricane Katrina, and therefore received FEMA assistance).[14]

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 relationship files available at the *Census Bureau* (www.census.gov).[15] When collapsing, we computed the total number of green bills sponsored or cosponsored 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 congressmen and to 1,735 district-decade 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.[16] Similar figures can be observed when looking at the share of counties hit by a hurricane, or at the share of

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

[15]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 18^{th} Congressional district in Congresses 108-112, which includes parts of Miami, is treated as a different district from Florida's 18^{th} district in Congresses 113^{rd}-114^{th}, which does not include Miami.

[16]Specifically, over the period 1989-2014 we could observe 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.

population.

On average, members of Congress sponsor 6.3 and cosponsor 107.8 bills, of which only 1.3 (1.2%) can be classified as green according to our baseline classification. Although this is indeed a small number, if we look at Figure 1 it seems that climate change has received increased attention by Congress members, especially after the release of the Fourth Assessment Report by the 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." Interestingly, there is also an increase in the number of districts that were hit by a hurricane, especially after 2005 (Hurricane Katrina and others).

3 Empirical model and identification strategy

We now investigate how the raw correlation presented in Figure 1 is affected once we control for differences between district and congressman hit by a hurricane or not. The basic model 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 cosponsored 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 election; 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 cosponsored; 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 (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 anthropomorphic activity. This randomness is well represented in Figure 2, which reports the observed trajectory of four representative hurricanes in the last twenty years. Here, there is no evident sign of any time or geographical pattern, besides the fact that al these hurricanes occur in the South-East and North-East of the country. 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 most preferred specification will include year fixed effects and state fixed effects (or, alternatively, congressional district fixed effects) separately, i.e., we will 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 congressman and district characteristics are balanced between districts hit by a hurricane or not, after controlling for state and year fixed effects. Of the 14 balancing tests reported in the table, only two are statistically significant at the 10%level and one at the 5%level, all three referred to district characteristics. It is reassuring that, even with a relatively coarse geographic fixed effect, most of the covariates are balanced. The few 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 the bottom panel lags the key right hand side variable 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 legislation in the same year as the hurricane. And in fact, the

coefficients in the top panel tend to be smaller and less precise than those in the bottom panel, where we measure hurricane incidence lagged one year, albeit with the same sign, despite the number of observations drops by (about 20%) because of missing values in the first observed year, and in inter-census years. We therefore concentrate our comments on the results from the bottom panel.

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 than the 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). When at least one county in the district is hit by a hurricane the average number of sponsored bills raises 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. Therefore, we conclude that there is strong evidence that the occurrence of hurricanes does causally affect the behavior of elected politicians, and induces them to initiate 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 a measure for the occurrence of a hurricane 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), the key right hand side variable is instead 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 a more "objective" measure of hurricane incidence, namely the highest wind speed recorded across all counties affected by the hurricane. 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 also restrict attention only to hurricanes that were declared Major Disasters, and could not detect significant changes either.

In Columns (5) and (6) we experiment with alternative measures of green bills. In Column (5) we use the C2ES classification of green bills. The sample becomes noticeably smaller (minus 15%), 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 cosponsored. Another concern is that cosponsorship 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 cosponsorship 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 cosponsorships 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 effect using only original cosponsorships is very similar to the baseline results (about 20%).

Finally, in Table 5 we show evidence that Congress members' legislative activity is tied specifically to hurricanes, and not other types of extreme weather events. Snowfalls, storms and tornadoes are typically not associated with global climate change, in contrast to hurricanes. Climate change legislation is not affected by these other types of events. Columns from (1) to (3) of Table 5 show no association, thus suggesting that the response in terms of climate change legislation is very precise and specific to hurricanes.

In the last three columns of Table 5 we also document that the occurrence of a hurricane, while boosting legislative activism over climate change issues, seems to also have some displacement effect over other policies. While it does not seem to reduce effort over

non-environmental legislation (Column 4), it reduces by about 6% the number of other environmental bills (Column 5). Not surprisingly, we find a positive effect when we look at relief bills, that is bills providing short-run economic and logistic assistance in the aftermath of a hurricane (Column 6), although this effect is not statistically significant.[17]

4.2 Additional Evidence

So far, we have focused on the response by representatives from districts hit by a hurricane. However, as long as information about the disaster spreads around through media outlets, or through evacuation operations over a larger area, one might also expect a response by representatives in nearby districts. In Table 6 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, although this effect is significantly smaller than the one observed in the district which is actually hit by the hurricane. 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 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 from being close to the disaster area, as neighoburing districts might still acquire information about its potential effects. However, the effect diminishes with distance from the

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

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 mechanism

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. There are three main hypothesis: (i) environmental catastrophes capture voters' attention, and politicians respond to the voters' desire for environmental regulation (ii) the general public fails to understand the importance of the global warming signals, but politicians miscalculate the 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.

