Random Events, Economic Losses, and Retrospective Voting: Implications for Democratic Competence

(Research Note)

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ABSTRACT

We leverage the natural experiment afforded by tornado incidence to estimate the effect of exogenous economic loss on electoral outcomes. We find that voters punish the incumbent party in presidential elections for economic damage resulting from tornadoes. While this behavior could suggest that retrospective voting in this domain reflects voters irrationally blaming incumbent politicians for circumstances beyond their control, we instead find evidence suggesting that voting behavior reflects democratic competence. First, voters do not punish the incumbent party for tornado-caused deaths, which governments likely do not have the power to address with effective policy. Second, the incumbent party may actually gain votes when a disaster declaration is made in response to the tornado, only losing votes when no declaration takes place. Thus, voters appear to be rewarding and punishing government with respect to its performance in handling the disaster, as opposed to blaming the government for these natural events.

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The extensive literature on retrospective voting demonstrates that voters reelect incumbents who have been stewards of peace and prosperity, and remove those who have presided over bad times (e.g., Kramer 1971; Fiorina 1981). Most of this early work and much of the subsequent research within this literature has focused on how macroeconomic conditions affect election outcomes in this way (e.g., Powell and Whitten 1993; Markus 1988; Lewis-Beck and Stegmaier 2007). Scholars have typically viewed such behavior as evidence of "a responsible electorate" (Key 1966) using diagnostic information to make reasoned judgments about the effectiveness of elected officials.

Despite the literature's primary focus on macroeconomic indicators, these aggregate economic conditions are non-ideal tests to assess the impact of negative economic outcomes and events on election results (Alesina, Londregan, and Rosenthal 1993). First, indicators such as GDP growth and the unemployment rate are difficult to pin down temporally. Assessing when the economy truly begins to contract and materially affect citizens is difficult for voters (and researchers) to determine. Second, macroeconomic outcomes are not randomly assigned, either across time or space. For instance, incumbents who are especially politically skilled may also be good managers of the economy. Any temporal correlation between local or national macroeconomic conditions and election outcomes may be due to this omitted variable. Additionally, election outcomes may affect economic conditions as opposed to causation running in the opposite direction. For example, officeholders may direct more resources to supportive areas or areas that were becoming more supportive before the election (Chen 2009). Alternatively, voters may become more optimistic when their favored candidates win, thus increasing demand (Gerber and Huber 2009). Finally, it is difficult to categorize commonly-used macroeconomic indicators as unambiguously "good" or "bad" given that they have

heterogeneous distributional consequences. Whereas inflation tends to adversely affect higher-income individuals, unemployment is mainly shouldered by those in the middle and lower classes.

To obviate these issues, we explore the effects of tornadoes—exogenous natural phenomena which cause economic damage—on election outcomes. Tornadoes can be precisely observed in small geographic areas, thereby reducing measurement error. In addition, since tornado occurrence is, conditional on a county's *ex-ante* exposure, randomly assigned, it is plausible to assume that causality runs in the direction of negative outcomes to election results, and not vice versa. As explained in greater detail below, including county fixed effects isolates positive and negative deviations from a geographic area's mean level of tornado exposure in any given year, producing "as-if" randomization of damage to counties (Dunning 2008).

We find that a 10% increase in per-capita tornado damage causes the incumbent party to lose approximately .15 percentage points of the vote. Because we are leveraging a natural experiment, changes in vote share resulting from the tornado damage can be plausibly attributed to the monetary losses that occurred before the election, providing clear evidence that voters do appear to respond to these economic shocks.

Our results also speak to a recent line of research that has challenged the conception of citizen competence and rationality underlying retrospective voting. These studies aim to show that voters reward and punish elected officials in response to circumstances beyond any incumbent's control, and are therefore behaving irrationally.[1] For example, Wolfers (2009) finds that the reelection prospects of U.S. governors of oil-producing states are affected by changes in

[1] Ebeid and Rodden (2006) also examine the effect of economic conditions beyond government control on gubernatorial vote share and find evidence of competent voter responsiveness. They show that state macroeconomic indicators affect incumbent governors' vote shares only in states that are *not* dependent on natural resources or agriculture. In resource-dependent states, the performance of the state economy is less likely to be related to incumbent performance.

the international price of oil, a variable beyond a governor's direct control. Similarly, Leigh (2009) shows that voters reward national leaders who are in power when the world economy booms, regardless of their own competence as economic managers as measured by their own country's growth rate relative to the global growth rate. Finally, Achen and Bartels (2004) find that "voters regularly punish governments for acts of God, including droughts, floods, and shark attacks" (2).

