Abstract

This study seeks to examine the effects of natural disasters on terrorism.

Exogenous natural disaster shocks - such as earthquakes and landslides - can affect a government’s capacity to suppress existing terrorism. Exogenous natural disaster shocks can also foment newfound grievances against a government.

Empirical scrutiny of monthly data on the occurrence of natural disasters and terrorism suggests that exogenous natural disaster shocks precipitate terrorist attacks. If terrorism were present in the year prior to a given attack, the driving mechanism for that attack tends to be opportunity-based; if terrorism were absent in the year prior to a given attack, the driving mechanism for that attack tends to be grievance-based.

Further analysis reveals that endogenous natural disasters - namely, famines - increase terrorism when considered alone, but reduce terrorism when they cause fatalities. This effect is more pronounced in the long-term than in the short-term.

Finally, in a democratic regime, the occurrence of exogenous natural disaster shocks alone tends to have little to no effect on terrorism, whereas disaster-induced fatalities increase levels of terrorism. In an autocratic regime, conversely, the occurrence of exogenous natural disaster shocks alone increases terrorism, but fatalities attributed to these shocks lower the incidence of terrorist attacks.

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I. INTRODUCTION

“In 2004, the Idara Khidmat-e-Khalq (IKK), a charitable front of Lashkar-e-Tayyiba (LeT), sent members to the Maldives under a humanitarian mission to aid tsunami victims [...] It was not long after the tsunami that the Maldives suffered its first recorded transnational terrorist attack when a bomb exploded in a recreational park killing two Britons, eight Chinese, and two Japanese citizens.”¹

The Earth’s natural processes have borne a noteworthy effect upon people around the globe since the inception of mankind. Largely out of the realm of human control, the world has witnessed the manifold effects that periods of climate variability, physical geography, and mother nature can cast upon a population. On more unfortunate occasions, these natural effects can prove catastrophic, at which point the effect in question generally comes to be categorized as a natural disaster.

The Emergency Events Database (EM-DAT), International Disaster Database broadly defines the term “disaster” as an “[u]nforeseen and often sudden event that causes great damage, destruction and human suffering.”² For the purposes of this research study, I precede the term with “natural”, thereby restricting its domain to such events that are a

² EM-DAT International Disaster Database, under “Glossary”.
direct result of naturally-occurring, earthly processes - to which EM-DAT attributes roughly 63 percent of its documented disaster events altogether.³

While certain areas of the globe may be more prone to certain types of natural disasters than others by virtue of climate, location, and physical geography, natural disasters are a terrestrial phenomenon to which no region or nation of the world is immune; the risk factors are simply too ubiquitous, and mother nature too fierce. From hurricanes in the Caribbean to volcanic eruptions in Hawaii, and from earthquakes in Japan to landslides in Italy, each and every corner of the planet has been, is, and will continue to be plagued by such disasters, of which the aforementioned constitute but a fraction. In fact, as hinted at above, different countries’ and global regions’ unremitting battle(s) against the forces of mother nature are only disparate from one another inasmuch as the form and frequency of natural disasters vary by region.

As a means to visualize this, I include the “Topics Geo - World Map of the 50 Major Loss Events 2016”, which depicts the type(s) of natural disaster(s) most prevalent in a given part of the world in the year 2016. The map data reflects 1,060 natural disaster observations within the year, categorized into four disaster types: a red circle denotes a geophysical disaster, a green circle denotes a meteorological disaster, a blue circle denotes a hydrological disaster, and a yellow dot denotes a climatological disaster. Larger circles represent specific natural disasters recorded by Topics Geo as being among the “50 major loss events” of 2016 in terms of monetary loss and loss of human life.

³ Ibid.
Below is this map:\footnote{Image Source: “Topics Geo”, Munich RE, 2017 - p. 77.}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{World Map of the Fifty (50) Most Fatal Natural Disasters in 2016}
\end{figure}

The notion of terrorism, a term whose origin dates back to the late 18th century Reign of Terror during the French Revolution, is one that gradually trickled its way into the international limelight beginning in the early 1970s following a series of intercontinental
airplane hijackings, along with several hundreds of bombings and attacks involving explosives.\textsuperscript{5} Though the frequency/number of terrorist attacks dipped by several hundredfolds in the wake of this early 1970s onslaught,\textsuperscript{6} they most certainly portended what would be a decades-long struggle for international security and for survival that has spanned up to the present day.