5.1 Electoral results

Our first 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.

In doing so, we collapse the original yearly data at Congress level, and separate green bills sponsored or cosponsored before (or in the absence of) a hurricane, from those sponsored or cosponsored after a hurricane. We then run the following regression:

$$VoteShare_{sd,t+1} = \alpha + \beta_1 H_{sd,t} + \beta_2 GBBefore_{sd,t} + \beta_3 GBAfter_{sd,t} + \gamma' X_{sd,t} + \delta_t + \mu_d + \epsilon_{sd,t}$$

We excluded uncontested races, races where the incumbent is not running for re-election, plus inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}) and Congress 114^{th} for which we could not compute the vote share in the following election. 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 to control for unobservable systematic differences among those who support more or less climate change legislation.

Table 7 presents the main results from regressing the number of green bills sponsored or cosponsored before and after a hurricane over the vote share in the following election. Column (1) shows that each green bill sponsored or cosponsored after a hurricane reduces the vote share by more that 1.5 percentage points.[18] 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 (18 percentage points).

The effect of politicians' activity on reelection probability poses empirical challenges, which are notoriously difficult to overcome. For example, estimates in Column (1) might still be biased even after controlling for Congress member fixed effects, if the response to a hurricane in terms of green bills was itself affected by the expected reelection probability, which is unobservable. We face this issue here by using an original instrumental variable

[18]We could not find significant effects over the probability of running for reelection. These results available upon request.

approach. In Columns (2) and (3) we instrument the number of green bills sponsored or cosponsored after a hurricane with the number of green bills already submitted by other Congress members by the time a district is hit.[19] The idea is that the number of other green bills submitted to Congress is orthogonal to the timing of a hurricane hitting a certain district. Importantly, a representative could be more likely after a hurricane to go and cosign a bill if there is already one, rather than drafting a new one from scratch. This is actually what we observe in Column (2), where we show that the number of cumulative green bills existing before the hurricane has a positive impact on the probability of cosponsoring one. 2SLS estimates in Column (3) show that the negative effect of supporting green legislation after a hurricane on re-election chances is even higher once we account for endogeneity, although this is not precisely estimated anymore.

Finally, following the rest of the literature (e.g., Cole et al., 2012) in Column (4) we also control for the number of relief bills sponsored or cosponsored, i.e., measures of short-run response to a natural disaster (see the discussion in Section 4.1). Not surprisingly, we find that these variables are positively associated with vote share, even though the estimate fails to hit conventional level for statistical significance for the number of relief bills sponsored or cosponsored after a hurricane. Most 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.

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. This goes strongly against the notion that politicians act in response to voters' desire for more environmental regulation in the aftermath of a hurricane.

[19] We excluded from this sample districts that were hit by a hurricane and whose representative had already sponsored a green bill before the disaster.

5.2 Short-run vs. long-run

The evidence in the previous subsection is clearly not consistent with hypothesis (i). To further discriminate between hypothesis (ii) and (iii), we next investigate whether politicians' increase of green legislation is temporary or persistent. A temporary effect would be aligned with hypothesis (ii): politicians are originally misled by interest 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 considering voters' behavior.

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. If by t_1 we denote the time a hurricane hits district d, we estimate the following equation:

$$GB_{sdi,t} = \alpha + \sum_{t=t_1-4}^{t_1+4} \beta_{t-t_1} H_{sdi,t_1} + \gamma' X_{sdi,t} + \delta_t + \mu_z + \epsilon_{sdi,t} \tag{2}$$

As we can only identify eight coefficients out of nine, we restrict the coefficient in the year before the hurricane ($t = t_1 - 1$) to zero. To avoid

If our identification assumption holds, one will expect the effect at each lead ($t - t_1 = -4, ..., -1$) to be equal to zero. This will rule out anticipation effects. One will also expect effects to manifest precisely in the year of a hurricane ($t = t_1$), the coefficient of each following lag being 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 a hurricane (time t_1). One can verify that, prior to entry, there is no trend in green legislation. This evidence rules out that anticipation effects can drive 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 through the following years, although less precise.[20]

We interpret the persistency of the effect as evidence that climate change permanently shapes Congress members' beliefs about the optimal policy, irrespective of the voters' views. This is reminiscent of a framework where politicians are more likely than the average citizen to have the experience, judgment, and information to decide wisely (Maskin and Tirole, 2004), and they are willing to lose electoral support in order to implement good but unpopular policies.

We believe this is a surprising result, which is of course hard to reconcile with a standard political agency setting (Barro, 1973; Ferejhon, 1986). Understanding why politicians voluntarily fail to maximize their electoral chances is of course a very difficult task, both theoretically and empirically. Still, we might learn something by looking at the portrait of the politicians who support more green legislation after a hurricane, and who is more strongly penalized by doing so. We turn to these questions in the following subsection.