However, in all of these examples, incumbent politicians may be expected to prepare for or respond to the events that are outside their direct control. The government can pursue policies aimed at diversifying the state economy, institute trade policies to change how a country interacts with the global economy, invest in preparing for natural disasters, provide aid to those adversely affected by floods and droughts, and assist the tourism-related businesses that lost customers due to shark attacks.[2] Consequently, observing that incumbents are adversely affected by natural disasters, for example, does not necessarily mean that voters are irrational. Even though government cannot be blamed for the adverse natural events themselves, they can be held responsible for mitigation, response, and recovery.[3] Moreover, previous evidence could be reconciled with a model of rational voters facing information constraints. Voters may not possess the information needed to accurately assess the extent to which government efforts and policies did or did not matter with regards to their welfare. Information-constrained but otherwise rational voters may then consider the total changes they observe in their own and others' standards of living as they make decisions if it is either not possible or too cognitively demanding to

[2] According to Achen and Bartels (2004, 12), the economic losses in New Jersey due to the shark attacks were substantial. "Some resorts had 75 percent vacancy rates in the midst of their high season (Capuzzo 2001, 274). Losses may have amounted to perhaps as much as $1 million for the season altogether, a sizable sum in 1918."
[3] The idea that there may be informational content in how organizations respond, or are anticipated to respond, to exogenous events extends outside the political domain. For example, Borokhovich et al. (2006) find that the stock price response to a CEO's death depends on the independence of the board that will choose the replacement.

decompose income changes into the pieces coming from external forces and other factors plausibly within the incumbent's control.

Perhaps surprisingly, we present a variety of evidence that suggests that voters' responses to natural events—in our case, tornado damage—do not reflect voters simply emotionally punishing the incumbent party for circumstances beyond its control. We conducted two sets of additional tests to provide insight into this issue.

First, although we find that tornado-related economic damage adversely affects incumbent vote share, tornado-related fatalities *do not*. In addition to showing that voters respond differentially to economic and non-economic damages, we interpret this pattern of results as suggesting that tornadoes may not harm incumbents' reelection prospects because citizens irrationally blame the government for the natural events themselves, but because they have been economically affected and therefore demand government action. As further evidence, we find that damage in surrounding counties affects incumbent vote share, but deaths in surrounding counties do not. Hence, our results are not simply due to the fact that deaths are concentrated among a few residents of a county whereas economic losses are more widespread. Instead, citizens punish incumbents not just for damage inflicted on themselves or in their own county, but also for damage in nearby counties—which they can observe and use to learn about government performance.

Second, we find that when the president issues a disaster declaration, thereby demonstrating responsiveness to the tornado and releasing federal funds, tornado damage actually *increases* vote share. Conversely, when no declaration is issued voters punish incumbents for economic losses. These results at least suggest that citizens do not reflexively punish government for circumstances beyond its control. Rather, the electorate's response

appears to depend on whether the incumbent robustly responded to the disaster.

This note is organized as follows. We first describe the data and the empirical strategy used to analyze our natural experiment. Next, we present the main effects of tornado-induced economic losses on incumbent vote share. We then provide evidence exploring whether voter reactions to tornadoes are consistent with rational decision making. We conclude by summarizing our findings and providing directions for future research.

Data and Empirical Strategy

We combine county-level data on voting and tornado damage to explore the ways in which incumbents are punished for natural disasters. To measure tornado damage and fatalities, we use county-level records collected by the National Climatic Data Center (NCDC) in its Storm Events Database (2008) since 1950.[4] This database consists of all tornado occurrences recognized by the National Weather Service. It provides information on economic losses and fatalities according to the county of occurrence for 1988 and earlier. For 1989-2004, we determine the county of occurrence based on the town in which the tornado is reported to have struck. We are able to match towns in the post-1988 data to counties for 96% of the tornado incidents from 1989 to 2004. We combine the tornado data with the county-level presidential election returns collected by Clubb, Flanigan, and Zingale (2006), supplementing these data with Congressional Quarterly's (2006) data for 1992-2004. For county population, which is used to create the per-capita tornado damage and fatality variables, we use the Census estimates of county-level population and interpolate those amounts to create estimates for the intercensal years. The control variables that we include come from Gomez, Hansford, and Krause's (2007)

[4] We accessed these data in March 2008 at: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms.

dataset.[5]

For estimation, we consider the following general model of voting behavior:

Incumbent Vote Share = f (Party's Previous Vote Share, Tornado Damage, Tornado Fatalities, Economic Conditions, Demographic Variables)

We also include county and year fixed effects in our regressions to isolate the impact of within-county variation in tornado damages and fatalities. The inclusion of county fixed effects controls for a county's average exposure to tornado damage, ensuring that the coefficients of interest are identified by temporal variation in damage from that baseline.

