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POLITICS OF NATURAL DISASTERS: MODELING PRESIDENTIAL RESPONSE TIME TO NATURAL DISASTERS IN THE UNITED STATES, 1960–2005

Zahid A. Choudhury*

Abstract

When collective misfortunes such as natural disasters strike a society, people may expect their governments to rescue them from sufferings. Failure on the part of a government to respond in a timely fashion may lead people to blame their government for inaction and negligence of duty. This article examines presidential response time to natural disasters in the United States of America for the time between 1960 and 2005. It addresses two broader questions regarding timeliness of presidential response: Why is it that some presidents have been quicker to respond to natural disasters than others? And, why are the presidential responses quicker with respect to some disaster events while slower with respect to others? This study finds that, all other things being equal, Democratic presidents declare emergencies more quickly than Republican presidents. Consistent with the electoral logic of presidential response, presidents who are in their second term respond to disasters more slowly than presidents who are in their first term. Furthermore, increase in pre-disaster approval rating of the presidents appears to be associated with slightly higher chance of responding quickly. In addition to these substantive conclusions, this article makes further contribution by examining a series of regression frameworks appropriate for duration data. Considering presence of unobserved heterogeneity and frailty effects (dissimilar effects of disaster types) in the data, this research suggests that a Cox Proportional Hazard framework that allows a frailty (random effects) parameter is a better choice for modeling disaster event to governmental response time.

Introduction

When collective misfortunes such as natural disasters strike a society, people may expect their government to rescue them from sufferings. Failure on the part of a government to respond in a timely fashion may lead people to blame their government for inaction and negligence of duty. When a heat-wave killed between 400 to 1,500 persons in Chicago (USA) in 1995 in a matter of five days,[1] and Hurricane Katrina in 2005 killed more than 1,300 persons and left thousands homeless,[2] the federal governments in general, and the presidential administration in particular, were criticized for not responding to these disasters in a timely fashion. Belated presidential response damaged President George W.

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* Assistant Professor and the Chairperson of the Department of Peace and Conflict Studies, University of Dhaka

1 Eric Klinenberg, "When Chicago Baked: Unheeded Lessons from Another Great Catastrophe." *Slate*, 2005

2 MSNBC , "Katrina: The Long Road Back" http://www.msnbc.msn.com/id/11281267, 2006

Bush's political reputation. His approval rating, which had been just above 50 percent in mid-2004, prior to Hurricanes Katrina and Rita, dipped to about 35 percent following the hurricanes by the end of 2005.[3] Some presidents, however, have been able to maintain or increase their approval rating by responding to disaster events promptly. President Jimmy Carter's approval rating hiked up from 30 percent to 33 percent after his quick response to Hurricane Frederick in September 1979, and President Clinton's approval rating went up from 57 percent to 59 percent after his response to a tornado in early March 1997. Why is it that some presidents have been quicker to respond to natural disasters than others? And, why are the presidential responses quicker with respect to some disaster events while slower with respect to others? More generally, what is the politics of the presidential response to natural disasters? This paper addresses these questions by analyzing presidential response time to disaster events that have taken place in the United States of America (USA) between 1960 and 2005.

Literature Review

Natural disasters are among the most tangible crises that governments face. They occur in a political space. Politics may not bring on disasters, but disasters, once they strike, definitely influence the political landscape of a country. The classic work of F. Glenn Abney and Larry B. Hill showed this relationship between natural disasters and politics decades ago.[4] They investigated how political actors react to natural disasters that create a strain in the status quo of the political system. In the context of politically hostile environment New Orleans's incumbent Mayor Victor Schiro managed to win the 1965 Mayoral election by "capitalizing upon the disaster" created by Hurricane Betsy.[5] Their study concludes, Mayor's political ingenuity and skill in administering large rescue and relief operation outwitted the thriving opposition campaign of James Fitzmorris.[6]

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3 Wall Street Journal, "How the presidents stack up", <http://online.wsj.com/public/resources/documents/info-presapp0605-31.html>, 2008

4 F Abney Glenn, and Larry B. Hill, "Natural disasters as a political variable: He effect of a hurricane on an urban election" *American Political Science Review*, Vol. 60 (4), 1966, pp. 974-981

5 F Abney Glenn, and Larry B. Hill, *Natural disasters as a political variable*, p. 975

6 F Abney Glenn, and Larry B. Hill, *Natural disasters as a political variable*, p. 975

A number of recent works have investigated how natural shocks dramatically change voters' perception and evaluation of the incumbent government.[7]T. Garrett and Sobel demonstrate that political considerations explain half of all federal disaster relief in the USA.[8] Mary Downton and Pielke Jr. show that presidents are more inclined to issue disaster declarations during reelection campaigns, and that second term presidents are less likely to pay adequate attention to disaster events than presidents in their first term.[9] The political dimensions of natural disasters have also been examined in the vast literature on disaster preparedness, prevention and post-disaster management.[10]

Charles Cohen and Werker offer a political economy model of natural disasters. They argue that some regimes (or governments) use disaster events as political and economic instruments.[11] These governments, in order to attract international aid funds, do not prepare well for disasters. Once received, these funds are often used for political patronage and corruption.[12] Although developed in the context of international regimes, the insight, that governments tinker with their

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7 Kevin Arceneaux and Robert M. Stein, "Who is Held Responsible when Disaster Strikes? The Attribution of Responsibility for a Natural Disaster in an Urban Election." *Journal of Urban Affairs*, Vol. 28(1), 2006, pp.43-53, Christopher H. Achen and Larry Bartels, "Blind Retrospection: Electoral Responses to Drought, Flu, and Shark Attacks." Working Paper, Princeton University, 2004, and A. J. Healy, "Do Voters Blame Politicians for Bad Luck? The Uneducated Ones Do." Working Paper, Loyola Marymount University Working Paper, 2008

8 T. A. Garrett and Sobel, "The Political Economy of FEMA disaster payments." *Economic Inquiry*, Vol. 41(3), 2003, pp. 496-509.

9 Mary W. Downton and Roger A. Pielke Jr., "Discretion without accountability: Politics, flood damage, and climate" *Natural Hazard Review*, Vol. 2(4), 2001, pp.157-166.

10 See for example: Richard Stuart Olson, "Toward a politics of disaster: Losses, agendas, and blame", *International journal of Mass Emergencies and Disasters*, Vol. 18(2), 2000, pp. 256-87; Rutherford Platt, *Disasters and democracy: The politics of extreme natural events*, Washington DC: Island. 1999; David Alexander, "Natural Disasters: A Framework for Research and Teaching." *Disasters*, Vol. 15(3), 1991, pp.209-226; J. M. Albala-Berrand, *Political Economy of Large Natural Disasters: With Special Reference to Developing Countries*, Oxford: Clarendon Press, 1993; and Claude Gilbert, "Studying Disaster: Changes in the main conceptual tools" in E.L. Quarantelli edited What is a Disaster?:*Perspective on the Question*, London and New York: Routledge, 1998.

11 Charles Cohen and Eric D. Werke, "The Political Economy of "Natural" Disasters", *Journal of Conflict Resolution*, Vol. 52(6), 2008, pp.795-819

12 Peter T. Leeson and Russell S. Sobel,. "Weathering Corruption", *Journal of Law and Economics*, Vol. 51, 2008, p. 667 (pp. 667-681)

preparedness in order to attract more outside funds in the form of disaster relief, is also found in works that investigate the case of Hurricane Katrina in the USA.[13]

The existing literature provides insights into the political space within which political actors operate, particularly, how politicians exploit such exogenous events as hurricanes, earthquakes or floods to manipulate the way voters evaluate them. However, this literature is mostly focused on the management dimension of disaster response (i.e. prevention, mitigation, relief and aid management and rehabilitation), and is limited to case studies of a few "mega-disasters" such as Hurricanes Katrina or Andrew. In this paper, I present a systematic analysis of presidential response to natural disasters historically and across all states of the USA.