Terrorism rose to an entirely new tier of significance in the aftermath of the September 11, 2001 attacks on the United States of America, a day that many pundits and civilians alike would argue left an indelible mark that would redefine the world’s general understanding of terrorism as an ideological and political phenomenon. Indeed, it marked the beginning of a protracted era of hypervigilance, especially on the part of the United States, towards radicalization, homegrown terrorist sympathizers, and, perhaps most of all, state-sponsored terrorism. All of these factors incited a Global War on Terrorism directed primarily, but not exclusively, towards radical Islamic terrorist networks, in which a plethora of international actors, including NATO and United Nations members, took part. Though, at the time this paper is being written, international terrorism seems to be fairly at bay, counterterrorism forces of the nations and international organizations involved have not let their guard down.

In reality, there is no formal or universally accepted definition for what “terrorism” truly is; the term remains very subjective. Oftentimes, the boundary between “terrorism” and

\textsuperscript{6} Ibid - pp. 1-2.
“freedom fighting” - which is already quite fine in and of itself - is obfuscated by disparate vantage points and opposing sympathies towards a cause in question. One of the most prototypical cases in point in the contemporary international arena is seen in the protracted Israeli-Palestinian conflict, over the radical Islamic fundamentalist organization Hamas. Viewed by the State of Israel and its Western allies as a terrorist organization, Palestinians and their sympathizers view Hamas as a heroic network of freedom fighters and martyrs declaring a Jihad, or holy war, on behalf of the liberation of Palestinian lands and citizens that Hamas views as having been unfairly stripped and occupied up to the present day by Israel. In fact, those sympathetic to the Palestinian cause widely view the Israel Defense Forces as an organization employing terroristic methods and tactics against the Palestinian people and territories. Regardless of one’s point-of-view towards any dispute or conflict involving alleged terror, what is known is that the concept of violence tends to be the largest point of controversy around terrorism.

With this in mind, it should serve as no surprise that the National Consortium for the Study of Terrorism and Responses to Terrorism (START), Global Terrorism Database interprets “terrorism” as “[t]he threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation.” As START’s definition suggests, terrorist violence may be directed towards a state and/or a national government, general populace, social

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8 Ibid
10 START Global Terrorism Database, under “Defining Terrorism”.
movement/organization, and so forth. Terrorist attacks are carried out in a number of ways and using a multitude of weapons of choice which vary depending upon the nature of the attack in question and what its stated or implied objective is.

Contemporary (2021) global terrorism threats are depicted in the NASA satellite map image below. Areas highlighted in red denote areas of the world that are currently at the highest perceived risk for terrorism. Areas highlighted in orange or yellow indicate a moderate threat for terrorism. Areas highlighted in green generally denote peripheral areas to where a threat may be most pronounced, and thus where at least some minimal caution is advised. Unmarked areas suggest that no foreseeable threat can be detected.\footnote{Image Source: The Risk Advisory Group, \textit{Terrorism Tracker}, NASA via Google Maps, 2021.}
That natural disasters and terrorism should consistently rank among the most pressing menaces to the international community is surely common knowledge to any layman. When considered in their most severe forms, there genuinely is no limit as to the destructive power of either event. All too often, in the context of a natural disaster, pandemonium is expected by many to terminate once the actual disaster - i.e., the weather event itself - strikes, passes, and ultimately, ends. With the exception of inevitable clean-up, power restoration, and rebuilding efforts in the days and weeks to follow, and perhaps a subsequent wave of panic buying, necessity shortage, and intermittent lootings, the worst generally seems to be behind the affected area and population. Casualties are tallied up, individuals return to their homes or are re-routed to a temporary place of refuge, and a return to normalcy - insofar as possible - is the expectation.

Unfortunately, the natural disaster, per se, is oftentimes only an augury of a long and treacherous stretch of problems to follow. This is where terrorism comes into play. In the midst of the post-disaster chaos, terrorists see a window of opportunity in which a preoccupied, and perhaps, incapacitated, government and population lack any substantial repressive capacity. As such, terrorists have a tendency to exploit this window of opportunity as a medium through which to vent their grievances towards the state. Furthermore, a government’s management, or lack thereof, of the adverse after-effects of a disaster has the potential to stir up new, and potentially more incendiary, grievances down the road. It should thus serve as no surprise whatsoever that the interaction between natural disasters and terrorism has the potential to inflict unprecedented levels of peril and catastrophic damage upon a nation and its citizens.
In this thesis, my postulations are threefold. First, I argue that the occurrence of exogenous natural disaster shocks increases the incidence of terrorism in both the short and long-term. Second, I posit that the occurrence of endogenous natural disasters (i.e., famines) decreases the incidence of terrorism in both the short and long-term, though more so in the latter than in the former. Third, I claim that autocracies are far more likely to experience post-disaster terrorism (in both the short and long-term) than are democracies. My logic of reasoning for each of my arguments is addressed at length in sections III and IV.