5.3 Heterogeneity

In Table 8 we look at the heterogeneous effects of hurricanes, by interacting our measure of hurricane incidence with district and individual characteristics, focusing in particular on political variables. This exercise might help us learning about the determinants of the

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

response to hurricanes in terms of climate change legislation.

We find fairly clear evidence that the response to hurricanes is weaker among districts where the Republican share in the previous election is higher (Column 1). This is not surprising, as Republicans have traditionally been supportive of the oil and automotive industries, i.e., the sectors potentially more penalized by climate change regulation. Perhaps interestingly, we find a positive and statistically significant effect for politicians belonging to the minority party (Column 2), possibly because politicians in the majority party are more focused on promoting the national agenda, or party discipline is more effective. The effect is large in magnitude: the legislators who endorse green bills after a hurricane are almost 50% more likely to belong to the minority party, ceteris paribus. We could not find instead significant differences with respect to the electoral cycle (Column 3), although it seems that the effect of hurricanes is stronger in more recent times (Column 4). This is consistent with the notion that awareness of the link between global climate change and hurricanes increased after publication of the 2007 IPCC report.

Finally, we look a whether there are differences depending on whether the representative is facing a competitive re-election or not. 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.[21] In this case, the whole effect seems to be driven by representatives holding a safe seat (Column 6), which is 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.

With the exception of the interaction with the Republican share, all of the above results still hold in magnitude when we pool all the interaction terms together (Columns

[21]This variable is not defined for inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}) and Congress 114^{th}. 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.

6 and 7), although in this case they are less precisely estimated.

In Table 9 we then look at the characteristics of the politicians who are more penalized for supporting green legislation in the aftermath of a hurricane, by examining the gradient in the estimated effects as a function of district and individual characteristics. The empirical specification is analogous to that of Table 7. In this case, we split the sample by each category of the interacting variables used in Table 8, to avoid a double interaction and ease the interpretation of the results.

Looking at Column (1) and (2), we could not find any significant difference by the party to which the politician is affiliated, or by whether the congressman belongs to the majority party (Column 3) or not (Column 4). As for the other dimensions, we observe a four times larger penalty for promoting more green legislation when a hurricane hits in the second year of the Congress, i.e., closer to the elections (Columns 5 and 6). Surprisingly, the penalty seems to be somewhat larger in more recent times (Columns 7 and 8).

Finally, in Columns (9) and (10) we split the sample between safe and non-safe districts. It is interesting to notice that the penalty for supporting green legislation after a hurricane is slightly stronger in districts where the incumbent face a safer reelection. This matches with the results in Table 8, where we showed that representatives engage in more environmental legislation when their seat is not at risk.

Overall, a finding that emerges from this analysis is that the politicians that take actions to fight climate change are more likely to belong to the minority party, and that their actions are punished by the voters with larger vote share losses. The natural question that thus arises is whether their effort is rewarded in terms of advancing climate change legislation in the legislative process. In Table 10 we provide an answer to this question. This Table shows that congressmen belonging to the minority party are more likely to sponsor or cosponsor bill that will then pass the House, or that will becom law.

The opposite is true if Congress members are in the majority, possibly because they are subject to more party discipline and have to focus on the national agenda (see also the discussion in Section5.3). Overall, these results suggest that the response to hurricanes in terms of green bills is real.

6 Concluding remarks

In this paper we have shown evidence that U.S. House members react to hurricanes affecting their districts by initiating more climate change legislation. We provide three novel insights with respect to the literature. First, the effect appears to be long-lived, which is suggestive that global threats may actually induce changes in beliefs. Second, the reaction kicks in especially after a experiencing a natural disaster but is smaller in neighboring districts, which is suggestive that information is not enough. Third, there is evidence of a penalty for supporting green legislation on electoral outcomes.

The last result, together with the evidence that representatives in safer districts are more likely to introduce more climate change regulation, is suggestive that politicians might be doing the right (long-run) thing against voters' (short-run) will.

References

[1] Abadie, A., and S.a Dermisi. 2008. "Is Terrorism Eroding Agglomeration Economies in Central Business Districts? Lessons from the Office Real Estate Market in Downtown Chicago." *Journal of Urban Economics*, 64, 451-463.

[2] Barro, R. J.. 1973. "The Control of Politicians: An Economic Model." *Public Choice*, 14, 19-42.

[3] Battaglini, M., amnd E. Patacchini. 2017. "Influencing Connected Legislators." *Journal of Political Economy*, forthcoming.

[4] Bechtel, M. M., and J. Hainmueller. 2011. "How Lasting Is Voter Gratitude? An Analysis of the Short- and Long-Term Electoral Returns to Beneficial Policy." *American Journal of Political Science*, 55, 852-868.

