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## Natural Disasters: Triggers of Political Instability?

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### Abstract:

Do different types of natural disasters – droughts, earthquakes, floods, storms, and others – trigger political instability? This study engages with this question. It revisits an ongoing debate over the nature of association between disasters and conflict and re-assesses this relationship using the model of conflict developed by the Political Instability Task Force as well as its data, measures of political instability, and methods of assessment. The study finds only marginal support for the impact of certain types of disasters on the onsets of political instability. The pre-existing country-specific conditions, including the resilience of a state's institutions to crisis, account for most of the variance in the dependent variable. Once the characteristics of a state's political regime are taken into account, the effect of disasters weakens or disappears completely suggesting that natural disasters become catalysts of political instability in only those states, which are already prone to conflict.

## **Natural Disasters: Triggers of Political Instability? <sup>1</sup>**

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*Do different types of natural disasters – droughts, earthquakes, floods, storms, and others – trigger political instability? This study engages with this question. It revisits an ongoing debate over the nature of association between disasters and conflict and re-assesses this relationship using the model of conflict developed by the Political Instability Task Force as well as its data, measures of political instability, and methods of assessment. The study finds only marginal support for the impact of certain types of disasters on the onsets of political instability. The pre-existing country-specific conditions, including the resilience of a state's institutions to crisis, account for most of the variance in the dependent variable. Once the characteristics of a state's political regime are taken into account, the effect of disasters weakens or disappears completely suggesting that natural disasters become catalysts of political instability in only those states, which are already prone to conflict.*

On the morning of December 26, 2004 a catastrophic quake struck 100 miles off the Northwest coast of the Indonesian island of Sumatra creating a deadly tsunami. The Indian Ocean tsunami devastated the coastal areas in Southeast Asia and beyond killing 227,898, displacing 1.7 million people from 14 nations, and causing serious damage as far as the east coast of Africa (US Department of the Interior 2010). Following the disaster, two countries – Indonesia and Sri Lanka – came to share the limelight of international attention. Not only did these states bear the brunt of the death and devastation but they also experienced ongoing civil conflict at the time of the quake.

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Immediately in the aftermath of the tsunami, there was a stream of speculations about the political consequences of the disaster. The 2004 tsunami had a divergent impact on the patterns of political instability in Indonesia and Sri Lanka. In the former country, the event served as a catalyst for a new peace agreement between the government and the rebels of the Free Aceh movement, but provided context for rekindled war in the northern region of Sri Lanka (Enia 2009). These different outcomes are emblematic of the ongoing debate over the nature of the impact of natural disasters on security environments of affected countries.

In this study, I revisit the debate on the disasters/conflict nexus and re-assess this relationship using a new research design and methods of assessment. This research draws on one of the existing models of violent conflict developed by the Political Instability Task Force (PITF). I augment the PITF dataset with data on natural disasters retrieved from EM-DAT Emergency Events Database<sup>2</sup> to assess whether different types of natural disasters – droughts, earthquakes, epidemics, and others – can trigger revolutionary or ethnic war, adverse regime change, and genocides within two year time-frame.

I begin with a brief survey of the state of scholarship on natural disasters and conflict. I highlight the importance of the resilience of political institutions to crises and use it as a starting point for theorizing the background conditions, under which natural disasters may become triggers of political instability. The second section discusses the research design followed by the review of empirical tests of the relationship between

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<sup>2</sup> The EM-DAT Emergency Events Database is considered to be the most comprehensive and reputable open source dataset on global natural disasters. This database contains extensive coverage of different types of natural and technological disasters from 1900 to present for nearly all countries included into the PITF dataset (EM-DAT 2010).

natural disasters and political instability in section three. I conclude with the discussion of findings and avenues for future research.

### Dissecting the Disaster/Conflict Nexus

For several decades, both the academic literature and the policy world have been divided over the nature of the relationship between natural disasters and different types of conflict. It has long been assumed that natural disasters can trigger or exacerbate a cycle of intra- and inter-state discord (Drury and Olson 1998; Bhavnani 2006; Brancati 2007; Nel and Righarts 2008). There is, however, a growing stream of literature suggesting that natural disasters can mitigate political violence, pacify rival states, induce cooperation in the conflict-ridden communities, or have no direct impact on the dynamics of conflict (Kelman 2003; Akcinaroglu, DiCicco and Radziszewski 2010).