My findings show that exogenous natural disaster shocks do, indeed, increase terrorism on all timescales. Exogenous natural disasters can hamper a government’s ability to contain terrorism, creating exploitable opportunities for terrorist attacks. Exogenous natural disasters can also create grievances against a government. The mechanisms through which disaster-induced terrorism evolves - opportunity or grievance - are a question of whether or not there were pre-existing terrorist organizations in the prior year. If terrorist networks were present in the prior year, the disaster-induced terrorism is likely to be opportunity-based; if terrorist networks were absent in the prior year, the disaster-induced terrorism is likely to be grievance-based.

Next, my findings show that endogenous natural disasters (famines) increase terrorism in and of themselves, but decrease terrorism when they result in the demise of citizens; this effect is more pronounced in the long-term than in the short-term.

Finally, my findings indicate that autocracies experience increased levels of terrorism as a result of exogenous natural disasters alone, but decreased levels of terrorism as a result of
disaster-related deaths. Democracies, on the other hand, experience no effect upon, or decreased, terrorism as a result of exogenous natural shocks alone, but increased levels of terrorism as a result of disaster-related mortalities.
II. **LITERATURE REVIEW**

*(I) NATURAL DISASTERS & CIVIL CONFLICT / TERRORISM*

While an extensive strand of academic research literature exists on the relationship between natural disasters and civil conflict/war, that on the relationship between natural disasters and isolated terrorist activity/attacks is notably more scarce. With this being said, given the intertwined nature of the definitions of violent civil conflict and terrorism, I will consider both of these literature strands as being, thematically, one and the same. I will, nonetheless - for the purposes of this project - apply the most weight to the literature that explicitly addresses terrorism as opposed to civil conflict/war. I might add that, of the three strands of literature that I will discuss in this thematic literature review, my analysis of this first strand will be disproportionately extensive relative to the following two. This is the result of having been able to garner a greater volume of bibliographic material on this first theme compared to the two that follow. It is, in no way, meant to undermine the importance of the latter two themes; all three themes contributed equally to the success of my research.

The overarching theme in this first section of the bibliography is that natural disasters tend to significantly increase the risk of violent civil conflict and terrorist activity.\(^{12}\) In a 2011 research paper entitled “Earthquakes, Hurricanes, and Terrorism: Do Natural Disasters Incite Terror?”, Claude Berrebi and Jordan Ostwald of The Hebrew University

\(^{12}\) Berrebi & Ostwald 2011; Berrebi & Ostwald 2012; Eastin 2017; Montalvo & Querol 2018; Nel & Righarts 2008.
of Jerusalem and the United States Air Force, respectively, offer some explanation as to why this is so. They note that “[n]atural disasters can strain a society and its government” and that “[t]he turmoil after a catastrophe creates or exacerbates vulnerabilities within a state which terrorist groups might exploit.” One vulnerability is the fact that a government may be preoccupied with remediating the deleterious effects that a given natural shock inflicts upon its nation and citizens. In certain cases, another vulnerability is the fact that the sheer magnitude of the disaster in question is great enough to incapacitate a government’s function altogether by virtue of mass destruction of the nation’s capital territory where government headquarters are located. Both of these situations can significantly compromise a government’s police and military capacity to defend itself against terrorist threats, which, in effect, “soften” what were previously “hard” government targets\textsuperscript{14} - an opportunity of which pre-existing terrorist networks will take advantage to launch an attack in the immediate aftermath of a natural shock.

“As a government’s resources are directed toward disaster recovery, those resources must be re-directed from some other purpose. In particular, a government’s ability to provide security and maintain control in disaster-afflicted areas can suffer significantly in an event’s aftermath [...] a government’s diminished security capacity amounts to a reduction in the potential costs of participating in terrorism. The loss of government security and control in a disaster-afflicted area may also incentivize terrorist action by reducing the costs


\textsuperscript{14} Ibid - p. 385.
associated with attacking specific targets. Terrorists' preferences for "soft" targets are well-documented. Diminished targeting costs for some previously "hard" targets could, in turn, increase terrorist action."15

In a scholarly article published one year later in 2012, Berrebi and Ostwald reinforce their claim that natural disasters have a positive effect on terrorism.16 In this latter study, however, the scholars incorporate another dimension into their analysis. Rather than simply scrutinizing a direct relationship between natural shocks and terrorist activity, they “[…] explore the differences between transnational and domestic terrorism […] to estimate the effect of exogenous catastrophic shocks on a country’s level of domestic and transnational terrorism […]”17 in so doing incorporating a time-scale element that varies contingent upon whether a terrorist attack is perpetrated by a transnational aggressor or a domestic aggressor. What they determine is that their findings not only “[…] show statistically significant, positive effects of natural disasters on both domestic and transnational terrorism,”18 but that a more profound “[a]nalysis of the target type indicated that […] attacks against the government appeared to manifest differently between domestic and transnational terrorism […]”19 Namely:

“Grievances against a state’s response to a disaster [takes] time to build as the adequacies and inadequacies of the government’s relief efforts are realized; thus, domestic attacks against a regime [foment] over time rather than occur

17 Ibid - p. 793.
19 Ibid
immediately after the disaster. Alternatively, transnational groups may want to act quickly to exploit the chaos surrounding a disaster, as they perceive a disaster as an opportunity to attack a distracted regime and then transition to other less fortified targets afterwards.”

These findings lend themselves to the fact that the effects of natural disaster shocks on the incidence of terrorism are twofold, in terms of temporality; one is short-term - “the perception of an exploitable weakness [by a transnational terrorist organization]” within a time-sensitive “[…] window of opportunity […]” whereas another is long-term - “[d]omestic terrorist activity against a government […] grow[ing] with time […] and […] stirring as a result of pent up domestic frustration related to a government disaster response [or lack thereof].” It should be noted that this twofold discrepancy is only applicable, per the findings of Berrebi and Ostwald, to terrorist attacks directed towards a government and/or a government target. As far as private targets are concerned, these tend to be “soft” targets irrespective of a disaster striking, and thus the temporal effects tend to be comparable between transnational and domestic terrorism. Though I do not specifically make the distinction between transnational and domestic terrorism in my research, this temporal disparity between transnational terrorist attacks and domestic terrorist attacks aligns quite closely with my theoretical intuitions of the timescales attached to opportunistic versus grievance-based terrorism, a notion upon which I shall elaborate in the section to follow.

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20 Ibid
21 Ibid - pp. 795, 808.
22 Ibid - p. 808.
23 Ibid
In their 2008 *International Studies Quarterly* piece titled “Natural Disasters and the Risk of Violent Civil Conflict,” Philip Nel and Marjolein Righarts report results consistent with the widespread pattern of a direct relationship between natural disasters and violent civil conflict.\(^{24}\) Unlike Berrebi and Ostwald’s studies, however, Nel and Righarts hone in on a much broader phenomenon of (violent) civil conflict as their dependent variable, as opposed to terrorism in and of itself. They conclude that the positive effects of disaster shocks on violent civil conflict are most significant “[…] in the short and medium term […],” and that countries most at risk for experiencing violent civil conflict tend to be “[…] low-and middle-income countries that have intermediate to high levels of inequality, mixed political regimes, and sluggish economic growth.”\(^{25}\) They also observe that “[…] rapid-onset disasters related to geology [… i.e., …] earthquakes and volcanic eruptions pose the highest risk [of violent civil conflict, with] climate-related disasters also significantly increas[ing] the risk […].”\(^{26}\) Finally, they make a noteworthy point of the way in which violent civil conflict is inspired by motives and opportunities; “[m]otive is affected through heightened grievances brought about by increased poverty, inequality, displacement and marginalization,” and the “[…] weakening of the state may also provide opportunity for groups with pre-established motives unrelated to the actual disaster to partake in conflict.”\(^{27}\) Both motive/grievance and opportunity are points of which Berrebi and Ostwald also make mention, and are concepts upon which much of my theoretical framework is predicated.


\(^{25}\) Ibid - p. 159.

\(^{26}\) Ibid - pp. 159, 162.

\(^{27}\) Ibid - p. 165.
José Montalvo and Marta Reynal-Querol of the Barcelona Graduate School of Economics study the effects of natural disasters on terrorism, as do Berrebi and Ostwald; however, Montalvo and Querol focus exclusively on the effect of earthquakes. Their empirical results suggest that the “[…] likelihood of terrorist events increases with the previous occurrence of an earthquake.” They cite (negative) economic shocks and compromised physical infrastructure as some of the most remarkable factors setting the stage for terrorism. As they state, “[a] negative economic shock reduces [state capacity to collect tax revenues] and, therefore, the ability of the government to repress terrorist actions.” With this being the case, a negative economic shock creates a window of opportunity that a pre-existing terrorist organization would certainly not pass up. As for damaged physical infrastructure, “[…] a shock that affects the ability of infrastructures to fulfill their functions may […] make it more difficult to catch […] terrorists.” The damage to a nation’s infrastructure, vital in facilitating the mobility of the nation’s armed forces and police, renders it incredibly difficult for the nation in question to quell a terrorist insurgency.