[5] Blennow, K., Persson, J., Tome, M., and M. Hanewinkel. 2012. "Climate Change: Believing and Seeing Implies Adapting." *PloS One*, 7, e50182.

[6] Boisjoly, J., Duncan, G. J., Kremer, M., Levy, D. M., and J. Eccles. 2006. "Empathy or Antipathy? The Impact of Diversity." *American Economic Review*, 9, 1890-1905.

[7] Boustan, L.P., Kahn, M.E., Rhode, P.W., and M.L. Yanguas. 2017. "The Effect of Natural Disasters on Economic Activity in US Counties: A Century of Data." NBER WP n. 23410.

[8] Burke, M., and K. Emerick. 2016. "Adaptation to Climate Change: Evidence from US Agriculture." *American Economic Journal: Economic Policy*, 8, 106-40.

[9] Chen, J.. 2013. "Voter Partisanship and the Effect of Distributive Spending on Political Participation." *American Journal of Political Science*, 57, 200-217.

[10] Cole, S., Healy, A., and E. Werker. 2012. "Do Voters Demand Responsive Governments? Evidence from Indian Disaster Relief." *Journal of Development Economics*, 97, 167-181.

[11] Dai, J., Kesternich, M., Loschel, A., and A. Ziegler. 2015. "Extreme Weather Experiences and Climate Change Beliefs in China: An Econometric Analysis." *Ecological Economics*, 116, 310-321.

[12] Dell, M., Jones, B.F., and B.A. Olken. 2012. "Temperature Shocks and Economic Growth: Evidence from the Last Half Century." *American Economic Journal: Macroeconomics*, 4, 66-95.

[13] Deryugina, T., Kawano, L., and S. Levitt. 2017. "The Economic Impact of Hurricane Katrina on Its Victims: Evidence from Individual Tax Returns." *American Economic Journal: Applied Economics*, forthcoming.

[14] Dustmann, C., and I. Preston. 2001. "Attitudes to Ethnic Minorities, Ethnic Context and Location Decisions." *Economic Journal*, 111, 353-373.

[15] Egan, P. J., and M. Mullin. 2012. "Turning Personal Experience into Political Attitudes: The Effect of Local Weather on Americans' Perceptions About Global Warming." *Journal of Politics*, 74, 796-809.

[16] Ferejohn, J.. 1986. "Incumbent Performance and Electoral Control." *Public Choice*, 50, 5-25.

[17] Frondel, M., Simora, M., and S. Sommer. 2017. "Risk Perception of Climate Change: Empirical Evidence for Germany." *Ecological Economics*, 137, 173-183.

[18] Fudenberg, D., and D. K. Levine. 1993. "Self-Confirming Equilibrium." *Econometrica*, 61, 523-545.

[19] Garret, T. A., and R. S. Sobel. 2003. "The Political Economy of FEMA Disaster Payments." *Economic Inquiry*, 41, 496-509.

[20] Gasper, J. T., and A. Reeves. 2011. "Make it Rain? Retrospection and the Attentive Electorate in the Context of Natural Disasters". *American Journal of Political Science*, 55, 340-355.

[21] Glynn, A. N., and M. Sen. 2015. "Identifying Judicial Empathy: Does Having Daughters Cause Judges to Rule for Women's Issues?" *American Journal of Political Science*, 59, 37-54.

[22] Healy, A., and N. Malhotra. 2009. "Myopic Voters and Natural Disaster Policy." *American Political Science Review*, 3, 387-406.

[23] Healy, A., and N. Malhotra. 2010. "Random Events, Economic Losses, and Retrospective Voting: Implications for Democratic Competence.". *Quarterly Journal of Political Science*, 5, 193-208.

[24] Hsiang, S. M., and A. S. Jina. 2014. "The Causal Effect of Environmental Catastrophe on Long-Run Economic Growth: Evidence From 6,700 Cyclones." NBER WP n. 20352.

[25] Intergovernmental Panel on Climate Change (IPCC). 2013. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge (United Kingdom), Cambridge University Press.

[26] Kahn, M. E.. 2007. "Environmental Disasters as Risk Regulation Catalysts? The Role of Bhopal, Chernobyl, Exxon Valdez, Love Canal, and Three Mile Island in Shaping US Environmental Law." *Journal of Risk and Uncertainty*, 35, 17-43.

[27] Kozlowski, J., Veldkamp, L., and V. Venkateswaran. 2015. "The Tail that Wags the Economy: Beliefs and Persistent Stagnation." NBER WP n. 21719.

[28] La Ferrara, E., Burns, J., and L. Corno. 2016. "Interaction, Prejudice and Performance: Evidence from South Africa." Mimeo.

[29] Leiserowitz, A.. 2006. "Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values." *Climatic Change*, 77, 45-72.