Presidential response time, defined as the difference between the actual date of the striking of a disaster and the date when presidents declare disaster emergency, is investigated for the terms of ten presidents, starting in 1960, the second term of Eisenhower, to 2005, the second term of George W. Bush. I consider all disaster events that occurred within this time period in all US states. Controlling for disaster types and magnitude, the speed of presidential response is considered to be a function of a number of political factors including whether presidents are Republican or Democratic and whether they are serving their second term (and thus whether they have electoral incentives to respond late).

Governmental Response

Federal Response Mechanism

At the core of the relationship between disaster and government response is the issue of distribution of public funds (e.g. various disaster related relief and reconstruction funds) to affected areas. In the USA, a presidential declaration of a major disaster or emergency is the key action that makes federal disaster relief available to states, local governments, businesses, and individuals affected by

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13 See for example, Russell S. Sobel and Peter T. Leeson."Government's Response to Hurricane Katrina: A Public Choice Analysis" *Public Choice*, Vol. 127, 2006, pp.55-73; Roger D. Congleton, "The story of Katrina: New Orleans and the political economy of catastrophe" *Public Choice*, Vol. 127, 2006, pp. 5-30; and William F. Shugart II, "Katerinanomics: The Politics and Economics of Disaster Relief", *Public Choice*, Vol. 127, 2006, pp.31-53.

disasters.[14] The Federal Response Plan (FRP) implements the provisions of the Stafford Act (Public Law 93-288, as amended), which defines the events that may be considered disasters (earthquakes, hurricanes, and typhoons, tornados, and volcanic eruptions), describes the basic mechanisms and structures through which federal aid and assistance will be provided, and outlines the coordination of various federal agencies to fulfill the emergency support functions.[15]The FRP identifies the Federal Emergency Management Agency (FEMA) as the pivotal federal agency in the US government's disaster response mechanism. The FRP begins to operate when a series of actions have been taken:

- "Contact is made between the affected state and the FEMA regional office. This contact may take place prior to or immediately following a disaster.
- If it appears that the situation is beyond state and local capacity, the state requests FEMA to conduct a joint Preliminary Damage Assessment, or PDA. Participants in the PDA include FEMA, state and local government representatives and other federal agencies.
- Based on the PDA, the governor submits a request to the President through the FEMA regional director for either a major disaster or an emergency declaration.
- The FEMA regional office submits a summary of the disaster "event" along with a recommendation based on the results of the PDA. The summary and recommendation are submitted to FEMA headquarters, accompanied by the governor's request.
- Once Headquarters receive these documents, senior staffs meet to discuss the request and determine what recommendation they will make to the President.
- FEMA's recommendation is forwarded to the White House for review.
- The President declares a major disaster or an emergency".[16]

The last provision culminates the previous steps. Once the documents are in the president's hands, it is entirely within his discretion, whether he declares a major disaster or an emergency and whether he includes the whole region or

14 Mary W. Downton and Roger A. Pielke Jr. ,"Discretion without accountability: Politics, flood damage, and climate"
15 *Disaster Handbook*, National edition, University of Florida: Institute of Food and Agriculture Sciences, 1998
16 Disaster Handbook, Section 3.7, p.4

part of it. However, the president, if he feels it necessary, may also make such a decision without going through the above sequential steps outlined in the FRP.

Presidential Response

The consequence of a presidential declaration is that federal resources (for security, rehabilitation, and reconstruction purposes) become available to the affected people at the local level. As important as the availability of resources is the speed with which they become available. In the wake of a disaster, the victims not only suffer death, loss of property, displacement, and homelessness, but also insecurity and exposure to criminal activities such as looting, murder, and theft.

Yet, presidents differ in how quickly they respond to natural disasters. In the case of Hurricane Katrina, for example, President Bush responded four days after the hurricane occurred, and this response time is generally criticized as late.[17] But, how late was President Bush compared to his own previous actions and those of other presidents? According to the data collected for this paper (see Appendix, Table 4), it turns out that on average President Bush took about 4.35 days to respond to the hurricanes he faced during his two terms, while President Clinton took about 2.35 days to respond to hurricanes he faced during his two terms.

Why do the presidents differ in their response time? There are at least two possible political reasons: First, partisanship of the presidents: Republicans are

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17 See Thomas Birkland, and Sarah Waterman, "Is Federalism the Reason for Policy Failure in Hurricane Katrina?" *Publius: The Journal of Federalism*, Vol. 38(4), 2008, pp.692–714; and Peter Dreiter, "Katrina and Power in America", Urban Affairs Review, Vol. 41(4), 2006, pp.528–549, and Saundra Schneider, "Who's to Blame? (Mis) perception of the Intergovernmental Response to Disaster." *Publius: The Journal of Federalism*, Vol. 38(4), 2008, pp.715–738.

In the wake of hurricane Katrina in 2005, although New Orleans officials "clamored for more assistance from Washington" (Eric Klinenberg 2005), they received the federal response only after four days when President Bush declared that "an emergency exists in the State of Louisiana and ordered Federal aid to supplement state and local response efforts in the parishes located in the path of Hurricane Katrina" (White House press release, August 27, 2007). (Statement on Federal Emergency Assistance for Louisiana, For Immediate Release, Office of the Press Secretary, August 27, 2005: <www.whitehouse.gov/news/releases/2005/08/20050827-1.html>, Accessed December12. Given the magnitude of Katrina (both in terms of meteorological scale as well as human suffering and wealth loss), federal response after "four days" is considered late (see the previous footnote for Birkland and Waterman 2008, Dreiter 2006, and Schneider 2008).

less likely to spend government money for public welfare than Democrats.[18] Second, term of the presidency: A president in his second term has no incentive to worry about the electoral consequences of his inaction because he is no longer eligible to run for presidency.[19] For example, considering the case of Hurricane Katrina, President Bush, serving his second term in the White House, "had little incentive to worry about the future electoral consequences of inaction, especially in a region (Louisiana) where, since Ronald Reagan, voters' presidential preferences had been reliably Republican".[20] On the other hand, when, in August 2004, Hurricane Charley struck Florida–the electoral-vote-rich, battleground state–he, in the middle of his reelection campaign, responded within two days that is faster by two days than his response to Katrina.[21] Thus, Bush, a Republican serving his second term as president was slow to respond to Hurricane Katrina, but he was faster when he was in his first term and running a reelection campaign towards the second term.

In order to test whether these conclusions about the effect of President Bush's party identity and term in office are generalizable to other presidents, I test the following two hypotheses:

Hypothesis 1 Republican presidents take more time than Democrats in responding to natural disasters.

Hypothesis 2 If the president is in his second term, he will be slower than presidents who are in their first term.

In addition to party identity of a president and his term in office, I also expect that pre-disaster approval ratings of the president predict his response rate. If the pre-disaster approval rating is low, the president might consider the disaster event as a chance to improve his public support. Case studies of disaster response by chief executives in other countries confirm the insight about the

18 Any disaster declaration involves marshaling federal resources to the welfare of a particular region. It is common knowledge that Republicans (presidents) would require more justification (therefore, time) before they decide to spend.

19 The twenty-second amendment of the constitution of the United States of America (ratified by the Congress on March 21, 1947 and by the requisite number of states on February 27, 1951) sets that no person can participate in elections to the office of President of the United States more than twice.

20 William F. Shugart II, "Katerinanomics: The Politics and Economics of Disaster Relief", *Public Choice*, Vol. 127, 2006, p. 38 (pp.31-53).