Despite the opposite conclusions, the underlying logic of the studies on natural disasters and conflict is, for the most part, the same. Stripped to its bare essentials, an oversimplified model of civil conflict portrays it as a function of grievances and political opportunities.<sup>3</sup> Grievances over inequalities in income, assets, and status can motivate people to act against the perceived sources of their destitution. Whether or not the organized dissent will take place also depends on the opportunities for violent revolt. The framework of opportunities includes different kinds of resources available to rebels relative to those controlled by the government. It also encompasses individuals' perceptions of benefits arising from engagement in violence and costs of forgoing other peaceful methods of expressing dissent (Nel and Righarts 2008; Enia 2009). New

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<sup>3</sup> In the interest of time and space I cannot review all of the exceptional quality work that examined different causal models of strife (for further discussion, see, for example, Gurr and Moore 1997; Gurr 2000).

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opportunities allow for political mobilization, which is necessary for political violence to take place, and grievances make mobilization possible.

The disaster events fit into this picture by generating or amplifying scarcities in basic resources and intensifying individuals' grievances over access to public goods. The shortage of vital resources caused by a disaster event weakens the state in terms of its ability to satisfy public demands. It also changes the balance of power between individuals, groups, and organizations that serve them (Drury and Olson 1998). In this way, natural disasters and the resulting resource scarcities help to translate individuals' frustration into an organized revolt by creating new opportunities for political mobilization.

Of the two parts of the civil conflict equation, grievances have received the most criticism. One of the concerns with the grievance-based approaches has been their neglect of the groups' subjective notions of economic justice. Whether or not people become frustrated with their situation and resort to violence depends, in part, on their understandings of what is "just" and "unjust" in their specific socio-economic and political milieu (Homer-Dixon 1999:144). Furthermore, the general scholarship on intrastate conflict provides little systematic evidence in support of the claim that socio-economic grievances motivate individuals to join rebel movements (Buhaug et al. 2008:31). Some disagreements over the impact of natural disasters on violent dissent can be found in different interpretations of the association between individuals' grievances and motives for violent dissent. The common experiences of tragedy caused by a disaster can override pre-existing grievances and encourage cooperation on pressing post-disaster tasks. In the aftermath of a natural disaster, the affected communities' efforts are aimed at

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accomplishing a clearly defined and consensual goal of managing the consequences of the natural disaster (Quarantelli and Dynes 1976). These joint efforts, in turn, can create opportunities for reconciliation and peace (Worldwatch Institute 2006).

If the notion of grievances as a determinant of strife has been contested in the literature on civil conflict, the structure of opportunities, including the strength of government and the robustness of political institutions, has featured strongly in all explanations connecting disasters to either peace and cooperation or violent dissent. Natural disasters can strengthen or emasculate the state leadership, solidify or break up the governing regime, and weaken or embolden the state's challengers. Some governments will emerge from disasters more popular and politically stronger, while others will lose their legitimacy and popular support (Pelling and Dill 2006; Olson and Gawronski 2010).

The question, then, becomes about the conditions that make a state resilient to various political and economic shocks. According to the recent studies of civil conflict, it is the features of a state's political regime (specifically, the robustness and adaptive capacity of its political institutions) that determine the degree of the state's vulnerability to instability and political crises (Goldstone et al. 2005, 2010). Poverty, low level of economic development and other economic, political, and demographic factors that have been traditionally associated with political instability are themselves products of poor governance. The vulnerability or adaptive capacity of political institutions of a governing regime will, therefore, determine the likelihood of a civil conflict in the aftermath of a natural disaster (Buhaug et al. 2008:3; Enia 2009).