[30] Levy, G., and R. Razin. 2017. "The Coevolution of Segregation, Polarised Beliefs and Discrimination: The Case of Private vs. State Education." *American Economic Journal: Microeconomics*, 9, 141-170.

[31] Luca, M., Malhotra, D. K., and C. Poliquin.2016. "The Impact of Mass Shootings on Gun Policy." Mimeo

[32] Maskin, E., and J. Tirole. 2004. "The Politician and the Judge: Accountability in Government." *American Economic Review*, 94, 1034-1054.

[33] Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., and A. A. Leiserowitz. 2013. "The Relationship between Personal Experience and Belief in the Reality of Global Warming." *Nature Climate Change*, 3, 343-347.

[34] Piketty, T.. 1995. "Social Mobility and Redistributive Politics." *Quarterly Journal of Economics*, 110, 551-584.

[35] Rudman, L. A., McLean, M. C., and M. Bunzl. 2013. "When Truth is Personally Inconvenient, Attitudes Change: The Impact of Extreme Weather on Implicit Support for Green Politicians and Explicit Climate Change Beliefs." *Psychological Science*, 24, 2290-2296.

[36] Sisco, M. R., Bosetti, V. and E. U. Weber. 2016. "When Do Extreme Weather Events Generate Attention to Climate Change?." *Climate Change*, 143, 227-241.

[37] Washington, E. L.. 2008. "Female Socialization: How Daughters Affect their Legislator Fathers' Voting on Women's Issues." *American Economic Review*, 98, 311-332.

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 cosponsored	107.778	70.999	0	92	643
N. green bills sponsored	0.075	0.334	0	0	7
N. green bills cosponsored	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 cosponsored, 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	0.004	0.028	-0.126	-0.582**	2.849*	3.170*	3.482
	(0.003)	(0.039)	(0.222)	(0.231)	(1.501)	(1.599)	(3.160)
Avg. outcome	13.30	10.20	14.20	13.34	11.92	9.229	72.56
Individual characteristics:	House leader	Republican	Majority	Margin victory	Female	Tenure (terms)	Age (years)
Hit by hurricane	0.012	-0.048	0.027	-2.471	-0.019	0.081	-0.092
	(0.007)	(0.035)	(0.043)	(3.008)	(0.024)	(0.454)	(0.830)
Avg. outcome	0.0112	0.484	0.447	38.05	0.131	4.482	55.04
N. year/districts				11,195			
State X 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. *Fossil* is the ratio between the national share of coal/oil production and the national share population (from *U.S. EIA*), at State level. *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. Standard errors clustered by State in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 3: 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 cosponsored, as defined by the CBP. *Controls* include the n. of relief bills and the n. of other non-green bills sponsored/cosponsored; 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 (from U.S. EIA), 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: Green bills - Alternative measures

	(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. *Major disaster* only includes FEMA major disaster declarations (not emergency declarations).*N. of green bills* sponsored and cosponsored, as defined by the CBP (or C2ES). *N. of original green bills* includes sponsored and originally cosponsored bills only. *Wind intensity* in 100 mph. 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: Green bills - Additional outcomes and disasters

	(1)	(2)	(3)	(4)	(5)	(6)
		N. green bills		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)
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	101.7	7.511	1.047
N. year/districts	9,039	9,039	9,039	9,039	9,039	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. green bills*, *N. other non-env. bills* and *N. other env. bills* sponsored and cosponsored, as defined by the CBP. *N. relief bills* sponsored or cosponsored, according to the bill's title. *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: Green bills - Neighboring districts

	(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 cosponsored, 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). 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: Electoral outcomes - Baseline estimates

	(1)	(2)	(3)	(4)
		IV estimates		
		N. green bills	Vote share next	
	Vote share next	First Stage	2SLS	Vote share next
Hurricane	-0.588		-0.441	-0.463
	(1.471)		(1.438)	(1.618)
N. cumulative green bills before		0.006***		
		(0.002)		
Hit by hurricane X:				
N. green bills before	0.007		0.012	0.011
	(0.093)		(0.093)	(0.095)
N. green bills after	-1.690***		-2.068	-1.716***
	(0.624)		(3.575)	(0.631)
N. relief bills before				0.250**
				(0.118)
N. relief bills after				0.159
				(0.306)
F-test		10.781		
Avg. outcome	68.19	0.0250	68.20	67.78
N. congress/districts	3,023	2,998	2,998	3,369
Congress FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes. In Columns (2) and (3) exclude year/districts for which a district was hit and the representative had already sponsored at least one green bill. 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 number of all green bills submitted to Congress at the time of a hurricane. *N. green bills before* and *N. relief bills before* is the number of green and relief bills sponsored and cosponsored 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. For a description of *Controls* see Table 3. *Controls* also include the time (in days) to the end of the Congress (two years if no hurricane). Standard errors clustered by State in brackets ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 8: Green bills - Heterogeneous estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	N. green bills						
Hit by hurricane (t-1)	0.435***	0.026	0.246**	0.083	-0.146	-0.114	-0.498**
	(0.125)	(0.107)	(0.112)	(0.091)	(0.119)	(0.219)	(0.201)
Hit by hurricane (t-1) X:							
Republican share	-0.004**					0.001	0.004
	(0.002)					(0.002)	(0.003)
House minority		0.439**				0.392**	0.464**
		(0.168)				(0.184)	(0.200)
First session			-0.029			-0.068	-0.181
			(0.173)			(0.155)	(0.210)
Post-2007				0.538***		0.456**	0.730*
				(0.188)		(0.172)	(0.429)
Safe district					0.392***		0.309*
					(0.118)		(0.171)
Avg. outcome	1.280	1.280	1.280	1.280	1.383	1.280	1.383
N. year/districts	9,039	9,039	9,039	9,039	6,019	9,039	6,019
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes		