21 William F. Shugart II, "Katerinanomics".

relationship between a chief executive's popularity or approval ratings and his or her response rate. For example, Evelyn Bytzek reports that before the federal election of 2002 in Germany, the popularity of the incumbent government coalition of Social Democrats and the Green Party had declined (44%).[22] But that popularity shifted in favor of the coalition government (53%) within a short time period following the Elbe flash flood.[23] Chancellor Gerhard Schroder's timely and astute response to the flood earned him positive public evaluations and eventual success in the 2002 election.[24]

A late response from a president, thus, maybe viewed by people as ineffective leadership and carelessness and this may be politically damaging to him.[25] Voters may perceive the crisis management action of their governments as symbolic action, and the speed of government response to crises increase the value of such symbolic action. This analysis suggests that public approval ratings of US presidents, immediately prior to disaster events, might also explain the speed of their response. Hence the following hypothesis:

Hypothesis 3 Presidents who have lower approval rating are quicker at responding to natural disasters than presidents who have higher approval rating.

State Governors

Like presidents, governors of the affected states also act on the basis of political incentives. Governors are more likely to respond to disaster events in ways that would attract federal funds to their states.[26] In the eyes of voters, the ability to attract federal funds may be an important mark of a governor's political skill. Thus, governors might request federal support even when the disaster events could be managed locally.[27] It is, however, also reasonable to assume that

22 Evelyn Bytzek, "Flood response and political survival: Gerhard Schroder and the 2002 Elbe flood in Germany" in Paul t'Hart Arjen Boin, Allan Mcconnell Ed., *Governing After Crisis: The Politics of Investigation, Account-ability and Learning*, Cambridge University Press, 2008, pp. 85-113.

23 Evelyn Bytzek, "Flood response and political survival"

24 Evelyn Bytzek, "Flood response and political survival"

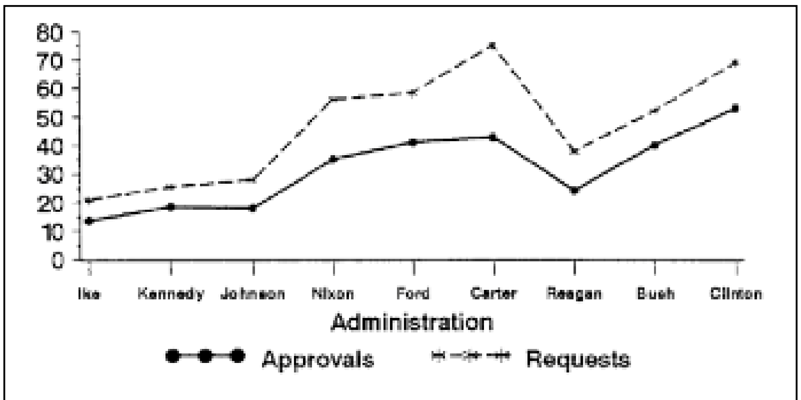
25 The New York Times editorialized on 1 September 2005 to characterize President George W. Bush based on his actions in response to Hurricane Katrina.

26 Charles Cohen and Eric D. Werke, "The Political Economy of "Natural" Disasters", *Journal of Conflict Resolution*, Vol. 52(6), 2008, pp.795-819

27 Governors in general have their own funds (e.g. Rainy Day Funds) to use as part of their initial response efforts.

presidents would know about such motivations of the governors, and thus would be conservative in their response to governors' call of federal assistance. Under the FRP, the president would respond to a governor's call only after a positive White House review of the call. Presidents, however, may not respect all calls of Governors. In fact, as figure 1 shows for floods, the number of presidential disaster declarations has generally been lower than the number of requests from the governors of the affected states. In cases of positive White House review, the president may eventually respond. But understandably, the review process takes time, and therefore, some delay in presidential response is expected.

Figure 1: Average Annual Number of Gubernatorial Requests and Presidential Declaration, Floods 1953-1997



Source: Mary Downton and Roger PielkeJr 2001, p. 159

The expected procedural delay, as described above, can be compounded by Governors' political ideology or partisanship. Republicans, in general, like to avoid involvement of the federal government in local affairs to secure the autonomy of the local political authorities. One might expect that Republican governors would less likely to invite federal government unless they are compelled by the severity of the disaster events. It takes time to assess the severity of a disaster; when the disaster is severe enough, it might already be late. Such a late call from the Governor adds up to the expected procedural delay, and therefore, the eventual presidential response to the disaster is expected to be late. I, thus, hypothesize:

Hypothesis 4 Presidential responses to disasters are slower when the governor of the affected area is a Republican.

Furthermore, both presidents and governors would like to claim credit of post-disaster management successes and relief efforts, but neither would shoulder the burden of blame if anything goes wrong. For example, in the case of Katrina, there was a tension between the President and Governor Kathleen Blanco regarding claims of credit–who was the savior of the people? On his first post-Katrina visit to Louisiana, on Friday, 2 September, President Bush is reported to have asked Governor Blanco, a Democrat, to relinquish control of local law enforcement and National Guard troops under her command. He probably wanted to follow what his father (George H. Bush) had done after the 1992 riots in Los Angeles by sending National Guard units to the affected area.[28] However, Blanco refused, after thinking about it for 24 hours, evidently believing that the proposal was motivated by the president's eagerness to claim credit for a relief operation that was finally showing progress.[29]Evidently, the discordant relationship induced by relative credit claiming between the president and the governor delayed decision-making, and partly explains why the president was slower to respond. Their competitive political stance can be considered as an indicator of such discordant relationship. I hypothesize:

Hypothesis 5 When both the president and the governor come from the same political party, presidential response is faster than if they are from different parties.

Implementing Federal Departments and Agencies

Although presidents have long responded to natural disasters by mobilizing federal funds through using their declaration power, the process of presidential disaster declarations was firmly established in 1974 by the Disaster Relief Act.[30] The Federal Emergency Management Agency (FEMA) came into being five years later, in 1979, through President Carter's Executive Order 12127, that merged several disaster-related responsibilities into FEMA. Before 1979, all major disaster responses were made through Federal Disaster Assistance Administration (FDAA), established within the Department of Housing and

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28 E. Thomas, "The lost city." Newsweek, Vol. 146, 2005, p.48 (pp.42–52.)

29 A. Repley et al, "An American tragedy: four places where the system broke down." *Time*, Vol. 166, 2006, p.39 (pp. 34-41)

30 All the historical facts regarding these Federal Agencies have been collected from FEMA's website at <www.fema.gov/about/history.htm>

Urban Development (HUD). Presidents and the federal government used HUD to respond to such major disaster events as Hurricane Carla in 1962, Alaskan Earthquake hit in 1964, Hurricane Betsy in 1965, Hurricane Camille in 1969, San Fernando Earthquake in 1971, and Hurricane Agnes in 1972. Later, hazards associated with nuclear power plants and the transportation of hazardous substances were also added to natural disasters, and more than 100 federal agencies were involved, in support of HUD, in some aspect of disasters, hazards and emergencies.

After the terrorist attacks of September 11, 2001, FEMA focused on issues of national preparedness and homeland security. The agency coordinated its activities with the newly formed Office of Homeland Security, and FEMA's Office of National Preparedness was given responsibility for helping to ensure that the nation's first responders were trained and equipped to deal with weapons of mass destruction. Substantial new funding was appropriated to FEMA to help communities face the threat of terrorism. In March 2003, FEMA joined 22 other federal agencies, programs and offices to form the Department of Homeland Security (DHS).[31] Following the alleged failure of President Bush and FEMA (DHS in general) in responding to and managing the crises ensued by Katrina in 2005, President Bush signed into law the Post-Katrina Emergency Reform Act on October 4, 2006 that significantly reorganized FEMA and provided it with substantial new authority to remedy gaps that became apparent in the response to Hurricane Katrina in August 2005.