To address the large amount of skewness in tornado damage and fatalities, we follow other authors (e.g., Ansolabehere, Gerber, and Snyder 2002) and convert these measures into logarithms. For example, the damage measure that we use is the logarithm of per-capita damage plus one. The one is added so that, when we take the logarithm, the measure is mapped back to zero for the case of zero damage. In equation form, where *TotalDamage* is total tornado damage in inflation-adjusted January 2008 dollars and *Population* is the county's population, we use the following measure of tornado damage:

$$Damage = \ln\left(\frac{TotalDamage}{Population} + 1\right) \quad (1)$$

We operationalize tornado fatalities similarly, also adding one and taking the log. We obtain similar results both in terms of statistical significance and substantive meaning when using unlogged measures, but we regard our results obtained using logged damage and fatalities as more relevant since they are less sensitive to outliers.

[5] We thank Tom Hansford for sharing the data with us.

The Effects of Tornado Damage on Presidential Elections

Simple mean comparisons suggest that economic damages due to tornadoes reduce the incumbent presidential party's vote share. In Table 1a, we consider the average change in incumbent party vote share for cases of high amounts of tornado damage. The first two columns refer to the change (from the previous election) in the incumbent party's vote share in the affected counties and the average change in the incumbent party's vote share nationally for those observations. For example, the -3.47 in the first row and first column indicates that the average change in incumbent vote share for the worst 50 county-year observations of tornado damage was -3.47%. The -1.45 in the second column indicates that, for these 50 observations, the incumbent party's vote share fell nationally by an average of 1.45%.[6] In other words, the incumbent party did, on average, 2.02 percentage points worse in the 50 highest-damage counties than it did nationally in those years, in terms of change in vote percentage. This difference is significant at the 10% level (p = .09, two-tailed). Expanding the sample to consider the highest 500 cases of per-capita damage, we find that the change in the incumbent party's vote percentage is 1.11 percentage points lower in the affected counties than nationally, a difference that is significant at the 1% level (p = .01).

Since other factors could also explain the apparent relationship between tornado damage and incumbent party vote share, we also estimate multivariate, fixed effects regression models. We first predict incumbent party vote share with log per-capita tornado damage, county dummies, year dummies, and the incumbent party's previous vote share as independent variables (see Table 1b). In the second column, we add a variety of control variables, including income, unemployment, and the percent black in the county. The results indicate that tornado damage has

[6] The fact that the average change is negative reflects regression to the mean. By virtue of winning the previous election, the incumbent party did well in that election and does, on average across a series of elections, a little worse in the current election.

had a negative effect on the incumbent's vote share. Damage is significant at the 10% level in both columns. To interpret the coefficient estimates (around -1.5 across the specifications) in substantive terms, consider the implied cost of tornado damage in terms of the vote share that the incumbent party loses. The regression estimate suggests that a 1% increase in per-capita tornado damage (an increase of .01 in the log) causes the incumbent party to lose approximately .015 percentage points of the vote.

Due to the randomness of tornado occurrence conditional on a county's average exposure to tornadoes, this effect should be an unbiased estimate of the impact that these kinds of economic losses have on incumbent success. The losses are thus clear evidence of economic voting; voters do appear to respond to these kinds of exogenous economic losses. However, by themselves, the results cannot provide insight into the extent to which voters' responses reflect reasoned retrospection. Voters could be emotionally blaming incumbents for losses they cannot redress with effective policy. Alternatively, voters could be reacting not to the damage itself, but to government response that is deemed inadequate. To distinguish between these hypotheses, we conduct two additional sets of analyses in the following section.

Implications for Democratic Competence

In this section, we assess whether voter reactions to tornados are indicative of "blind retrospection" and irrationality (as argued by Achen and Bartels 2004) or are instead consistent with the traditional paradigm of rational citizens engaging in economic voting (Key 1966). We caution that these findings are suggestive rather than conclusive given that one cannot get inside the voter's head via aggregate-level data.

We conduct two sets of empirical tests in order to assess whether adverse reactions to

natural events suggest a competent electorate. First, we compare the effects of material damage to the effects of tornado-induced fatalities. Fatalities are generally caused by the strongest tornadoes and thus are largely unpreventable by government policy, and there is also less scope for effective government response to address the problem than in the case of monetary damage. If incumbents are punished for deaths related to natural disasters, it suggests that voters are reacting emotionally to the disaster. Second, we test whether voters do indeed reward incumbents for responsiveness by comparing the electoral effects of tornado damage in cases where the president issued a disaster declaration to cases where he did not.