Various formal characteristics of political institutions have been associated with stability or vulnerability of the governing regime (Fearon 2005; Reynal-Querol 2005). Governments of transitional states, in which new political institutions are weak and unstable, are particularly sensitive to political turmoil. Also, in states lacking peaceful channels for resolving impending social and political conflict, public dissent can be transformed into violent strife. Violence is more likely to take place in the absence of political and social restraints on decision makers in the form of competitive elections or cross-pressures resulting from political pluralism, which is an intrinsic quality of a democratic regime. The opposite is true of partial democracies and partial autocracies, both of which are considerably more vulnerable to political turbulence. Factionalism in political institutions is another characteristic that increases the state's vulnerability to political crisis. A state's political environment is factionalized when a number of dominant parochial groups compete for political influence for promoting their own agendas to the detriment of the broader common interests of people and the state itself (Goldstone et al. 2005, 2010).

It is these factionalized, transitional, and weak states that may submerge into severe political crises when challenged by various political and economic shocks, including climate-induced stress and natural disasters. It has been argued that states need capabilities, competence, and credibility to cope successfully with the post-disaster tasks (Olson and Gawronski 2010). The factionalized and transitional states will be devoid of these important resources. The posts in the governments of these states are meted out on the basis of kinship ties or other non-meritocratic grounds. The people in the leadership positions in these states lack competence for effective administration of appropriate

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measures to deal with disasters and their aftermath. The disaster relief policies adopted by governments of those states that lack cohesion and political pluralism will lack credibility in the eye of political opponents as well as the broader population because of the parochial allegiances of the leadership of these states. Parochial interests will also be an obstacle to implementation of a wide range of preventive measures and forecasting tools to improve the preparedness of the state to deal with the threat of disasters. Lacking the widespread popular support and contested by political rivals, the leaders of fractionalized and transitional states will be unable to procure resources necessary for coping with the impact of the disaster events. High levels of corruption endemic to transitional and weak states are an additional challenge for mobilizing sufficient resources and gaining people's trust.

What follows from the preceding discussion is that it is the poorly governed states that are particularly vulnerable to political conflict in the aftermath of a natural disaster. When a natural disaster strikes, it simply actualizes potential instability that is already present in the governing regime and determined by the limitations or adaptive capacity of political institutions (Goldstone et al. 2010: 204-205). Once the latter characteristics of a state's political regime are taken into account, natural disaster events can be expected to produce no significant or consistent results.

The statistical analyses of the impact of natural disasters on political instability have traditionally been limited to tests of the effect and magnitude of variables measuring different types of natural disasters on different measures of conflict. My goal is to go beyond the demonstration of statistical significance or insignificance of the variables of interest supporting theoretical predictions. I aim to assess whether the effect of natural



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disasters is sufficiently important to include the variable in the model predicting political instability, or whether the overall explanatory power of models with natural disaster is greater than that of the alternative specifications containing only those variables that zero in on characteristics of political regime. It is important to identify independent variables that are significant and robust to empirical tests. However, it is also imperative to select models capable of distinguishing those states that will soon plunge into violence from those that will remain stable with greater accuracy and precision.

#### A New Research Design for the Study of Natural Disasters

To specify a model as well as measurements and empirical tests, I chose to adopt one of the existing models of violent conflict developed by the PITF. After 15 years of work, this panel of researchers from leading American universities settled on a statistical model of political instability that is robust, parsimonious, and accurate. For all kinds of political instability, the PITF model is able to correctly classify onsets of instability in about 80% of cases, which is a significant improvement over the majority of models, which leave a half of the variance in the dependent variable unexplained (Goldstone et al. 2005, 2010).

The PITF model stands out for its simplicity. It incorporates only a handful of variables, which have revealed consistent association with the onset of political instability across numerous model specifications, statistical tests, and sets of data. Importantly, the model specification emphasizing characteristics of political regime is consistent with the study's theoretical expectations concerning the vulnerability of certain types of political institutions to crisis. Most of the studies of political conflict employ an aggregate measure of democracy or binary and tertiary indices of political regime developed on the basis of the 21-value autocracy/democracy scale from the Polity IV dataset (Marshall and

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Jagers 2002). The PITF team disaggregated the index and examined the relationship between individual components of democracy and conflict, as well as the impact of different combinations of those components and their values on the onsets of political instability (Goldstone et al. 2005, 2010).