The above historical account shows that presidents have used at least three different administrative mechanisms to respond to natural disasters–HUD (FDAA), FEMA as an independent agency, and FEMA under DHS. Although, after 1979, FEMA, as an administrative unit, remained with the direct responsibilities to address disasters, its administrative location, issue areas and independence varied during the following thirty years. The movement of FEMA from one administrative location to another, and from one issue focus (e.g. natural disaster in general) to another (e.g. Nuclear hazards, terrorism) has substantially affected its ability as well as its incentives to respond to natural disasters. Many have, therefore, speculated that if FEMA were still an independent agency in 2005, President Bush would have been informed about

31 FEMA no longer enjoys the Independent Agency status; although exists as a separate unit, it is now under the direct control of DHS.

the severity of Katrina much earlier and the presidential declaration would also have been faster. In order to test the effect of this varied organizational position of FEMA (generally the implementing agency), I hypothesize:

Hypothesis 6 Presidential response to natural disaster is quicker when FEMA (during the period between 1979 and 2002) is an independent agency than when it is not.

Measures and Data

My unit of analysis in this study is a natural disaster. To identify all natural disasters that struck the United States, I used the natural disaster database that is maintained as the Emergency Event Database (EM-DAT) by the WHO Collaborating Centre for Research on the Epidemiology of Disasters.[32] The dataset includes cross-country information about start and end dates of disasters, types of disasters, number of people killed, number of people affected, and estimated total resources damaged per disaster. I utilized these information regarding natural disasters that occurred between 1960 and 2005 in the USA in a series of event-history regression models to test the hypothesized relationships formulated above.

The dependent variable of this paper (TIME) measures the time (in days) taken by a presidential government before it responded to a natural disaster event. I measured the interval as the number of days between the start of the disaster and the date when presidents issued the disaster declaration. I collected the presidential disaster and emergency declaration dates primarily from the websites of the White House of the United States and FEMA's websites. Based on this information, I calculated TIME = ('Presidential Response Date' – 'Start Date of a Disaster'). This is a continuous variable, the lower limit of which is 0–since response time cannot be negative–and the upper limit is theoretically unbounded. The unit of time is day.

The covariates of interest are partisanship of the presidents, their pre-disaster approval rating, whether the presidents are in their second term, partisanship of the governors of the affected areas, organizational independence of the implementing agencies (e.g. FEMA), and president-governor partisan differences. A measure of severity LN (AFFECTED) is used as a control variable.

32 Emergency Events Database at <http://www.emdat.be/>

Table 1 provides the description and summary statistics of these variables. Appendix A at the end of the paper provides information regarding measurement of the variables and their sources. The appendix also includes three tables that provide information about average number of natural disasters per state, frequency distribution of disaster events per presidents, and average time taken by each president in responding to disasters, all covering the time frame studied in this paper.

Table 1: Description and summary statistics of the major variables.

Variable	Description	Mean	Std. Dev.	Min	Max
TIME	Duration in days.	11	20.49	1	100
PARTYID	Partisanship of the presidents. Democrat =1, Republican =0.	0	0.49	0	1
APPROVAL	Approval rating of presidents just before a disaster occurred	54	9.60	30	84
SECONDTERM	1 if the president is in his second term, 0 otherwise.	0	.46	0	1
GOVID	Partisanship of the governors. Democratic = 1, Independent = 2, Republican = 3.	2	.99	1	3
ORGINDEP	Organizational independence of the implementing agency. 1 if independent, 0 otherwise.	1	.46	1	2
PGdiff	1 if the president and the governor are from different parties, 0 otherwise.	0	.99	0	2
LN(AFFECTED)	Ln(Total People Killed + Injured + Affected)	6	3.70	0.69	14.91

Source: see Appendix at the end of text. Total number of observations for all variables: 558. Out of 558 events, presidents responded to 302 and did not respond to 256 events. The non--responded observations are censored (46%) according to the requirements of survival analysis.

Standard Cox Regression Model

Since the dependent variable measures the duration of time that presidents have taken before responding to natural disasters, the appropriate statistical model to summarize the effects of the covariates on the time variable is a duration model.

The Cox Semi-parametric Model – by far the most popular approach to deal with time-to-event data in political science – is the most used duration model due to its computational feasibility and elegance.[33]The general functional form of the Cox model is as follows:

$$h_i(t) = h_0(t)\exp(\beta' X) \qquad (1)$$

where $h_0(t)$ is the baseline hazard function, $\beta' X$ are the covariates and regression parameters, and none of the covariates vary over time.

The Cox regression model allows analysts the flexibility to obtain estimates of the covariates of interest while leaving the particular form of the duration dependency unspecified.[34] Cox model is a member of proportional hazard models. However, unlike parametric models such as Weibull or Gompertz, it does not assume any particular distributional form of time duration. The shape of the hazard over time can be constant, increasing, decreasing, or a mixture of increasing and decreasing. Mario Cleaves et al observe that "whatever is the general shape, it is the same for everyone".[35] In this model the ratio of the hazards for two subjects or individuals at the same time $\frac{h_i}{h_j}$, where $i \neq j$, is constant and does not depend on time. This assumption allows the model to avoid any specific parameterization of the baseline hazard ratio $h_0(t)$. All this is possible because the Cox model uses a partial likelihood estimation procedure that, instead of maximizing the full likelihood function, maximizes the portion of the function that depends on the regression coefficients (β) but not on $h_0(t)$ (Allison 2004). The quantity $h_0(t)$ depends solely on the order in which the event occurs without identifying the exact time of the event. Consequently, the $h_0(t)$term can safely be left unestimated.[36] As a corollary of this assumption, thus, it embeds the regression constant term β_0 into the

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33 Mario A Cleaves, William W. Gould and Roberto G. Gutierrez, *An Introduction to Survival Analysis Using STATA*. Second ed. College Station, Texas: STATA Press, 2004

34 Janet Box-Steffensmeier and Bradford Jones, *Event History Modeling: A Guide for Social Scientists*, Cambridge: Cambridge University Press, 2004

35 Mario A Cleaves, William W. Gould and Roberto G. Gutierrez, *An Introduction to Survival Analysis Using STATA*, p.129

36 Mario A Cleaves, William W. Gould and Roberto G. Gutierrez, *An Introduction to Survival Analysis Using STATA.*

baseline hazard function, which is not directly estimated in the model.[37] Therefore, the Cox estimation process does not directly calculate and report any regression constant term.

For the purpose of intuitive interpretation, the Cox model is expressed in scalar form[38] as

$$\log h_i(t) = \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik} \quad (2)$$

where

$$\log h_i(t) = \log\left(\frac{h_i(t)}{h_0(t)}\right).$$

Considering the hypotheses developed in the "Governmental Response" section above, the model for our present purpose is

$$\begin{aligned} \log h_i(t) = {} & [\beta_1(\text{PARTY ID})] + [\beta_2(\text{APPROV AL})] + [-\beta_3(\text{SECONDTERM})] \quad (3) \\ & +[-\beta_4(\text{GOV ID})] + [\beta_5(\text{PGdiff})] + [\beta_6(\text{ORGINDEP })] \\ & +[\beta_7(\text{TOTPOLAPNT })] + [-\beta_8(\text{log AFFECTED})] \\ & +[\beta_{91-8}(\text{DISTY PE}_{1-9})] + [\beta_{101-8}(\text{PRESNUM}_{1-9})]. \end{aligned}$$

In this model, when the sign of the coefficient is negative, the hazard rate is less than 1: an increase of the coefficient indicates a decrease in the hazard and therefore, the time taken to respond increases. When the sign is positive, the hazard rate is more than one: the hazard increases with the covariate, thus, the time taken to respond decreases. For example, when the hazard rate is .8, log(.8) is $-.22$; when the hazard is 1.5, log(1.5) is .41.