Comparing Tornado-Induced Damage and Fatalities

Although there is a significant correlation between damage and fatalities, the correlation between the two is sufficiently small so that it is possible to investigate the separate effects that damage and fatalities have on election outcomes. Only 20% (11 of 54) of the cases in which there were at least five fatalities were also among the 54 highest instances of per-capita damage. 27% (76 of 277) of the cases in which there was at least one fatality were also among the 277 highest instances of per-capita damage. Overall, the correlation coefficient between the log of per-capita damage and the log of per-capita deaths is .21. The correlation coefficient between the log of per-capita damage and the absolute number of deaths is .26. These relatively weak correlations arise primarily because tornadoes of intermediate strength are correlated with damage nearly as strongly as the strongest tornadoes, while only the strongest tornadoes are correlated with deaths. The correlation coefficient between a county's log per-capita damage and the number of tornadoes it experienced in the two most severe categories (F4 and F5)[7] is .37,

[7] Tornado intensity is measured using the Fujita scale (or F-scale) and is based on wind speed and the average damage path width. For instance, F1 tornadoes have wind speeds of 40-72 miles per hour and an average damage path of 10-50 meters. F5 tornadoes have wind speeds of 261-318 miles per hour and an average damage path of over

while the corresponding correlation coefficient between the log of per-capita fatalities and the number of F4 and F5 tornadoes is .34. On the other hand, the correlation coefficient between log per-capita damage and the number of F3 tornadoes is .27, while the correlation coefficient between the log of per-capita fatalities and the number of F3 tornadoes is only .10.[8] In the data, F3 tornadoes occur about 2.5 times more often than tornadoes of greater strength.

Unlike tornado damage, fatalities do not affect the electoral prospects of the incumbent party. If we take the 54 cases in which at least five people in the county died due to tornadoes, the incumbent party did approximately .60 percentage points worse in the affected counties than it did nationally, an insignificant difference (p = .72) both statistically and substantively (see Table 2a). Since some of these cases also had high monetary damage, even these small changes would not suggest that people vote against the incumbent party in response to fatalities *per se*. Moreover, if we consider the 277 cases in which there is at least one death in the county in the election year, we also find no effect of fatalities on election results. The incumbent party does .12 percentage points better in counties that experienced at least one death than it did nationally, an insignificant difference (p = .85).

Note that this finding contrasts with the effects found by Grose and Oppenheimer (2007) and Karol and Miguel (2007), who find that incumbents were adversely affected by Iraq war deaths. However, in the case of the Iraq war, the military deaths can be sensibly attributed to the policies implemented by both the executive and legislative branches.

In the multivariate analyses, the point estimates of the fatalities coefficients are close to zero in all cases (see Table 2b). Whether we consider the log of per-capita fatalities or the

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1100 meters (Marshall 2001). Since 2007, the National Weather Service has used the Enhanced Fujita Scale to classify tornadoes.

[8] The correlation between the log of per-capita damage and the total number of weaker tornadoes (F1 and F2) is .15, while the correlation between deaths and the number of F1 and F2 tornadoes is only .02.

absolute number of fatalities, we cannot reject the hypothesis that fatalities have no effect on voting decisions (p = .92 and p = .61 in columns (1) and (2), respectively). We obtain similar results when including demographic controls (see columns (3) and (4)). In both the mean comparisons and in the regression results, voters appear to not blame incumbents for deaths caused by tornadoes, which are more random than monetary damage and less likely to be redressed by government response. The fact that voters appear to specifically respond to the component of tornado impact where government response would be more ameliorative, as opposed to reflexively voting against the incumbent whenever any adverse event occurs, suggests that voter responses to random events may reflect greater rationality than would appear to be the case at first glance.

One potential criticism with interpreting our results as evidence of voter rationality is that the insignificant effect of fatalities may simply be due to the fact that they are rare and few people are personally affected by them. Of course, even if this was the case, it would not be inconsistent with competent voting. However, we do not think this interpretation can entirely explain the differential effects of damages and fatalities. First, previous studies have shown that even rare military casualties can significantly affect incumbent vote share if they are tied to policy choices (e.g. Karol and Miguel 2007; Grose and Oppenheimer 2007). Additionally, following the empirical strategy of Levitt and Snyder (1997), we predicted incumbent party vote share in a given county with: (1) tornado damage in the three nearest counties;[9] and (2) tornado fatalities in the three nearest counties. Damage in surrounding counties does not personally affect people within the county of interest. However, if we observe a significant effect of nearby tornado damage, then it suggests that personal exposure to the negative consequences of the

[9] The three nearest counties are those counties within the same state whose centroids are the shortest distance from a given county's own centroid.

tornado is not the sole determinant of whether it affects electoral outcomes. Rather, voters may observe damage in adjacent counties and learn about government competence in disaster management. As shown in Table 3, the regressions using damage and fatalities in adjacent counties produce similar results as the earlier specifications using within-county damage and fatalities. The regression estimates suggest that a 1% increase in per-capita tornado damage in neighboring counties causes the incumbent party to lose approximately .021-.023 percentage points of the vote. All of the coefficient estimates across the various specifications are significant at the 10% level. Conversely, in no specification is the tornado fatalities measure statistically significant or substantively large.