Another problem that has been common to the large-N studies of disasters and conflicts concerns a statistical procedure used in the tests. Civil wars and other types of violent conflict are very significant, but rare events. Popular statistical procedures that have been used for examining these rare events can underestimate the probability of conflicts and produce biased coefficients on the variables of interest (King and Zeng 2001). The PITF's method allows for overcoming this methodological problem. The PITF team adopted random case-control comparison methodology, a technique that is frequently used in epidemiological studies of risk factors for diseases that occur rarely in diverse populations (Goldstone et al. 2005). In a case-controlled design, countries that experienced state failure are paired up with a random set of countries that did not experience political instability during several years preceding and following the state failure. Then, the conditions in "failed" states in the years preceding the onset of failure are compared with conditions in the randomly selected set of "control" countries in the same years using a conditional logistic regression, which identifies factors associated with a higher risk of instability onset (Goldstone et al. 2005).

Finally, to test whether the effect of natural disasters is sufficiently important to include the variable in the model predicting political instability, I use the Wald test to examine the significance of adding a new block of predictors (natural disasters) to the basic model, which does not contain these predictors. The precision of the new model

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with natural disasters will be further examined through the framework of the Akaike's information criterion (AIC) which is used for selecting the best among the plausible models evaluated on the basis of their "fit" for the data at hand.

#### *Measurements of Key Dependent and Independent Variables*

For the purpose of this study, I use the PITF's measures of political instability and its global data set (1955-2008). The dependent variable is the *onset of an episode of political instability* comprised of one or more of the following types of events: ethnic wars, revolutionary wars, adverse regime changes, and genocides and politicides. An event is considered to be an episode of war and included into the PITF dataset when it meets the two minimum thresholds: a mobilization threshold (parties of the conflict must mobilize at least 1,000 people), and a conflict intensity threshold (the conflict must result in at least 1,000 total conflict-related deaths and exceed 100 fatalities during at least one year). A consolidated "problem set" of events, the definitions of wars, adverse regime changes, genocides, and politicides, as well as the coding rules can be accessed at the PITF website.<sup>4</sup>

Natural disaster defined as a nature-induced event or situation, which overwhelms local capacity, necessitating a request to national or international level for external assistance, is a key independent variable in the study (EM-DAT 2010). The data on natural disasters are retrieved from the CRED EM-DAT database.<sup>5</sup> For a disaster to be entered into the database at least one of the following criteria must be fulfilled:

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<sup>4</sup> PITF Problem Set and Codebook. <http://globalpolicy.gmu.edu/pitf/pitfcode.htm>.

<sup>5</sup> The raw data on natural disasters was gratefully received via email in February 2009. The criteria for registering events in the database as well as the definitions of different types of natural disasters and other coding rules are retrieved from the explanatory notes accompanying the CRED EM-DAT.

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- Ten or more people reported killed;
- Hundred people reported affected/injured/homeless;
- A state of emergency declared following the disaster event;
- An event is declared as a significant disaster (for example, “a worst disaster in the decade”);
- A call for international assistance issued; or
- An event that is believed to fulfil one of the above criteria and for which more information is expected at a later date.

For the purpose of this study, I utilize data on 10 types of natural disasters that had occurred over a period of 1955 to 2008 across the globe. Those types of natural disasters are: droughts, earthquakes, epidemics, extreme temperatures, floods, insect infestations, mass movement dry, mass movement wet, volcanoes, and wildfires. For each country-year, I calculated the number of disaster events of each type. In addition, I included variables with the counts of killed (the total number of people confirmed as dead and people missing and presumed dead), injured (the number of people suffering from physical injuries, trauma or illnesses requiring medical treatment as a direct result of a disaster), and total affected (a sum of injured, homeless, and the number of people requiring immediate assistance during an emergency situation) for each event type. The counts of killed, injured, and affected were adjusted for the total population (both sexes) of a country in the year when the disaster(s) took place. The combination of 10 types of natural disasters and three types of counts of individuals affected by those disasters gave me 30 independent variables (to be included in separate models). I also introduced three

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variables representing the totals of all natural disasters and totals of all people killed, injured, and affected by all natural disasters in a country-year.