Notes. *N. green bills* sponsored and cosponsored, as defined by the CBP. *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}. 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 9: Electoral outcomes - Heterogeneous estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Vote share next									
	Republican	Democrat	Majority	Minority	First session	Second session	Post-2007	Pre-2007	Safe district	Non-safe district
Hit by hurricane	-0.840	0.681	-1.612	0.669	-0.538	0.931	2.513	-1.405	-1.407	2.268
	(1.494)	(1.689)	(1.447)	(1.699)	(1.153)	(3.326)	(1.581)	(1.190)	(1.580)	(1.694)
Hit by hurricane X:										
N. green bills before	-0.033	0.025	-0.047	-0.071	0.006	-0.023	0.002	0.140	0.071	-0.102
	(0.108)	(0.089)	(0.133)	(0.124)	(0.095)	(0.096)	(0.124)	(0.127)	(0.090)	(0.095)
N. green bills after	-1.394*	-1.522	-1.286	-1.233**	-1.217**	-6.552***	-2.204***	-1.439	-1.149	-1.452***
	(0.724)	(1.136)	(1.272)	(0.518)	(0.557)	(2.084)	(0.773)	(0.966)	(1.149)	(0.395)
Avg. outcome	71.64	55.51	68.02	68.22	65.86	69.56	69.69	66.22	66.79	68.15
N. congress/districts	2,561	802	2,912	2,799	1,622	1,747	1,517	1,852	923	2,446
Congress FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District 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

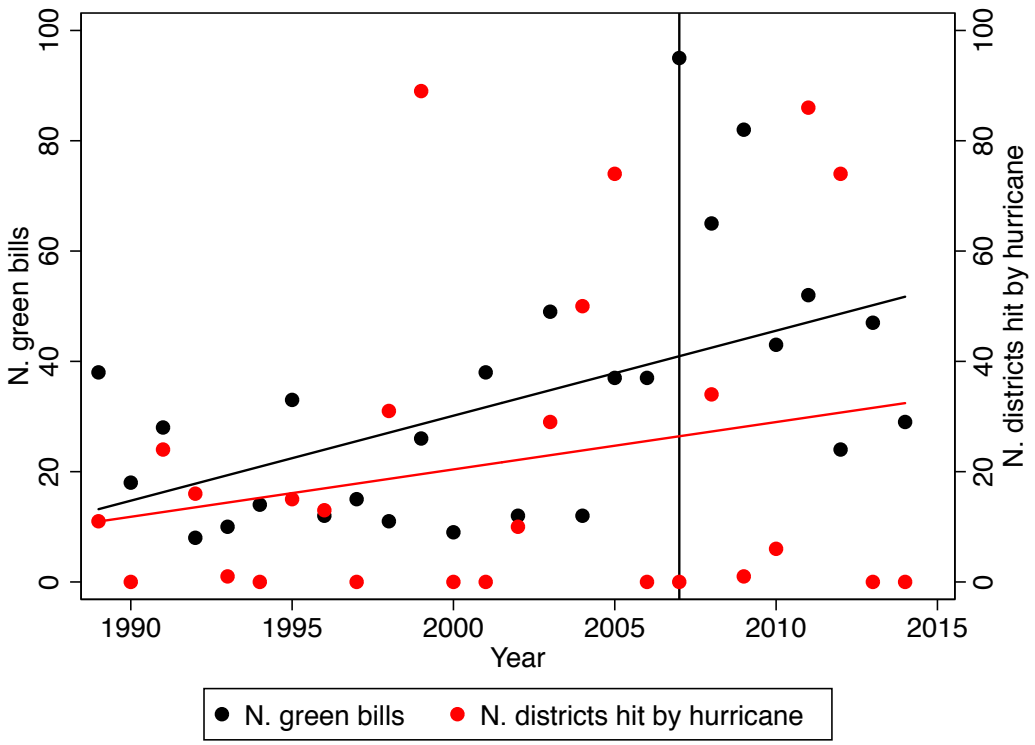
Notes. Uncontested races, inter-census races (Congress 102^{nd}, 107^{th}, and 112^{th}), and Congress 114^{th} excluded.*N. green bills before* is the number of all green bills sponsored and cosponsored before (or in the absence of) a hurricane. *N. green bills after* equal to zero if no hurricane. *Vote share next* only defined if the incumbent is running for re-election. *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. For a description of *Controls* see Table 3. *Controls* also include the time to the end of the Congress (two years if no hurricane). Standard errors clustered by State in brackets ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Table 10: Bill outcomes