Comparing Responsive and Unresponsive Executive Action using Disaster Declarations

If the main effect of tornado damage was the result of irrational retrospection, then citizens should be blind to federal government efforts to respond to the disaster. Conversely, if incumbent (un)responsiveness is a key consideration in voter decision making, then citizens should reward elected officials when they assist local communities in response to adverse circumstances and punish them if they do not. To test this hypothesis, we collected data on county-level disaster declarations issued by the president in response to tornadoes or severe storms (Federal Emergency Management Association 2010). The database extends back to 1965, so that our regressions go back to the 1968 presidential election. These declarations have become more frequent in recent years.[10] Presidential disaster declarations are a unilateral means by which the executive branch can deliver federal funds to disaster-stricken areas (Reeves 2009).

As shown in Table 4, when the president issued a disaster declaration in response to the tornado, there is actually a *positive* relationship between tornado damage and incumbent party

[10] Declarations for these events occurred in 1.3% of the county-year observations in 1976, 1.1% in 1988, 9.2% in 1996, and 26.3% in 2004.

vote share (b = 3.78, p = .004 in column 1). In other words, voters appear to reward government responsiveness to exogenous negative events, although we caution against interpreting these results too strongly since they are based on 6% of the sample (1942 observations). Conversely, when no declaration is issued, we again find a significant and negative relationship between tornado damage and support for the incumbent (b = -2.59, p = .016 in column 3).

As an additional test of the conditioning effect of government responsiveness, we examine whether the effect of tornado damage was attenuated during the Clinton Administration, which was generally acknowledged for greatly improving the organizational effectiveness of FEMA both in terms of disaster preparation and response under the leadership of Director James Lee Witt (Birkland and Waterman 2008). As shown in Table 5, the negative effect of tornado damage on incumbent vote share is significant in the non-Clinton years, but is substantively close to zero and statistically insignificant during Clinton's presidency. This result can be seen by adding the coefficient for the linear damage term and the interaction term between damage and the Clinton dummy, where we must be cautious in interpreting the result since the standard error for the interaction term is large. Although many other events were coincident with the development of FEMA during the 1990s (including a robust economy), this finding is at least suggestive of the importance of government responsiveness in voter decision making and is consistent with the evidence mentioned above.

Discussion

The study of retrospective voting has witnessed exciting advances in recent years, as scholars have begun to explore domains of government performance beyond management of the macroeconomy. Following this line of research, we leverage the temporal and spatial isolation of

tornado incidence in order to more precisely analyze government accountability and definitively demonstrate the effect of economic loss on voting behavior.

This note also contributes to the emerging literature questioning the rational underpinnings of retrospective voting. Many recent analyses have concluded that voters irrationally blame politicians for events, such as natural disasters, that are outside of their control. However, these studies cannot disentangle the events themselves from how voters expect government to prepare for and respond to the events. Hence, associations between the natural and political world are not necessarily evidence of voter irrationality. We have attempted to address this limitation in previous work by tying exogenous, natural events to economic outcomes, for which politicians could reasonably be expected to be held accountable. We contrast the voter response to random events that lead to economic damages with the voter response to random events that cause non-economic losses. We find that voters punish incumbents for tornado-induced economic damages, but not for tornado-caused fatalities, in both the county itself and in nearby counties. Moreover, voters seem to only punish incumbents in the absence of a response to the negative event.

Our results indicate a need for future research to consider the interaction between events, government policy, and voter decisions. In studying democratic accountability, one particular challenge is finding situations where researchers can simultaneously: (1) identify exogenous events and measure their effect on election outcomes; (2) demonstrate that such events are unrelated to government performance; and (3) estimate the consequences of substandard accountability with respect to policy outcomes. Additionally, subsequent research can more directly address the issue of voter rationality by attempting to get inside voters' heads in either the survey or laboratory context. Such evidence would complement our findings from a

naturalistic context. In doing so, we anticipate that future work can fruitfully explore the causal mechanisms underlying retrospective voting and further pry open the black box.

References

Achen, Christopher H. and Larry M. Bartels. 2004. "Blind Retrospection: Electoral Responses to Drought, Flu, and Shark Attacks." Working Paper, Princeton University.

Alesina, Alberto, John Londregan, and Howard Rosenthal. 1993. "A Model of the Political Economy of the United States." *American Political Science Review* 87: 12-33.

Ansolabehere, Stephen, Alan Gerber, and James Snyder. 2002. "Equal Votes, Equal Money: Court-Ordered Redistricting and Public Expenditures in the American States." *American Political Science Review* 96: 767-777.

Birkland, Thomas, and Sarah Waterman. 2008. "Is Federalism the Reason for Policy Failure in Hurricane Katrina?" *Publius: The Journal of Federalism*. 38: 692-714.