Natural hazards have been classified into two groups: rapid-onset disasters, which occurrence is difficult to predict far in advance and the warning time before a disaster strikes ranges is very short (ranging from seconds to several days), and slow-onset disasters, which outcomes become disastrous in months or even years. Earthquakes, storms, floods, volcanic eruptions, wildfires, landslides, and avalanches are usually categorized as rapid-onset disaster events, whereas droughts fall within the slow-onset disaster category. The rapid-onset disasters pose considerably more danger because they strike suddenly catching the governments and people by surprise. To test for the impact of rapid-onset disasters on political instability, I created separate variables – counts of all rapid-onset disasters and people affected by them in a year in a given state.

Finally, disaster events included into the EM-DAT dataset range from those causing ten or more deaths and those affecting thousands of people. To differentiate between the low and high impact disasters and account for the possibility that it is only those disasters with the high magnitude determined by the total number of killed and affected individuals, I created another count variable - *high human impact disasters* - that kill 1000 or more people.

#### *Other Independent Variables*

This study retains the four independent variables - *regime type*, *infant mortality*, “*bad neighborhood*”, and *state-led discrimination* - which have shown consistent and

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statistically significant impact on the risk of instability onset in the PITF tests.<sup>6</sup> The variable of *infant mortality* is logged and normalized to the global mean in the year of observation. “*Bad neighborhood*” is an indicator of conflict-ridden environment where four or more bordering states are embroiled in an armed conflict. *State-led discrimination* is a binary index created from the scores of 4 on indicators of political or economic discrimination in the Minorities at Risk Project data (CIDCM 2006). Political regime is a categorical variable formed using the scores from POLITY IV *executive recruitment* and *competitiveness of political participation* components. Another dimension added to partial democracy is that of factionalism in political participation. The five categories of political regime are:

- *Full democracy* (a political system characterized by systematic, free and fair elections and well-institutionalized and unconstrained political participation);
- *Partial democracy with factionalism* (a system lacking competitiveness of political participation due to the presence of parochial groups competing for power, promoting particularistic interests and agendas of the group);
- *Partial democracy without factionalism* (a political system that does not completely meet either the standard of free and fair elections of the chief executive or competitive political participation);
- *Partial autocracy* (a system in which competitive elections may take place but there are also significant constraints on participation); and

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<sup>6</sup> These variables have been singled out from an initial roster of 75 conflict-inducing independent variables suggested by experts. They were selected on the basis of thousands of tests of different statistical models with various functional indicators and interactive specifications.

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- *Full autocracy* (a system characterized by the absence of effective political contestation and repressed political participation) (Goldstone et al. 2010:194-195).

The study employs random case-control comparison and conditional logistic regression for assessing the models. In the case-controlled design, the cases of historical episodes of instability onset are matched by country-year with randomly selected control sets of countries that did not experience political instability during several years preceding and following the year of that country-year observation (Goldstone et al. 2005). Then, the conditions in “failed” states in the years preceding the onset of political instability are compared with conditions in “control” countries in the same years. Following the PITF’s design, I compare conditions in the two years preceding the onset of state failure. The two-year lag ensures that observations on countries experiencing instability were not affected by changes associated with the instability itself. The observations for control cases were also drawn from two years prior to the matching year and from the same geographical region. Matching the control cases by geographical region and years minimizes the possible bias of model estimates that may arise due to the regional and temporal differences in political instability. Without regional matching, the control country-year observations drawn from Europe and North American would have been overrepresented in the control sets. Also, instability events that have occurred in the post-Cold War era would have been compared to conditions existing during the Cold War (Goldstone et al. 2005).

The sets of control country-years, therefore, have the same regional and temporal distribution as the set of observations on country-years with onsets of political instability. The control sets have the same proportion of cases from all geographical regions and time

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periods as the instability set. To illustrate the matching procedure, let's use Azerbaijan that experienced an adverse regime change in 1993 as an example. All observations on the independent variables for this country are drawn from 1991 (two years prior to the onset of instability). Three matching cases from Europe are drawn at random from among those states that were free of political instability from 1991 to 1997, and data on conditions in those countries in 1991 was also obtained.

The instability cases and matched control sets are then analyzed using a conditional logistic regression to identify those factors that are associated with a higher risk of instability onset. To ensure the consistency of results, the analysis is performed three times using different randomly selected sets of control cases as matching samples. Additional tests are carried on the models with the observations on rapid onset-disasters lagged by 1 year because of the outcomes of these events become disastrous within a shorter time-frame.