Joshua Eastin offers the last word on the natural disaster vs. civil conflict theme. While he acknowledges the common findings in the literature that natural disasters/climate change positively affect civil conflict, Eastin turns most of his focus towards the way in

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29 Ibid - p. 20.
30 Ibid - p. 5.
31 Ibid - p. 5.
which the “[…] impacts of [natural disaster] events can shape the tenure of conflicts already underway.” He concludes that a “[…] key impact of natural disasters [tends] to be longer and more intractable civil wars[.]” with many of the reasons being due to “[…] infrastructure-wrecking rapid-onset events […] that […] decrease the state’s [and military’s] capacity to [project power and] suppress conflict while enhancing the ability of insurgent groups to avoid losses and escape defeat.” He notes that the unmitigated expenses of a disaster prove particularly problematic as “[t]he need to provide relief and reconstruction assistance requires governments to increase expenditures at the same time tax revenues decline due to lost productivity[,]” the result being that “[…] states embroiled in civil conflict [have] fewer funds available for counterinsurgency […]” Finally, he notes that in the aftermath of a natural disaster, “[…] soldiers can be redeployed away from the conflict zone to provide humanitarian assistance and support recovery operations […] which] reduces military pressure on insurgents[,]” thereby giving them an excellent window of opportunity to exploit. Indeed, this seems to be a recurring theme in this strand of the literature.

**II) POLITICAL REGIME, NATURAL DISASTERS, & CIVIL CONFLICT / TERRORISM**

The second strand of the bibliography treats the effects of regime type on a state’s predisposition to civil conflict and/or terrorist violence in the context of a natural disaster.

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33 Ibid
34 Ibid - p. 2.
36 Ibid
37 Ibid
The prevailing trends in this second section of the literature establish that, following a disaster event, (1) democracies/large coalitions are generally much less susceptible to political violence and terrorism than are autocracies/small coalitions, and (2) the natural disaster fatality rate within an autocracy/small coalition runs remarkably higher than that within a democracy/large coalition. Much of the logic behind why these themes hold true finds itself in the most basic premise of selectorate theory: once in power, the paramount objective of a leader is to retain office and to remain in power.

To this end, logic would only dictate what Alejandro Quiroz and Alastair Smith of New York University’s findings suggest in their 2012 paper; since in a large coalition political regime - i.e., a democracy - “[…] leaders require mass support to stay in office […] democratic leaders make more effort than autocrats to prepare for and ameliorate the effects of natural disasters.” In other words, a democratic administration will be relatively quick to implement preventative measures in order to attenuate a disaster’s adverse effects, as well as be at its citizenry’s disposal in terms of furnishing post-disaster relief, both of which minimize disaster-affiliated mortality. This preemptive and palliative assistance with which a democracy furnishes its citizens, which brings increased survival rates, will contribute to the citizens’ level of content and satisfaction with the government. This gives citizens a marginal motive, if any, to terrorize their government out of anger.

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38 Quiroz & Smith 2010; Quiroz & Smith 2012.
In a small coalition political regime - i.e., an autocracy - the circumstances are flipped; “[…] the incentive for leaders to protect [their] citizens from disasters is much less than in large coalition systems[,]”\(^{41}\) since “[p]reparing for disasters and providing assistance in their aftermath consumes resources […] which would […] more effectively enhance [an autocrat’s] survival […] if they were to be retained […] to buy the loyalty of their small coalition of supporters.”\(^{42}\) In other words, autocrats thrive off of re-allocating state funds and resources towards themselves and their cronies’ welfare as opposed to any form of humanitarianism, disaster prevention, and/or disaster relief amongst the populace; this, in turn, increases disaster-related fatalities. The autocracy’s lack of preparedness for a disaster and unresponsiveness to the impact of a disaster inevitably stirs up animosity amongst the populace, leading them to resort to terrorism as a channel through which to exhaust their grievances against the small coalition leader. Ironically, this hostility-driven terrorism can end up posing an even greater threat to the autocrat’s survival than had he not exclusively “[…] focus[ed] on the welfare of the essential few in [his] coalition […]”\(^{43}\) in the first place.

In their 2010 piece entitled “Disaster Politics”, Quiroz and Smith recapitulate this theme quite well: “[u]nless politicians are beholden to the people [which, in the case of a democracy, they are], they have little motivation to spend resources to protect their citizens from Mother Nature, especially when these resources could otherwise be earmarked for themselves and their small cadre of supporters [which holds

\(^{41}\) Ibid - p. 23.  
\(^{42}\) Ibid  
\(^{43}\) Ibid
true in the case of an autocracy].”