	(1)	(2)	(3)	(4)
	N. green bills that:			
	passed the House		became Public Law	
Hit by hurricane (t-1)	-0.032	-0.110	0.002	-0.019***
	(0.047)	(0.074)	(0.003)	(0.003)
Hit by hurricane (t-1) X:				
House minority		0.162**		
		(0.067)		
Congress minority				0.037***
				(0.005)
Avg. outcome	0.230	0.230	0.0238	0.0238
N. year/districts	9,039	9,039	9,039	9,039
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

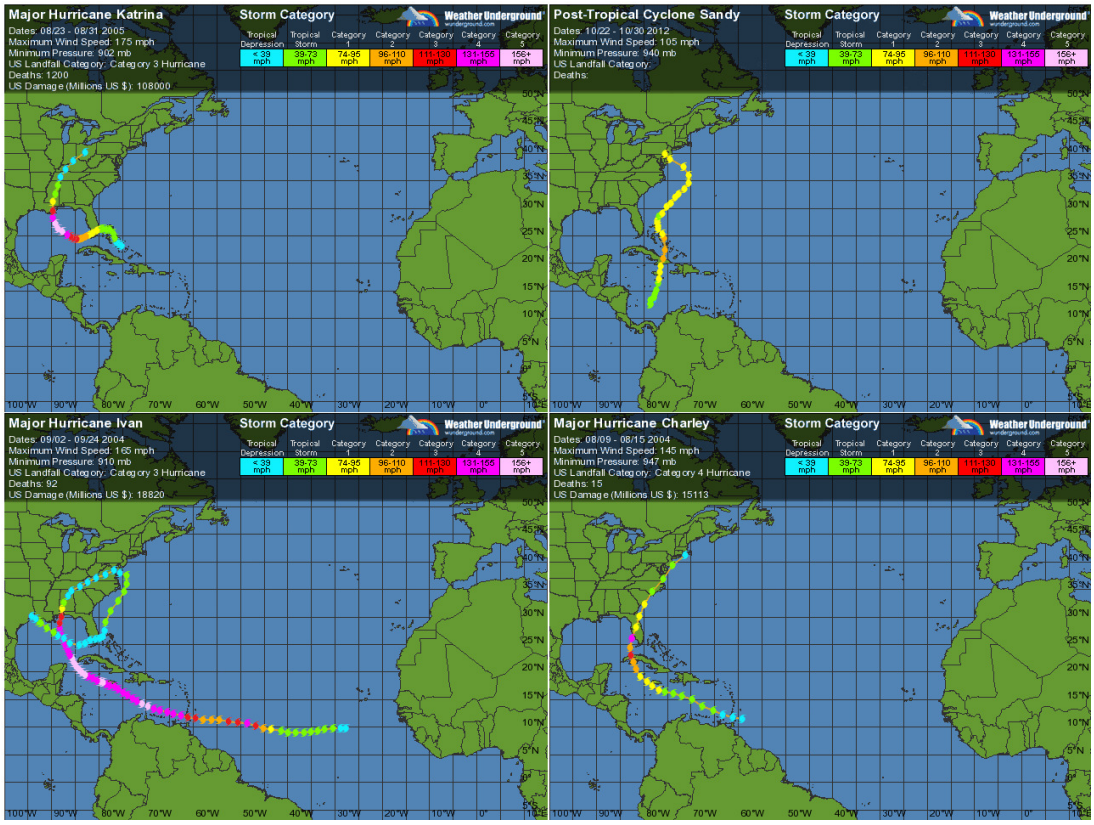
Notes. *N. green bills* sponsored and cosponsored, as defined by the CBP. *Congress minority* equal to 1 if the party has no majority in both the House and the Senate. For a description of *Controls* see Table 3. Standard errors clustered by State in brackets. ***, **, *: denote significant at 1, 5 and 10 percent level respectively.