Since the onsets of political instability concentrate in Sub-Saharan Africa, the findings for the global set of the onsets of political instability may be driven by what is happening in this region. To test for the possibility of the impact of region on the onset of political instability, I re-run all tests using conditional logit and controlling for the county's region using regional dummies. Also, to ensure that the global model, which includes observations from rich, stable, and democratic countries from Europe and North America is not leaving out any other important information about the ways, in which poverty and poor governance affect states' prospects for instability in other parts of the world, particularly, Africa, I repeat the analysis on a subset of data (Goldstone et al.



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2005). The same analytical tests are performed on countries within the Sub-Saharan Africa, the region where the majority of the episodes of instability since 1955 took place.

### Data Analysis

Table 1 contains the coefficients and odds ratios for the model with the cumulative sum of all natural disasters as one of the predictors of political instability. Both conditional logit and unconditional logistic regression were performed on three sets of randomly drawn “control” cases. The results from the third comparison did not reveal any new information and are not published here. The four key independent variables - *political regime*, *infant mortality*, “*bad neighborhood*”, and *state-led discrimination* – showed consistent results in the predicted direction of impact across all model specifications, tests, and control sets. The *full democracy* variable was the only measure of political regime that appeared statistically insignificant in some tests.

Full autocracies appear to be the most stable regimes, whereas partial democracies with factionalism and states in transition have highest propensity toward state failure (odds ratio for instability in transitional states increases between 22.20 and 122.97, depending on a control set used in the analysis, whereas the odds of instability grow by 48.45 - 50.12 for partial democracies with factionalism). Even full democracies, *ceteris paribus*, have higher odds of instability compared to full autocracies. Partial autocracies and partial democracies without factionalism are somewhat less stable than full autocracies. All things equal, the odds ratio in the former case is 12.55 to 13.84, whereas in the latter – 7.67 to 11.

The likelihood of the onset of political instability in countries at the 75<sup>th</sup> percentile in global infant mortality are higher than in countries at the 25<sup>th</sup> percentile (odds ratios

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are between 5.26 and 6.88), and when four or more bordering countries are experiencing internal conflicts, the odds of instability increase by a factor of 10.67 to 19.75. Countries with state-led discrimination designated with a score of “4” on the index of economic or political discrimination in the Minorities at Risk Project are almost twice as likely to experience the onset of political instability as countries without such discrimination.

The parameter's coefficient on the total number of natural disasters is significant at 0.05 level, suggesting that, *ceteris paribus*, having one more natural disaster of any type in year  $t$  increases the odds of the onset of political instability in the country in year  $t+2$  by 1.31, compared to a similarly situated country with the reference level of that independent variable. However, this finding has not been confirmed in the tests using the other two sets of control cases or logistical regression testing the models with regional dummies. Logistical regression largely confirmed the results of conditional logit on the four key independent variables. Of the regional dummies, only Europe showed statistically significant results suggesting that, everything else being equal, European countries (including the countries of East and Central Europe, countries of the former Communist block, and former republics of the Soviet Union) had higher chances of experiencing instability, compared to Africa (odds ratio for instability in the European states is slightly above 5).

I used both conditional and unconditional logit for testing the impact of individual types of natural disasters as well as percentages of people killed, injured, and affected by those disasters on all three sets of instability and control cases. With the exception of *flood*, *storm*, and *earthquake*, no other measure of natural disaster showed consistent and statistically significant results across control sets and tests. Therefore, the results of these

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30 models are not reported here. *Flood*, *storm*, and *earthquake* showed statistically significant (at 0.1 or 0.5 level) and positive impact on the onset of political instability in at least one of the control sets, but not the other two. The parameters on those variables are reported in Table 2.

TABLE 1 ABOUT HERE

TABLE 2 ABOUT HERE

Everything else being equal, the odds of political instability in year  $t+2$  are 1.51 higher for a country that suffered from one or more floods in year  $t$ , compared to a similarly situated country, which had no flood during the reference year. Storms increase the odds of state failure by a factor of 1.68, and earthquakes – by 2.38. It is important to reiterate, however, that these results appeared in only one of the three sets of randomly drawn “control cases”. The level of statistical significance for floods and storms is rather low ( $p < .1$ ), and the level of practical significance (the odds ratio) is the lowest among all predictors.