In a democracy, where leaders are “behinden to the people,” the government’s humanitarian efforts related to the disaster will minimize fatalities, damage, and, therefore, grievance-based terrorism. In an autocracy, conversely, where leaders have “little motivation to spend resources to protect their citizens from Mother Nature” and in fact benefit from not doing so, the government’s apathy towards its citizens’ well-being results in more damage, more deaths, and, in turn, a more incensed and terrorism-driven citizenry.

The domain of literature on endogenous natural disasters - specifically, famines - and their implications within the breadth of regime type and civil conflict/terrorism is more scarce than that on exogenous natural shocks. However, it is worth mentioning a commonplace trend regarding famines of which scholars have taken note over the years: famines are “human-made emergencies” that happen “[…] only with some degree of human complicity.” In other words, it is widely understood within the field of international relations that famines are no accident; national governments (or, in certain cases, non-state actors) foist famines upon the citizenry in pursuit of an ulterior motive, which is most commonly tied to some technique of personal political survival. With this taken into account, it stands very much to reason that Amartya Sen would make such a famously bold thesis that “[…] no famine has ever taken place in the history of the world in a functioning democracy […].” As Sen asserts himself, “[a]uthoritarian rulers, who are themselves rarely affected by famines […] tend to lack the incentive to take timely

44 Alejandro Quiroz Flores & Alastair Smith, “Disaster Politics,” 2010 - p. 3.
46 Amartya Kumar Sen, Development as Freedom, 1999 - p. 16.
preventive measures [against famines]. Democratic governments, in contrast, have to win elections and face public criticism, and have strong incentives to undertake measures to avert famines and other such catastrophes.”

Sen’s line of argument is buttressed by the findings in a latter study by Joe Hasell and Max Roser of the Oxford Martin School at the University of Oxford, published in 2013.

(III) Root Causes of Terrorism

The third and final strand of the bibliography I have gathered addresses the root causes of terrorism. The literature on this topic reveals that, while the factors that contribute to the incidence of terrorism are aplenty, those that consistently fall at the top of the list are poverty, inequality, civilian dissatisfaction/discontent, and undemocratic regimes.

In the words of Murat Bilhan in his 2002 academic piece “The Causes of Terrorism and Ways to Eradicate Them,” “[…] poverty and inequality are the main causes [of terrorism … and it] is common logic that poverty, poor education, unemployment and consequent phenomena such as famine, poor sanitation, malnutrition, epidemic diseases, high delinquency rates and so on are fertile grounds for terrorists to emerge.” He adds that terrorist recruitment is further facilitated by “[…] hopeless and helpless youth[…].” and later takes note as well of the role that religious fundamentalism, ideology, ethnicity, racial intolerance, and fanaticism often play in fanning the flames of hatred-based

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51 Ibid
terrorism. Lastly, he notes that “[…] more democracy is needed to allow the people to express themselves freely, not violently, and thus to avoid any excuses for terrorism.”

James Forest cites the root causes of terrorism as stemming from a perception that one is undervalued or underserved, often by corrupt governments who are apathetic to the quality of life of its citizenry. These terrorist networks, Forest claims, “[…] seek power to change the status quo, to forge a future that they do not believe will come about naturally, and are thus determined to use terrorism to achieve their objectives.” He further attributes terrorism to “[…] unequal distribution of power […], political repression […], and [… resource] scarcity[.]”

Edward Newman of the University of Leeds undertakes a unique research methodology by which to identify and analyze the “root causes” of terrorism. He separates the independent variables - i.e., the “root causes” of terrorism - into two categories: (1) permissive conditions, which are the independent variables that seem to indirectly set the stage for terrorism, and (2) direct conditions, which are the independent variables that more directly and immediately enable terrorism. He lists the so-called “permissive conditions” as poverty, urbanization, urban migration, population growth, burgeoning young age structure, population density, unemployment, and social change. He lists the latter “direct conditions” as inequality, exclusion, repression, dispossession, humiliation,

52 Ibid - p. 31.
54 Ibid - p. 4.
55 Ibid - pp. 3-4, 7.
alienation, foreign occupation/hegemony, identity clashes, violent conflict, negative effects of globalization, and sudden economic downturns.\textsuperscript{57} Many of these variables exhibit overlap with the aforementioned literature to the extent that they are the grassroots of contemporary terrorist activity, and I employ several of them in my econometric model specification found in a subsequent section.

As James Forest quite accurately states in his concluding remarks, “[…] dissatisfaction with the conditions of the present, combined with an inability (or perceived inability) to shape a future more to their liking, contributes to the formation of groups who seek violence as a means for gaining the power necessary to achieve their objectives.”\textsuperscript{58}

\textsuperscript{57} Ibid - p. 764.