Figure 1: Hurricanes and green bills over time



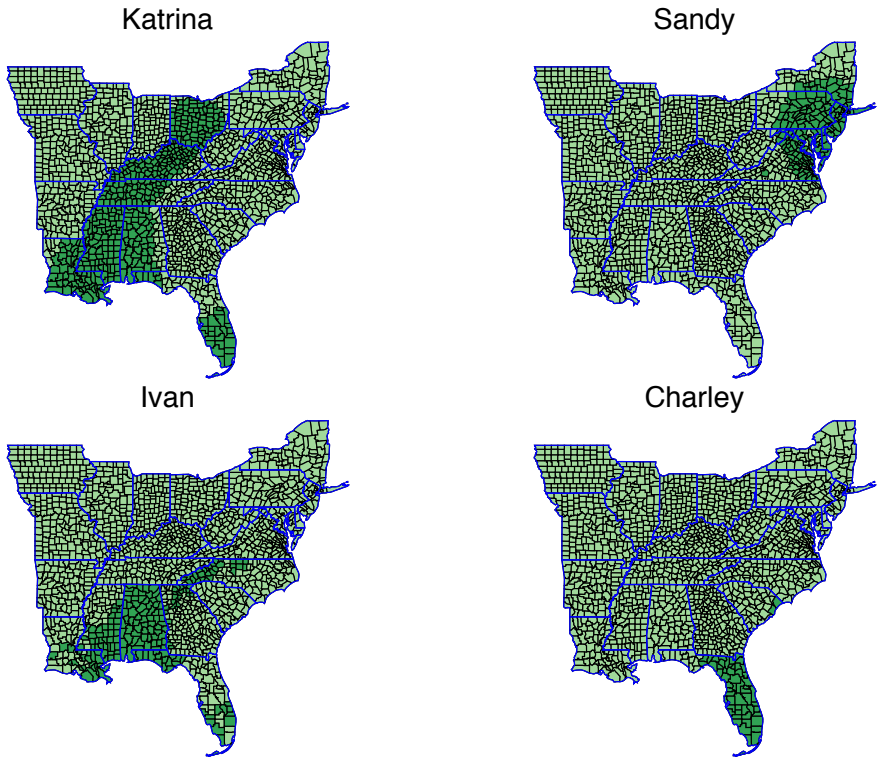
Notes. *N. green bills* sponsored and cosponsored, as defined by the CBP. The vertical line corresponds to the Fourth Assessment Report by the IPCC in 2007.

Figure 2: Hurricane trajectories



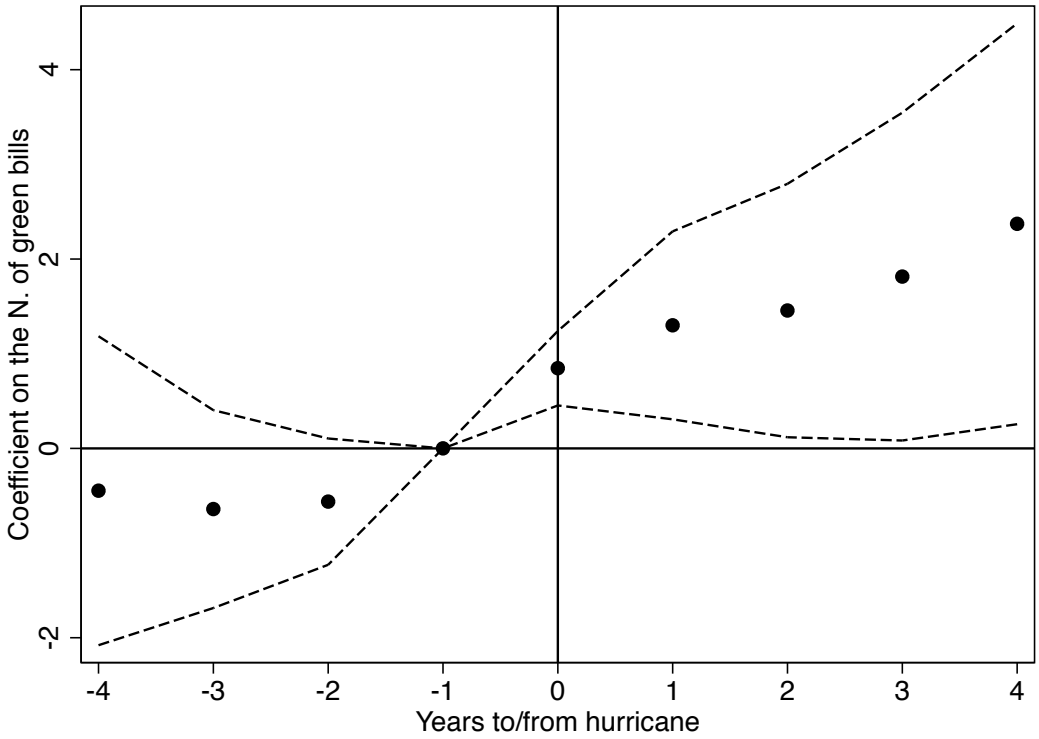
Notes. Source: *Weather Underground*.

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 number of green bills sponsored/cosponsored 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).