Borokhovich, Kenneth, Kelly Brunarski, Maura Donohue, and Yvette Harman. 2006. "The Importance of Board Quality in the Event of a CEO Death," *Financial Review* 41: 307-337.

Capuzzo, Michael. 2001. *Close to Shore*. New York: Broadway Books.

Chen, Jowei. 2009. "Buying Votes with Public Funds in the US Presidential Election: Are Swing or Core Voters Easier to Buy Off?" working paper, Stanford University.

Clubb, Jerome M., William H. Flanigan, and Nancy H. Zingale. 2006. Electoral Data for Counties in the United States: Presidential and Congressional. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Congressional Quarterly Voting and Elections Collection. 2006. Washington, DC: Congressional Quarterly.

Dunning, Thad. 2008. "Improving Causal Inference: Strengths and Limitations of Natural Experiments." *Political Research Quarterly* 61: 282-293.

Ebeid, Michael and Jonathan Rodden. 2006. "Economic Geography and Economic Voting: Evidence from the U.S. States." *British Journal of Political Science* 36: 527-547.

Federal Emergency Management Administration. 2010. "Federal Disaster Declarations." Accessed at: http://www.fema.gov/news/disasters.fema.

Fiorina, Morris P. 1981. *Retrospective Voting in American National Elections*. New Haven: Yale University Press.

Gerber, Alan S. and Gregory A. Huber. 2009. "Partisanship and Economic Behavior: Do Partisan Differences in Economic Forecasts Predict Real Economic Behavior?" *American Political Science Review*, 103: 407-26.

Gomez, Brad T., Thomas G. Hansford, and George A. Krause. 2007. "The Republicans Should Pray for Rain: Weather, Turnout, and Voting in U.S. Presidential Elections." *Journal of Politics* 69: 649-663.

Grose, Christian R., and Bruce I. Oppenheimer. 2007. "The Iraq War, Partisanship, and Candidate Attributes: Variations in Partisan Swing in the 2006 U.S. House Elections." *Legislative Studies Quarterly* 32: 531-558.

Inter-university Consortium for Political and Social Research. 1995. *Candidate and Constituency Statistics of Elections in the United States, 1788–1990*, ICPSR Study 7757, available at: *www.icpsr.umich.edu*.

Karol, David, and Edward Miguel. 2007. "The Electoral Cost of War: Iraq Casualties and the 2004 U.S. Presidential Election." *Journal of Politics* 69: 633-648.

Key, V. O. 1966. *The Responsible Electorate: Rationality in Presidential Voting 1936-1960.* Cambridge, MA: Harvard University Press.

Kramer, Gerald H. 1971. "Short Term Fluctuations in U.S. Voting Behavior, 1896–1964." *American Political Science Review* 65: 131-43.

Leigh, Andrew. 2009. "Does the World Economy Swing National Elections?" *Oxford Bulletin of Economics and Statistics*, forthcoming.

Leip, Dave. 2006. "Atlas of U.S. Presidential Elections." accessed at: http://www.uselectionatlas.org/.

Levitt, Steven and James Snyder. 1997. "The Impact of Federal Spending on House Election Outcomes." *Journal of Political Economy* 105: 30-53.

Lewis-Beck, Michael and Mary Stegmaier. 2007. "Economic Models of Voting." In The Oxford Handbook of Political Methodology, eds., Russell Dalton and Hans-Dieter Klingemann, 518-537.

Markus, Gregory B. 1988. "The Impact of Personal and National Economic Conditions on the Presidential Vote: A Pooled Cross-Sectional Analysis." *American Journal of Political Science* 32: 137-54.

Marshall, Timothy P. 2001. "Birth of the Fujita Scale." *Storm Track* 24: 6-10.

National Climatic Data Center. 1994. "Time Bias Corrected Divisional Temperature-Precipitation-Drought Index." (updated since 1994), accessed at: ftp://ftp.ncdc.noaa.gov/pub/data/cirs/.

National Climatic Data Center. 2008. "The Storm Events Database." accessed at: http://www4.ncdc.noaa.gov/cgi-in/wwcgi.dll?wwEvent~Storms.

Powell, G. Bingham Jr. and Guy D. Whitten. 1993. “A Cross-National Analysis of Economic Voting: Taking Account of the Political Context.” *American Journal of Political Science* 37: 391-414.

Reeves, Andrew. 2009. “Political Disaster? Electoral Politics and Presidential Disaster Declarations.” Working Paper, Boston University.

Wolfers, Justin. 2009. “Are Voters Rational? Evidence from Gubernatorial Elections.” Working paper, Wharton School, University of Pennsylvania.