The results from the above Cox duration model are reported in the first column of Table 2 (at the end of next section). The results are presented in terms of the log of the hazard ratio. As such, whenever a hazard ratio is less than 1, the sign of the coefficient (log of the hazard ratio) takes negative, this means that the risk decreases as the coefficient increases, thus resulting in a longer time (slower response) until a President declares emergency for an affected region. In contrast, a hazard ratio of more than one makes the sign of the coefficient

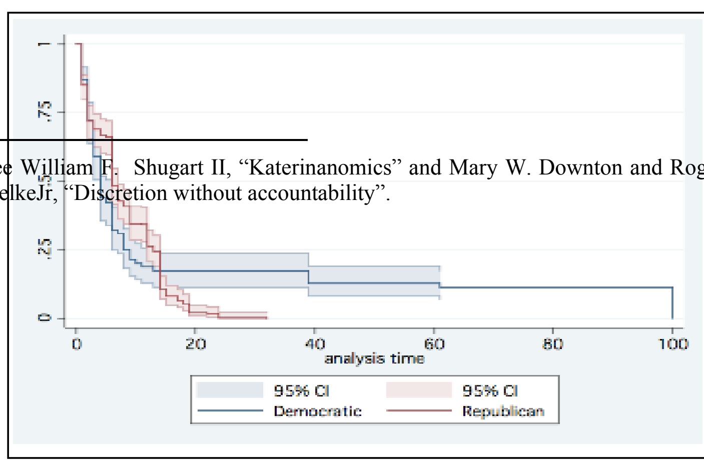
37 Janet Box-Steffensmeier and Bradford Jones, *Event History Modeling.*

38 See Paul D. Allison, "Event History Analysis", in Melissa Hardy & Alan Bryman edited *Handbook of Data Analysis*, London and Thousand Oaks and New Delhi: SAGE Publications, chapter 16, 2004, pp. 369–385, and Janet Box-Steffensmeier and Bradford Jones, *Event History Modeling.*

positive, implying that the risk increases with the covariate. This suggests the duration until the presidential response is decreasing.

I expected, in hypothesis 1, that Republican presidents take more time than Democrats in responding to natural disasters. The coefficient for the independent variable for this hypothesis PARTYID is 3.18, significant at $p < .10$ level. This means that, all other things being equal, a president being democrat is associated with substantially higher risk (hazard rate $\exp(3.182) = 24.1$ is substantially greater than 1) of responding to a disaster event. In other words, Democratic presidents are significantly faster to declare emergencies than are Republican presidents. The non-parametric Kaplan-Meier survival estimates for Democratic and Republican presidents, as shown in Figure 2, affirms this conclusion. The coefficient of SECONDTERM $(-.611)$ is significant at p < .10 level, and thus confirms the second hypothesis. The hazard ratio $\exp(-.611) = .54$ is less than one, indicating that, all other things being constant, presidents who are in their second term respond to disasters more slowly than presidents who are in their first term. This result is consistent with the electoral logic of presidential responses as proposed by such authors as William Shugart II and Mary Downton and Pielke Jr.[39]

However, contrary to my third hypothesis regarding pre-disaster presidential approval rating, the APPROVAL variable, with a coefficient equal to .043 significant at p < .01, takes an opposite sign. The current coefficient indicates that an increase in approval ratings of the presidents is associated with slightly higher chance (hazard rate $\exp(043) = 1.04$ is slightly higher than 1) of responding quickly, all other things being equal. Three other variables of interests–GOVID, PGdiff, and ORGINDEP–did not turn out to be significant. The null hypotheses against which hypotheses four, five and six were proposed, thus, cannot be rejected.



39 See William F. Shugart II, "Katerinanomics" and Mary W. Downton and Roger A. PielkeJr, "Discretion without accountability".

Figure 2: Kaplan-Meier Survival Estimates

Cox Regression with Shared Frailties

So far my analysis of presidential declaration to disaster events has been based on the assumption that the model is completely specified on the basis of the baseline hazard function and the values of the covariates; the hypothesized covariates exhaust all factors that explain why some presidents respond quicker than others. All presidents from the same party and same term (i.e. second term) have the same underlying distribution of survival time. If there is no censoring, the observed response-time is independent observations from a distribution with the same kinds of parameters.

However, such assumptions seem problematic because the standard Cox model does not account for the heterogeneity of the subjects that might exist even after knowing a set of covariates that is able to explain much of the variability in duration time. Presidents might have individual leadership characteristics that differ from each other significantly. Floods might be disasters that attract the attention of presidents more slowly than hurricanes. Perhaps some events, because of their inherent characteristics, attract attention differently than others.

There may be at least two sources of variability or heterogeneity in a typical time to event data set: theoretically predictable variability that is generally accounted for by observed risk factors included in the data set, and theoretically unpredictable heterogeneity that is caused by unobserved factors that have not been included in the data set. Even when the possible sources of heterogeneity are measured, it is not possible to know their relative risk rate. Thus, the case of theoretically predictable heterogeneity is often a trivial one. In social science, it is always impossible to include in analysis all possible risk factors because detailed information of many social events are often unknown.

Survival analysts have offered the idea of 'frailty' to account for such unknown or unobserved heterogeneity in the data. Accounting for unobserved heterogeneity is important because patterns of heterogeneity in the data set might represent a selection process and, thus, cause selection bias. If some disaster events are experiencing higher rate of response due to some unknown factors, then the rest of the events are experiencing lower rate of response. If the unobserved frailty is not accounted for, regression models would underestimate the hazard function to an increasingly greater extent as time goes by.[40]

A standard frailty model incorporates an unmeasured random effect (z_i) into the hazard function to account for the heterogeneity yielding the following functional form:

$$\boldsymbol{h}_i(t) = \boldsymbol{h}_0 z_i(t) \exp(\beta' X) \qquad (4)$$

where $\boldsymbol{h}_0(t)$ and $\beta' X$ are the same as before. The frailty term (z_i), a random variable, represents a mixture component capturing the fact that in the population there is a mixture of individual subjects with different risks (generated by unknown sources). Duration models with frailty, generally, assumes that (z_i) is independent of any censoring that may take place, it is time-independent, and it acts multiplicatively on the underlying baseline hazard function. While the independence assumptions are statistical, the choice of incorporating (z_i) multiplicatively is to remain consistent with the proportional hazard assumption.[41] The precise nature of the relationship between the individual and population (of presidential response) depends on the frailty distribution among individual subjects (individual case of presidential response).

It is a challenge to select an appropriate statistical distribution for frailty that takes account of the fact that hazard cannot be negative. Considering this property of hazard and following many other cases of mixed distribution, previous works on frailty suggests use of a Gamma distribution with mean equal to 1 and variance parameter θ. Gamma offers computational simplicity,

40 Andreas Wienke, *Frailty Models in Survival Analysis*, Chapman and Hall CRC Bio-statistics Series Boca Raton, USA: CRC Press: Taylor and Francis Group, 2011

41 Andreas Wienke, *Frailty Models in Survival Analysis.*

closed form (in most cases analytical solution is available through Laplace transformation) and intuitive shape. The Gamma distribution Γ(k, λ) is flexible since it can take variety of shapes as k changes.[42] "When k = 1, it is identical to well-known exponential distribution; when k is large, it takes a bell shaped form reminiscent of normal distribution".[43] Correspondingly, when the variance parameter of the distribution is equal to 1 its density function decreases monotonically, but as the variance gets smaller the distribution function increasingly approaches normal distribution–it gradually increases, reaches a maximum point, and then decreases.[44] Overall, therefore, a frailty value (z_i) greater than 1 indicates that the subject has a larger than average hazard, making it more "frail"; a frailty value less than 1 implies that the subject is less "frail" than an average subject.[45]