Floods, earthquakes, and storms belong to the category of rapid-onset natural disasters. Earlier research has shown that rapid-onset disasters, particularly, earthquakes, pose a higher overall risk to political instability compared to slow-onset disasters (Brancati 2007; Nel and Righarts 2008). To test for this possibility, I re-examined all models using the counts of rapid-onset disasters as one of the predictor variables, as well as the percentages of all people killed and affected by rapid onset-disasters in a given year and state. Both 2 year and 1 year lags were used for the rapid-onset disasters. Finally, considering the possibility that it is only high human impact disasters that increase a state’s propensity to political instability, I created additional variables – one

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measuring all natural disasters reaching a threshold of 1,000 deaths, and another one – for all natural disasters that affected 1,000 or more people. All these models were tested using both conditional logit and logistical regression. The parameters' estimates and odds ratios for models with rapid-onset disasters lagged by 2 and 1 years and high human impact disasters appear in Table 3.

#### TABLE 3 ABOUT HERE

Consistent with the earlier research, I find that rapid-onset disasters increase the risk of the onset of political instability. *Ceteris paribus*, the odds of political instability in year  $t$  in a country that experienced one or more rapid onset disasters 2 years prior are 1.49 higher compared to a similarly situated country, which had no rapid-onset disasters in year  $t$ . When one or more rapid onset disasters are lagged by 1 year, the odds of political instability occurring the following year are 1.55. These findings are statistically significant in one set of instability and control cases, but disappear in the other two as well as in logistical regressions. The odds of instability in the aftermath of rapid-onset disasters are somewhat higher compared a total sum of all natural disasters. Finally, the parameters' coefficients on the high human impact disasters are in the predicted direction but statistically insignificant suggesting that whether or not a natural disaster reaches a threshold of 1,000 deaths or people affected does not significantly affect a state's vulnerability to the onset of political instability.

Table 4 reports estimates of the parameters' coefficients and odds ratios from models performed on a subset of data on instability and control cases drawn from the African region. The results are largely consistent with the outcomes of analyses performed on the global dataset. The coefficients on the variables of *infant mortality*,

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“*bad neighborhood*” and *state-led discrimination* are in the predicted direction of impact and statistically significant across all tests and model specifications. The levels of statistical significance are somewhat smaller, whereas the confidence intervals for odds ratios are larger due to the smaller sample size. The odds ratios for political instability for African states with high levels of infant mortality and state-led discrimination are almost twice higher than for the states in the global dataset. The likelihood of the onset of political instability in African countries at the 75<sup>th</sup> percentile in global infant mortality is between 8.11 and 11.47 higher than in the African states at the 25<sup>th</sup> percentile. The odds ratios for political instability in African countries with high state-led discrimination is 4.59 – 4.9 higher than in the African states without such discrimination. Just like in the global dataset, full autocracies appear to be the most stable regimes in the subset of African countries, whereas full democracies and partial autocracies have highest propensity toward state failure. Partial democracies without factionalism are also less stable than full autocracies. Both states in transition and partial democracies with factionalism have insignificant coefficients due to the low frequencies of these types of political regime in the sample of African data. Although, all measures of natural disasters appear with the expected sign, their impact is insignificant in all model specifications and tests performed on the sets of African instability and control cases.

#### TABLE 4 ABOUT HERE

Evaluating the impact of disaster events within the model’s performance can serve as an additional test of robustness of the relationship between natural disasters and political conflict. I used the Wald test and Akaike’s information criterion (AIC) for evaluating whether the disaster variables contribute anything to improving the predictive

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accuracy of the models. The Wald test is a one of the methods of testing the significance of a predictor or a block of predictors in a statistical model. If the Wald test is significant, the parameter associated with a variable is not equal to zero and the variable should be kept in the model. If the Wald test is insignificant, this explanatory variable can be omitted from the model specification. I performed Wald tests on all of the models containing different measures of natural disasters. Due to space limitations, I report summative results of the Wald tests performed on the models, which parameters coefficients appear in Tables 1-4.