Table 1a:
The Effect of Tornado Damage on Presidential Voting, 1952-2004

	Average change in the county's vote	Average change in the national vote (same set of years)	Difference
50 largest amounts of per-capita damage	-3.47	-1.45	-2.02* (p = .09)
500 largest amounts of per-capita damage	-4.07	-2.96	-1.11*** (p = .01)

Note: All the damage amounts refer to the year preceding a presidential election. p-values are for the test of equality between the change in the incumbent's vote share in the county and the change in the incumbent's national vote share. * p<.10, ** p<.05, *** p<.01.

Table 1b:
The Effect of Tornado Damage on Presidential Voting, 1952-2004

Dependent variable: Incumbent party's presidential vote share in the county

	(1)	(2)
Log of per capita tornado damage	-1.46*	-1.41*
	(.79)	(.80)
Incumbent's previous vote share	.61***	.60***
	(.04)	(.04)
Percent black		.07**
		(.03)
Percent high school graduates		-.19
		(.31)
Farms per capita		-13.1*
		(7.1)
Unemployment rate		-.08
		(.07)
Per-capita income		.47
		(.56)
Statewide vote share for incumbent party	.67***	.67***
	(.06)	(.06)
Constant	-18.4***	-11.2***
	(2.7)	(3.5)
R-squared	.771	.772
N	42424	42274

Notes: * $p<.10$, ** $p<.05$, *** $p<.01$. Regression standard errors, corrected for clustering at the state*year level, are in parentheses. All regressions include county and year fixed effects.

Table 2a:
The Effect of Tornado Fatalities on Presidential Voting, 1952-2004

	Average change in the county's vote	Average change in the national vote (same set of years)	Difference
All cases with at least five deaths	-3.70	-3.10	-.60 (p = .72)
All cases with at least one death	-4.10	-4.22	.22 (p = .85)

Note: Fatalities refer to the year preceding a presidential election. p-values are for the test of equality between the change in the incumbent's vote share in the county and the change in the incumbent's national vote share. * p<.10, ** p<.05, *** p<.01.

Table 2b:
The Effect of Tornado Damage on Presidential Voting, 1952-2004

Dependent variable: Incumbent party's presidential vote share in the county

	(1)	(2)	(3)	(4)
Log of per capita tornado damage	-1.52*	-1.44*	-1.48*	-1.39*
	(.82)	(.81)	(.83)	(.82)
Log of per capita tornado fatalities	675.9		697.5	
	(1197.0)		(1202.3)	
Number of tornado fatalities		-.01		-.01
		(.07)		(.07)
Incumbent's previous vote share	.61***	.61***	.60***	.60***
	(.04)	(.04)	(.04)	(.04)
Percent black			.07**	.07**
			(.03)	(.03)
Percent high school graduates			-.19	-.19
			(.31)	(.31)
Farms per capita			-13.1*	-13.1*
			(7.2)	(7.1)
Unemployment rate			-.08	-.08
			(.07)	(.07)
Per-capita income			.47	.47
			(.56)	(.56)
Statewide vote share for incumbent party	.66***	.66***	.66***	.66***
	(.06)	(.06)	(.06)	(.06)
Constant	-18.4***	-18.4***	-11.2***	-11.2***
	(2.7)	(2.7)	(3.5)	(3.5)
R-squared	.771	.771	.772	.772
N	42424	42424	42274	42274

Notes: * $p<.10$, ** $p<.05$, *** $p<.01$. Regression standard errors, corrected for clustering at the state*year level, are in parentheses. All regressions include county and year fixed effects.

Table 3:
The Effect of Tornado Damage and Fatalities in Nearest Three Counties

Dependent variable: Incumbent party's presidential vote share in the county

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of per capita tornado damage (adjacent counties)	-2.19* (1.26)	-2.26* (1.33)	-2.30* (1.30)	-2.20* (1.25)	-2.28* (1.32)	-2.32* (1.28)	-2.10* (1.20)	-2.14* (1.16)
Log of per capita tornado fatalities (adjacent counties)		1011.5 (5612.2)			1248.6 (5579.1)		1179.1 (5621.0)	
Number of tornado fatalities (adjacent counties)			.03 (.08)			.03 (.08)		.04 (.08)
Log of per capita tornado damage (own county)							-.81 (.82)	-.77 (.82)
Log of per capita tornado fatalities (own county)							181.7 (1044.2)	
Number of tornado fatalities (own county)								-.03 (.05)
Incumbent's previous vote share	.61*** (.04)	.61*** (.04)	.61*** (.04)	.61*** (.04)	.61*** (.04)	.61*** (.04)	.60*** (.04)	.60*** (.04)
Percent black				.05 (.03)	.05 (.03)	.05 (.03)	.05 (.03)	.05 (.03)
Percent high school graduates				-.17 (.30)	-.17 (.30)	-.17 (.30)	-.17 (.30)	-.17 (.30)
Farms per capita				-13.4* (7.1)	-13.4* (7.1)	-13.5* (7.1)	-13.2* (7.1)	-13.2* (7.1)
Unemployment rate				-.11 (.07)	-.11 (.07)	-.11 (.07)	-.11 (.07)	-.11 (.07)
Per-capita income				.30 (.50)	.30 (.50)	.30 (.50)	.33 (.51)	.33 (.51)
Statewide vote share for incumbent party	.66*** (.06)	.66*** (.06)	.66*** (.06)	.67*** (.06)	.67*** (.06)	.67*** (.06)	.67*** (.06)	.67*** (.06)
Constant	-18.7*** (2.6)	-18.7*** (2.6)	-18.7*** (2.6)	-11.0*** (3.3)	-11.0*** (3.3)	-11.0*** (3.3)	-11.2*** (3.3)	-11.1*** (3.3)
R-squared	.771	.771	.771	.772	.772	.772	.772	.772
N	42529	42529	42529	42370	42370	42370	42206	42206