The shared frailty model extends the above univariate (where cluster size is one only) frailty model to incorporate random-effects (for larger size of clusters of events) and multivariate analysis of time-to-event data. Consequently, the shared frailty model differs from the simple frailty model in that it defines frailty as a measure of the relative risk that individual disasters responses in a group (such as flood or hurricane group) share. In other words, the frailty variable z_i is associated with clusters of events rather than individual events per se. It assumes that all response time (failure times) in a cluster are conditionally independent given the frailties. Andreas Wienke observes that the "value of the frailty term is constant over time and common to all individual events in the cluster".[46] The main focus of the shared frailty models, therefore, is to account for the intra-group correlations in the regression analysis. If $i = 1, 2, \dots g$ groups and $j = 1, 2, \dots n$ subjects in the i^{th} group, then the shared frailty model takes the following functional form:

$$\boldsymbol{h}_i(t) = \boldsymbol{h}_0 z_i(t) \exp\left(\acute{\beta} X_{ij}\right) \qquad (5)$$

42 Andreas Wienke, *Frailty Models in Survival Analysis*; David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis: Regression Modeling of Time-to-Even Data,* New Jersey: John Wiley and Sons, Inc., 2008; and Janet Box-Steffensmeier and Bradford Jones, *Event History Modeling*

43 Andreas Wienke, *Frailty Models in Survival Analysis*. p. 72

44 Andreas Wienke, *Frailty Models in Survival Analysis*. p. 72

45 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis.*

46 Andreas Wienke, *Frailty Models in Survival Analysis*. p.135

where $h_i(t)$ and $\beta' X$ are the same as before (equation 4), and some of the covariates in X_{ij} are at a group level and are constant over subjects within each group. The frailties $z_1 i$ $(i = 1, 2, \ldots, n$) are assumed to be independently and identically distributed (iid) with density function f(z) that depends on unknown parameters, including θ to be estimated. All individual cases within cluster i share the same value of frailty $z_1 i$ $(i = 1, 2, \ldots, n$).

The above shared frailty model is just a restricted version of a stratified model $h_i(t) = h_{0(t)} \exp(\beta' X_{ij})$ where $h_{0i}(t) = h_0(t) z_i$ is the stratum-specific baseline hazard function.[47] It is restrictive in the sense that it has incorporated the frailty z_i that is assumed to have a specific distribution, Gamma, with mean equal to 1 and variance θ. David Hosmer *et al* favors frailty model over a stratified model, particularly when covariates include dichotomous variables and the group is 5 or larger. They argue that the "little is to be gained by using a more complicated random effects model when the group size is 5 or larger."[48] They, thus, conclude that whenever it is computationally convenient frailty model is to be preferred to stratified models.

If the *z* variable in the shared frailty model is a nonrandom constant, it indicates that there exists no dependence among individual responses within a given cluster. That means, the events are independent and there is no unobserved heterogeneity in the data. Consequently, it reduces to the standard proportional hazard model.

Although dealing with shared frailty parametrically is straightforward and elegant, it is not possible to include the frailty directly into semiparametric regression models such as the Cox, where baseline hazard function does not have a specific distributional form (as discussed earlier) and is left out of the estimation process done through partial likelihood estimation procedure. Since in such models direct maximization of the marginal likelihood is not possible the literature on shared frailty models proposes an Expectation-Maximization (EM) algorithm to produce a solution numerically.[49] EM algorithm operates in

47 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis, p.299*

48 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis,p.303*

49 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis* and Andreas Wienke, *Frailty Models in Survival Analysis*.

two steps: at the first, Expectation (E) step, besides current parameter estimates, the expectation of the unobserved frailties is calculated based on the observed data. This is simply calculating, for each subject, an estimate of the value of its frailty $\widehat{z_i}$. The computation of $\widehat{z_i}$ uses the following formula:

$$\hat{z} = \frac{1+\theta\times c_i}{1+\theta\times\hat{h_i}(t)}$$

where $\widehat{h}_i(t)$ is the proportional hazard estimates (Cox) for each subject without frailty. Inthe second, maximization (M) step, these estimates are used for maximization to obtain new parameter estimates given the frailties estimated in the E step. At this step, the following estimation is done:

$$h_i(t) = h_0 z_i(t)\exp(\beta' X_{ij}) = h_0 z_i(t) exp\left[\beta' X_{ij} + \ln\left(\widehat{Z}_i\right)\right] \quad (6).$$

I will not further detail the EM algorithm here; David Hosmer et al show the complete steps of the EM algorithm and related maximization procedure.[50]

The shared frailty model estimates the variance parameter θ, which distinguishes the model from a standard Cox proportional hazard model that does not account for frailty. In the shared gamma frailty models, the frailty variance is interpreted as a measure of the correlation between the response times taken by presidents conditional on these responses being in the same cluster of disaster events. This implies that a likelihood ratio test (G) of the null hypothesis that H_0: $\theta = 0$ can be used as an evidence that whether the model with frailty is statistically different from the standard Cox proportional hazard model.[51] Under this test if the p-value = 1, the estimate of θ is close to zero and if the p-value is $0.5 \times \Pr[\chi^2(1) > G]$ then the estimate is not zero.[52]

Column two of table 2 reports the result of a shared frailty Cox model applied on the presidential response data. In this model, disaster type is considered as the clustering variable. I used disaster types as the clustering variables because of the qualitative differences among disasters, between the consequences of floods and hurricanes, for example. Once flooding occurs, for example, its

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50 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis*.

51 $G = 2\left[L(\hat{\theta},\hat{\beta}) - L(0,\hat{\beta})\right]$. Computation of the p-value for G uses a mixture of a χ^2 with df = 1 and a distribution with point mass 1.0 at the value θ = 0 (David Hosmer, Lemeshow & May 2008, 303).

52 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis*, p.303

effects remain longer, both the affected citizens and governments (locals well as federal) have time to assess the magnitude of the event. As a result presidential declaration may come understandably late. On the other hand, earthquakes, even hurricanes, do not give much time to the citizens and the governments. In a post earthquake or hurricane situation, presidents are expected to act faster.

The fact that disaster events are different from each other and presidents consider each of the disaster types differently is also confirmed in the standard Cox model, reported in column one of the same table. In the standard Cox model I included fixed effects of the disaster types and a few of the disaster types (Flood and Storm) appeared to have significant effect on the presidential response time.[53] A few others (hurricane, forest, earthquake) also show strong effect on presidential response time, although coefficients of these categories are not significant in the fixed effect model. Bases on the findings of the fixed effect Cox model and general knowledge about the qualitative difference among disaster types, I found it reasonable to conceive of disaster types as the clustering variable.

The interpretation of the frailty models is little different from that of the standard Cox model since in the frailty models interpretation of coefficients must account for the effect of the frailties. For example, the APPROVAL variable, with coefficient equal to .038 that is significant at $p < .01$ level, indicates that among disasters with the same value of the frailty or random effect, a one percent increase in pre-disaster approval rating of a president is associated with a higher chance (hazard rate –exp(.038) = 1.038 is greater than 1) of responding quickly. This is almost the same effect (.040) of the APPROVAL variable as found in the standard Cox model without frailties. So, inclusion of frailties did not really change the effects of this variable on presidential respond time. As can be seen in column two of table 2, similar conclusions can also be drawn for coefficient of most of the variables that have not changed much after inclusion of the frailties. However, two important variables of interest–PARTYID and ORGINDEP–did change their coefficients. The coefficient of PARTYID (1.007) now is no longer significant and its hazard magnitude (exp(1.007) = 2.73) is dramatically smaller. Similarly, ORGINDEP, although it is not significant in either case, also appears to have a dramatically

53 Flood is the baseline category for disaster type, thus not reported. When I changed the baseline category to hurricane, flood category had significant coefficient $\beta = -.53$ and β SE = .27. As expected, the coefficient of flood is negative implying that presidents take longer time to respond to flood than the baseline category hurricane.

smaller effect (-.0158) with an opposite sign. Major shifts in the effects of these variables, thus, indicate that there is in fact a frailty effect in the data set.