By adding one of the measures of natural disasters to the basic model with the four key explanatory variables,  $R^2$  for these models increases by a modicum ranging from 0.01 to 0.02. By comparison, the five variables that measure different types of regime jointly explain 31% of variance in the dependent variable, and by adding 3 more predictors – *infant mortality*, “*bad neighborhood*”, and *state-led discrimination*,  $R^2$  increases by 15%. However, all predictors - *total number of natural disasters*, *flood*, *storm*, *earthquake*, and *rapid-onset disasters* (with the exception of the *high human impact disasters* variable) - have moderately statistically significant Wald tests ( $p$  rangers from .016 to .095). This suggests that these variables can be kept in the models of political instability.

The AIC is used for comparing two or more alternative statistical models specified a priori. The model with the lowest AIC is considered to be the best model among all model specifications for the data at hand. Delta AIC is calculated as difference between the model with the higher AIC and the “best” model with the lowest AIC. It has been suggested that a Delta AIC less than 2 provides a strong support for an alternative

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(other than “best”) model. If the values of delta are between 3 and 7, then there is considerably less support for the model based on the data at hand, and delta values of 10 and above suggest that the model fits the data very poorly (Burnham and Anderson 2002). All models reported in Tables 1-4 have either strong or moderate support based on the data at hand (Delta ATC ranges from 0.78 in the model with *flood* as one of the predictors to 4.48 in the model with *rapid-onset disasters lagged by 1 year* on the right hand-side of the equation). The model with the measures of *storm* also provides good fit for the data (Delta AIC is 1.03).

### Discussion of Findings

In this study, I revisited an ongoing debate over the nature of the relationship between different types of natural disasters and conflict. Using conditional logic and logistic regression performed on three sets of instability and control cases in both global and regional datasets, I tested the impact of different measures of natural disasters on the onset of political instability. Of all types of natural disasters, only floods, storms, earthquakes, and the total sum of all natural disasters appeared statistically significant in one, but not the other two sets of instability and control cases. I also found that rapid-onset disasters posed a higher and more significant risk, but the disaster’s intensity seemed to make no difference for the chances of the onset of political instability. The majority of disaster variables showed no statistically significant effects in either global or regional dataset.

All other explanatory variables – *political regime*, “*bad neighborhood*”, *infant mortality*, and *state-led discrimination* – revealed much more consistent and statistically significant results in the predicted direction of impact across all model specifications,

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tests, and datasets. The instability risk posed by natural disasters is higher in states in transition, where political institutions are unstable or weak, and those political units with mixed and factionalized regimes. Full autocracies appear to be the least conflict prone regimes. Infant mortality that serves as a proxy for a range of economic conditions is an important background factor that determines a state's vulnerability to political instability that can also be triggered by the high level of state-led discrimination and conflicts in 4 or more bordering states.

According to the "goodness-of-fit" tests, only those disaster variables that were statistically significant at 0.1 or 0.05 levels added to the explanatory power of the models. In all other tests, models containing the key independent variables performed equally well, if not better, as those models that contained the disaster variables.

What these findings suggest is that, consistent with the study's expectations, it is the pre-existing country-specific conditions, including the resilience of a state's political and economic institutions to crisis, that account for most, if not all variance in the dependent variable. When those background conditions are controlled for, the effect of natural disasters lessens or disappears suggesting that natural disasters can trigger political instability in only those states, which already exhibit the attributes of the conflict-prone societies.

The findings of this study encourage further investigation of the background conditions of the societies affected by natural disasters, particularly, characteristics of their governing regimes. It may be worthwhile to shift the focus of attention from efforts at demonstrating significant direct impact of natural disasters on conflict to investigation of complex interactions between natural disasters and various formal and informal



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features of political institutions. The researchers should not overlook other possible political consequences of natural disasters, such as low intensity violence and even different kinds of criminal behavior. It is also advisable to expand the scope of analysis beyond investigation of the onsets of political violence to include assessment of the impact of natural disasters on ongoing conflicts. Finally, secondary political effects of natural disasters, such as the emergence of new political parties, alliances, impact on the outcome of elections, changes in institutional features and leadership, and alike also constitute a fruitful avenue for future research in this field.

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