Notes: * $p<.10$, ** $p<.05$, *** $p<.01$. Regression standard errors, corrected for clustering at the state*year level, are in parentheses. All regressions include county and year fixed effects.

Table 4:
The Effect of Tornado Damage on Presidential Voting by Disaster Declarations, 1968-2004

Dependent variable: Incumbent party's presidential vote share in the county

	Declaration is made		No declaration	
	(1)	(2)	(3)	(4)
Log of per capita tornado damage	3.78***	3.93***	-2.59**	-2.57**
	(1.29)	(1.26)	(1.07)	(1.06)
Log of per capita tornado fatalities	-7273.8	-6926.3	-153.7	-254.7
	(6738.2)	(6345.2)	(4001.7)	(3882.5)
Incumbent's previous vote share	.95***	.94***	.63***	.63***
	(.02)	(.02)	(.05)	(.05)
Percent black		.07***		.12***
		(.02)		(.04)
Percent high school graduates		.12		.35
		(.38)		(.38)
Farms per capita		-8.0		-6.2
		(8.5)		(8.3)
Unemployment rate		-.35***		-.08
		(.13)		(.12)
Per-capita income		-.32		-.58
		(.77)		(.60)
Statewide vote share for incumbent party	.18***	.18***	.66***	.67***
	(.04)	(.04)	(.09)	(.09)
Constant	-9.2***	-12.9***	-24.0***	-16.5***
	(2.4)	(3.4)	(4.3)	(3.9)
R-squared	.928	.930	.778	.780
N	1942	1942	28626	28514

Notes: * $p<.10$, ** $p<.05$, *** $p<.01$. Regression standard errors, corrected for clustering at the state*year level, are in parentheses. All regressions include county and year fixed effects.

Table 5:
The Effect of Tornado Damage on Presidential Voting by Presidential Administration

Dependent variable: Incumbent party's presidential vote share in the county

	(1)	(2)	(3)	(4)	(5)	(6)
Log of per capita tornado damage	-1.51*	-1.58*	-1.50*	-1.49*	-1.57*	-1.48*
	(.82)	(.85)	(.84)	(.83)	(.86)	(.85)
Log of per capita damage*Clinton dummy	1.35	1.37	1.35	1.52	1.54	1.52
	(2.49)	(2.5)	(2.49)	(2.4)	(2.4)	(2.4)
Log of per capita tornado fatalities		685.5			772.2	
		(1197.1)			(1205.1)	
Number of tornado fatalities			-.01			-.01
			(.06)			(.06)
Incumbent's previous vote share	.61***	.61***	.61***	.60***	.60***	.60***
	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Percent black				.04	.04	.04
				(.03)	(.03)	(.03)
Percent high school graduates				.01	.01	.01
				(.32)	(.32)	(.32)
Farms per capita				-13.11*	-13.12*	-13.10*
				(7.82)	(7.83)	(7.82)
Unemployment rate				-.07	-.07	-.07
				(.07)	(.07)	(.07)
Per-capita income				.06	.06	.06
				(.52)	(.52)	(.52)
Statewide vote share for incumbent party	.66***	.66***	.66***	.66***	.66***	.66***
	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)
Constant	-15.95***	-15.95***	-15.95***	-15.14***	-15.14***	-15.14***
	(2.78)	(2.78)	(2.78)	(3.28)	(3.28)	(3.28)
R-squared	.771	.771	.771	.772	.772	.772
N	42424	42424	42424	42274	42274	42274

Notes: * $p<.10$, ** $p<.05$, *** $p<.01$. Regression standard errors, corrected for clustering at the state*year level, are in parentheses. All regressions include county and year fixed effects, and a dummy for the election. occurring either in 1996 or 2000.