The presence of the frailty effect in the data is also confirmed by the estimated variance parameter θ. As noted earlier, the null hypothesis that $H_0: \theta = 0$ can be used as an evidence that whether the model with frailty is statistically different from the standard Cox proportional hazard model. As reported in table 2, θ = 3.89 and the likelihood ration test of θ is significant $p \geq \bar{\chi}^2 = .024$ which indicates that $H_0: \theta = 0$ cannot be rejected. This is a proof of significant heterogeneity and intra-cluster correlation in the data.[54] In order to see the consistency of the frailty effect, I also ran the same model using Weibull regression with gamma frailty, a parametric counterpart of Cox proportional hazard model. Column three of table 2 reports the result of this model. The θ parameter in this model also appears to be significant ($22.04, p \geq \bar{\chi}^2 = .000$) indicating strong frailty effect.

Table 1: Comparing regression models§

VARIABLES	(1) Cox (Standard)	(2) Cox (Shared Frailty)†	(3) Weibull (Frailty)†
PARTYID	3.182*	1.007	-2.762*
	(1.760)	(0.867)	(1.506)
APPROVAL	0.0403***	0.0382***	-0.0453***
	(0.00966)	(0.00898)	(0.00774)
SECONDTERM	-0.611*	-0.627*	0.479
	(0.334)	(0.321)	(0.297)
GOVID	-0.0709	-0.0731	0.0952*
	(0.0641)	(0.0628)	(0.0552)
PGdiff	0.0679	0.0714	-0.0825
	(0.0835)	(0.0818)	(0.0715)
ORGINDEP	0.238	-0.0158	0.0196
	(0.849)	(0.752)	(0.679)
Log(AFFECTED)	-0.00834	-0.00840	0.0205
	(0.0179)	(0.0174)	(0.0155)
(Eisenhower)‡	3.843**	3.898**	-3.495**
	(1.657)	(1.621)	(1.431)
(Johnson)		4.234*	
		(2.304)	
(Nixon)	2.445*	2.498*	-2.312*
	(1.470)	(1.443)	(1.262)
(Ford)	1.228	1.291	-1.044
	(0.805)	(0.797)	(0.694)
(Carter)	-0.508	3.602***	0.131
	(1.294)	(1.203)	(1.107)

54 David W. Hosmer, Stanley Lemeshow and Susanne May, *Applied Survival Analysis: Regression Modeling of Time-to-Even Data*, p.304

(Reagan)	0.939	1.236	-1.102
	(1.102)	(0.992)	(0.916)
(G-Bush)	-1.810*	-1.486	1.549*
	(1.049)	(0.974)	(0.863)
(Clinton)	-4.376*		4.214**
	(2.377)		(2.020)
(Hurricane)‡	0.531		
	(0.327)		
(Tornado)	-0.0347		
	(0.325)		
(Storm)	0.834**		
	(0.357)		
(Forest)	0.433		
	(0.444)		
(Extreme)	0.135		
	(0.424)		
(Earthquake)	0.349		
	(0.699)		
(Other Disaster Types)	-0.166		
	(1.162)		
Constant			6.576***
			(1.333)
ln p			0.142***
			(0.040)
ln(θ)		.0481164	-1.507*
		(.0458027)	(0.627)
LR-test(θ)		3.89 p χ¯2 = 0.024	22.04 p χ¯2 = 0.000

§ Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
† Frailty variable is 'Disaster Type'
‡ For Presidents, W-Bush is the baseline. For disaster types, flood category is the baseline.

Concluding Remarks and Discussion

Disasters happen in political space, and when it comes to presidential disaster declarations, presidents are very political. In this study, I have found that there is a substantial difference between a Democratic president and Republican president in their response time: all other things being equal, Democratic presidents declare emergencies more quickly than Republican presidents. Consistent with the electoral logic of presidential response, presidents who are in their second term respond to disasters more slowly than presidents who are in their first term. However, contrary to what I expected, increase in pre-disaster approval rating of the presidents appears to be associated with slightly higher chance of responding quickly. Given the lack of an alternative insight about how pre-disaster approval rating determines the behavior of an incumbent president, at this point I am not sure why should this be the case. I drew this hypothesis from observing the behavior of German Chancellor (a non-presidential system) in the wake of a flash flood. The opposite sign of the approval variable clearly indicates that the U.S. presidential response mechanism is at least not the same as that of Germany. This striking result demands careful theorizing about the relationship between presidents' disaster response behavior and their pre-disaster approval rating. In this study, I did not find significant effect of partisanship of the governors of the affected areas, organizational independence of the implementing agencies, and president-governor partisan differences on the presidential response time.

In addition to making a contribution to our understanding of the political determinants of presidential response to natural disasters in the U.S., in this paper I have also explored possible ways to statistically model duration data with unobserved heterogeneity due to intra-group correlations. I have explored the disaster type specific effects by incorporating a frailty parameter within the Cox proportional hazard model. Modeling frailty effects is important for the current data because it is not reasonable to assume that all disaster types are the same. There exists significant heterogeneity with respect to disaster types in the data. Presidents' responses to flooding are expected to differ systematically from their response to Hurricanes. Presidential responses, therefore, are probably systematically faster with respect to some types of disaster than others. Standard Cox proportional hazard model cannot recognize this systematic group effect (the effects of frailty on regression coefficients), and, therefore, is inappropriate for the current data. A shared frailty term had to be incorporated into the Cox model to appropriately capture the frailty effects.

A common alternative to frailty approach is fixed effect proportional hazard approach. A common way to incorporate fixed effect is to include $j-1$ disaster types indicator covariates in the model (see column 1, table 2). However, it is to note here that the general literature on multi-level modeling is divided in terms of their advice on whether to rely on fixed effect or random effects model to identify unobserved heterogeneity in the data having more than one level. While some scholars make 'rule of thumb' arguments that if group size is less than 10 uses fixed effects[55], others recommends to "always" use

55 Tom Snijders and Roel Bosker, *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*, London and Thousand Oaks and New Delhi: SAGE Publications, 1999

random effects models.[56] Andersen Klein and Zhang conducted a comprehensive Monte-Carlo study that tests relative performances of fixed effects and frailty models in survival analysis.[57] They conclude “the fixed effects test [Likelihood Ration, Score and Wald] for a center [group variable] effect tends to reject the null hypothesis [when it is in fact true] of no center effect too often when the number of subjects per center is small. The random effects test does, however, appear to maintain the correct significance level for these small sample cases”.[58] Overall, they recommend use of frailty model, particularly when dealing with small group size. Similarly, Allison, in a Monte-Carlo study of repeated events, finds “serious inflation of parameter estimates” in fixed effects Cox regression with dummy variables “when the number of interval per individual is low and percentage of censored cases is high”.[59]Janet Box-Steffensmeier and Jones also observe that in fixed effects model “the effects are a fixed quantity to be estimated and have consistency problem”.[60]

Overall, therefore, it seems that in the context of survival analysis with small or imbalanced group size (see tables in Appendix for the current data) and substantive proportion of censoring (46 percent in the current data set) frailty or random effects model is better than fixed effects model. Such conclusion, however, can still be premature given that we have almost no knowledge about the relative performance of fixed and random effect model applied to the kind of data (natural disaster onset to presidential declarations time) used in this paper. A Monte-Carlo study incorporating the assumptions made in this data set would shed some important lights on the issue. However, I set that study aside for now as a separate but important project. Based on the current study, I recommend that further event history analyses of the presidential declaration process that go beyond one particular disaster event should avoid the temptation to use a simple Cox model, and take the frailty effects into consideration.