III. THEORETICAL INTUITIONS & FRAMEWORK

(I) From a theoretical perspective, the majority of my core ideas regarding exogenous natural disaster shocks, along with the assumptions they carry and the logic behind them, are encapsulated by the following graphic:

Figure 3: Theoretical Mechanisms by which Exogenous Natural Disaster Shocks Spawn Terrorism
The incidence of exogenous natural disaster shocks in a given nation engenders both imminent opportunities for terrorist activity (left) as well as a breeding ground for grievances to foment over time (right). Both yield separate mechanisms, or pathways, through which terrorism evolves. My theoretical framework postulates that disaster-driven terrorism arising from opportunity will occur in the immediate to short-term following the natural disaster in question; I define “short-term” as (terrorist attacks) occurring within a matter of weeks to six (6) months following a given natural disaster. Conversely, my theory posits that disaster-driven terrorism arising from newfound grievance will occur in the long(er)-term following the natural disaster in question; I define “long-term” as (terrorist attacks) occurring between seven (7) to twelve (12) months following a given natural disaster.

I theorize that pre-existing terrorist organizations and/or insurgent groups (i.e., those that were in place prior to a natural disaster striking) presumably have/had pre-existing grievances against their government, unrelated to the natural disaster that just took place. In fact, I should note that, in the case of opportunity-based terrorism, such pre-existing grievances are a necessary (though not sufficient) condition for terrorist violence; a window of opportunity absent pre-existing grievances would, logically, breed no terrorism, since without grievances (e.g., against a national government) there is nothing for which to fight. Consequently, these pre-existing terrorist organizations will exploit the immediate opportunity to attack their government that has been rendered incapacitated, distracted, or otherwise out of commission by the effects of a natural disaster. In other words, when a natural disaster strikes and weakens the government’s police and military
capacity to defend itself against terrorist threats, thereby temporarily “softening” what were previously “hard” government targets, I argue that the pre-existing terrorist networks will take advantage of the fact that their government is in a compromised state to launch an attack without delay. Such was the case following the cataclysmic floods in Pakistan in the summer of 2010; just two months after the inundations, a Taliban suicide bomber “[…] rammed an explosives-laden truck into a police station […]”\(^{59}\) in the Khyber Pakhtunkhwa province, slaying 19 persons of whom 11 were police officers.\(^{60}\)

Five months following the onset of the floods, the terror extended to intergovernmental organizations when a Taliban-affiliated female suicide bomber wearing a burqa detonated a bomb - and, thus, herself - in a United Nations-sponsored food rationing line in the Bajaur tribal region along the Pakistani-Afghani border; this attack left nearly 50 dead and about 100 more wounded.\(^{61}\) I reiterate that this line of theoretical intuition is illustrated succinctly in the model proposed above, in correspondence with the left side of the diagram.

On the other hand, I theorize that, independent of whether or not pre-existing terrorist and/or insurgent networks are present, inadequate government response to a natural disaster will incense a citizenry and foment new grievances (or exacerbate existing grievances) against the government over time. I postulate that this will lead to the dawn of new terrorist or rebel networks down the road, on the basis of shared grievances. More specifically, looking in the long-term, a natural disaster can hamper a given government’s

\(^{59}\) S.S. Hasan, “Pakistan Suicide Bomb on Police, Children Among Dead,” 2010.
\(^{60}\) Ibid
\(^{61}\) AsiaNews, “Female Suicide Bomber Stops UN Aid to Pakistan Flood Victims,” 2010.
capacity to act and provide relief, recovery, and aid to its citizens, which will lead to a buildup of grievances over time. I argue that what logically follows is the formation of new terrorist groups in the several months to follow the disaster. This is to say, people’s grievances towards a government’s response - or lack thereof - to the adverse aftereffects of a natural disaster will manifest themselves in the form of political violence and terroristic methods. Once again, I argue that this mechanism of terrorist organization formation is, naturally, far more likely to bud in the long-run. This is due to the fact that grievances require time to develop as a function of a government’s disaster response, as opposed to ones that already existed pre-disaster as explained in the preceding paragraph. This line of reasoning is illustrated on the right side of my model as shown above.