56 Andrew Gelman, and Jennifer Hill, *Data Analysis Using Regression and Multi-level/Hierarchical Models. Analytical Methods for Social Research,* 5th printing ed., New York, Melbourne: Cambridge University Press, 2008

57 Per Kragh Andersen, John P. Klein and Mei-Jie Zhang, “Testing For Centre Effects in Multi-Centre Survival Studies: A Monte Carlo Comparison of Fixed and Random Effects Tests.” *Statistics in Medicine*, Vol. 18: 1999, pp.1489–1500

58 Per Kragh Andersen, John P. Klein and Mei-Jie Zhang, *Statistics in Medicine*, p.1493

59 Paul D. Allison, “Bias in Fixed-Effects Cox Regression with Dummy Variables”, 2002, URL: <www.ssc.upenn.edu/allison>, p.8

60 Janet Box-Steffensmeier and Bradford Jones, *Event History Modeling*, p.162, footnote 5.

Appendix

Measurement and Sources of Data

- Political ideology of the presidents (PARTYID). This is a dichotomous variable that takes 1 if the President is a Democrat, and 0 if the President is a Republican. Source: The American Presidency Project of The University of California, Santa Barbara, found at <http://www.presidency.ucsb.edu/ >
- Presidential second terms (SECONDTERM). This is a dichotomous variable that takes 1 if the President is in his second term when he responded to a natural disaster and 0 otherwise. Source: The American Presidency Project of the University of California, Santa Barbara.
- Presidential approval (APPROVAL). This variable measures the level of popularity of presidents by percentage of job approval received by presidents in the last weekly Gallup poll before a disaster strikes. Gallup poll used the question: "Do you approve or disapprove of the way [first and last name] is handling his job as President?" Source: The weekly Gallup poll results are available at www.gallup.com/tag/Presidential\%2bJob\%2bApproval.aspx, and also The American Presidency Project of The University of California, Santa Barbara. Note: this variable changes over time for a particular president. This requires that in duration model this variable should be considered as time varying covariates. However, since in this paper I am particularly interested to explore if the presidential response data has any frailty effect, I will leave an in-depth consideration of time varying covariates for a future exercise.
- Political ideology of the governors (GOVID). This variable takes 1 if the governor is a Democrat, 2 if s/he is independent or from local parties, and 3 if s/he is a Republican. Source: National Governors Association, found at <http://www.nga.org>.
- Organizational independence of the implementing agency (ORGINDEP). This is a dichotomous variable that takes 1 if the implementing agency is an Independent Agency (FEMA), and 0 otherwise (FDAA under HUD before FEMA was created in 1979 or FEMA under DHS). Source: Federal Emergency Management Agency, found at <<http://www.fema.gov/>>.
- Total political appointees in the implementing agency's rank and file (TOTPOLAPNT). This variable counts the total political appointees (usually every new president replaces such posts as agency director, deputy director etc. by his own appointees) present in the implementing agency's rank and file when presidents respond to disasters. This variable takes 0 if there is no political appointee (during or immediately after presidential regime change, many posts are made vacant so that new presidential appointees can assume the offices.) when presidents respond to disasters, and any number n, where (n = 1, 2, 3 …) otherwise, depending on the count of such appointees. When federal disaster management was under HUD I counted all the presidential appointees under FDAA, and when it is under the HS I counted all the presidential appointees under FEMA. Source: United States Government Manuals for all years, and the United States Government Policy and Supporting Positions (published every 4 years) for all years between 1960 and 2005.

- A measure of total disaster related loss (AFFECTED). This is an interval level measure, where AFFECTED = (Total Number of People Killed + Total Number of People Injured + Total Number of People Affected). I use the Natural Log of this measure (log AFFECTED). From the calculation of log AFFECTED I dropped property or resource damage dimension in order to secure a reasonable sample size. The EM-DAT data set does not have information on property or resources for all disaster events. Source: Emergency Events Database (EM-DAT) at <<http://www.emdat.be/>>
- President-Governor Difference (PGdiff). This variable takes 0 if both the president and the governor are from the same political party, and 1 if they are from different parties (Democrat vs. Republican). Source: My calculations based on the above information.
- PRESNUM is an index variable that simply identifies presidents, for example, Eisenhower = 1 … G-W Bush = 10.
- Disaster Type (DISTYPE). This is a nominal variable, where 1 = Hurricane; 2 = Tornado; 3 = Storm; 4 = Forest related disasters (e.g. wildfire); 5 = Extreme Temperature (e.g. Winter, Heat-wave); 6 = Geological; 7 = Flood; 8 = Drought; and 9 = Others all other types of disaster events. Source: EM-DAT data set.

Table 1: Average Presidential Response Time and Death Counts by States, 1960-2005

State	Time	Death	State	Time	Death
AK	1	131	MT	39	2
AL	10	170.11	NC	7.52	29.23
AR	17	19.3	ND	8	38.50
AZ	26.2	15.6	NE	8.72	7.27
CA	5.93	16.13	NH	6.66	62.33
CO	6	9.5	NJ	17.37	44.12
CT	22	52	NM	100	35
DE	22.83	49.83	NV	23	26.20
FL	4.88	75.61	NY	15.55	35.55
GA	5.61	106	OH	6.5	30
HI	2.2	15.4	OK	8.37	17
IA	12.2	7.5	OR	8.5	16.5
ID	17.66	7.33	PA	16.22	43.77
IL	5.75	13.75	RI	6.4	55.4
IN	9	16.8	SC	6.81	39.45
KS	8.66	17.55	SD	7.2	64.2
KY	10.33	18.83	TN	7	33.33
LA	7.6	126.66	TX	12.8	20.54
MA	22	52	UT	7.25	11
MD	16.22	45.66	VA	15.08	79.08
ME	7.25	50	VT	3	38.5
MI	8.75	17.5	WA	13.2	30.6
MN	29	19.16	WI	21	16.66
MO	27.2	17.8	WV	3.2	37.2
MS	12.41	159.83			
			Total Average	11.62	48.11

Table 2: Frequency of disasters during presidential regimes, 1960-2005

President	Hurricane	Tornado	Storm	Forest	Geological	Flood	Extreme	Others	Total
Eisenhower	16	0	0	0	1	0	0	0	17
Johnson	5	1	0	0	2	0	0	0	8
Nixon	16	1	0	0	0	2	1	0	20
Ford	1	0	2	0	0	0	0	0	3
Carter	6	2	0	0	1	3	0	0	12
Reagan	30	17	14	0	0	2	13	0	76
H-Bush	17	3	23	5	2	12	0	0	62
Clinton	26	66	41	6	2	19	66	4	230
W-Bush	34	27	26	6	2	1	26	1	123
Total	151	117	106	17	10	39	106	5	551

Table 3: Average Response Time of Presidents by Disaster Type, 1960–2005

President	Hurricane	Tornado	Storm	Forest	Geological	Flood	Extreme	Total
Eisenhower	2.25	.	.	.		.	.	2.29
Johnson	5.20	3.00	.	.	7.00	.	.	5.37
Nixon	5.75	3.00	.	.	.	2.00	.	5.21
Ford	11.00	.	2.00	.	.	.	.	5.00
Carter	1.83	2.00	.	.	4.00	3.00	.	2.27
Reagan	10.03	7.00	.	.	.	.	.	9.12
H-Bush	5.33	12.00	10.75	11.00	.	6.40	.	8.54
Clinton	2.35	41.82	4.15	11.00	1.00	23.5	8.18	20.40
W-Bush	4.35	6.00	15.00	3.00	.	.	.	4.98
Total	5.14	26.16	6.60	9.22	4.40	13.53	8.18	11.50