(II) My next line of theory moves away from the generic channels of terrorism that my standard model proposes, in so doing seeking to point out what I theorize will be a stark contrast between the impact of an exogenous natural shock on terrorism - as described in the previous three paragraphs - and the impact of an endogenous natural disaster (famine) on terrorism - which I put forth in this paragraph. I posit that, contrary to the aforementioned theoretical propositions included in the graphic, the incidence of endogenous natural disasters - i.e., types of disasters that a government willfully, deliberately, and systematically inflicts upon its population - will lead directly to a noticeable decrease in the possibility of terrorist activity in the short-term, and, even more so, in the long-term. The simple logic behind this assumption is that government-induced disasters - in my project, famines - naturally incapacitate a nation’s citizenry, and not its government, to a point of starvation and mass suffering which
progressively worsens over time. A classic example of such a government-induced famine was seen in the 1983-1985 Ethiopian Famine, when then-dictator Mengistu Haile Mariam’s military regime strategically deprived the masses of nourishment as a counterinsurgency strategy against the Tigrayan People’s Liberation Front - Ethiopian People’s Revolutionary Democratic Front (*inter alia*).\(^{62}\) While originally ascribed to an exogenous natural disaster - i.e., drought - it was determined upon further investigation that Mengistu willfully executed a campaign of mass starvation that was more hastened, protracted, and pronounced “[…] than would otherwise have been the case […]”\(^{63}\) had the famine not been brought about endogenously in the interest of Mengistu’s personal political survival.\(^{64}\) In the short-run, people may be able to make do with a less than ideal food supply; however, being in a state of extreme scarcity of food over a longer period of time, citizens (including those in pre-existing terrorist networks) will eventually become too famished and too lethargic to even begin contemplating launching an attack against their government, let alone to have the energy or the wherewithal to unite in lamentation over common grievances and undertake a calculated procedure of developing a terrorist group or insurgency over time. Furthermore, once a famine reaches a certain level of severity, the population that the famine targets will inevitably perish; needless to say, once deceased, the capacity of a population to terrorize its government over any timeframe is non-existent.

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\(^{63}\) Ibid - p. 5.

\(^{64}\) Ibid - pp. 4-5.
(III) Lastly, as far as regime type ties into my theoretical framework, I put forth a theory consistent with the theory and findings of Quiroz and Smith in the thematic literature review: leaders, regardless of regime type, are resolute about remaining in power as long as viable. A democratic ruler, reliant on the support and votes of constituents to secure the continuity of his/her tenure, will accordingly be at the constituents’ beck and call in terms of their needs and wants regarding natural disaster effect prevention and relief aid. Such a response will content these constituents, who will harbor little to no indignation towards the leader/administration, and will be inclined to re-elect the leader in question on account of respect and trust. An authoritarian ruler, on the other hand, has little to no incentive to allocate any sector of the national budget towards natural disaster-related humanitarian causes. In fact, as an authoritarian leader is far more indebted to his/her small corps of political patrons than to the masses, to do so would be a politically disfavorable move to the extent that office retention is concerned. However, this authoritarian strategy is a double-edged sword; with no relief aid to the masses comes a great deal of displeasure on their part, leading to ire, grievances, and terrorism, the associated violence of which alone menaces the political longevity of an authoritarian regime.
IV.  **HYPOTHESES**

My hypotheses serve as a means by which to bridge the gap between my theoretical notions and my empirical evidence. The hypotheses that I propose are conjectures based on information I have gleaned from both the literature and the logic within my own theoretical framework, both of which were tackled in the previous sections. They, along with their rationale(s), are explained in this section.

As stated in the previous section, the primary natural disaster foci in this research paper are (1) exogenous natural disasters - i.e., a natural shock developing from and/or related to external factors and that is out of a nation’s realm of control - and (2) endogenous natural disasters - i.e., a natural disaster developing from and/or related to internal factors within a nation’s realm of control. Following EM-DAT’s model, I subcategorize exogenous natural disasters into four forms of shocks: (1) geophysical - a hazard originating from solid earth, (2) meteorological, a hazard caused by extreme weather and atmospheric conditions, (3) hydrological - a hazard originating from the movement and distribution of water, and (4) climatological - a hazard attributed to atmospheric processes resulting from climate variability. On the other hand, I subcategorize endogenous natural disasters into one specific form of disaster - famines - which, though technically classified by EM-DAT as a form of natural disaster, are more often than not internal in origin, and catalyzed by a national government upon its population in the pursuit of some form of political aim.
My first hypothesis seeks to determine the relationship - if any - between exogenous natural disaster shocks and terrorism. Based on my literature, theory, and intuitions, I hypothesize that:

\( H_1 \) : The occurrence of an exogenous natural disaster shock in a given nation will increase the incidence of subsequent terrorism within that nation in both the short and long-term.

It is my educated assumption that exogenous (i.e., geophysical, meteorological, hydrological, and climatological) natural disaster shocks within a country will give way to terrorism - both in the near and distant aftermath - within that country. A national government has, presumably, very negligible to no control over an exogenous natural disaster, as the term “exogenous” suggests. In fact, in the case of certain types of exogenous natural shocks - for sake of example, an earthquake - a government’s knowledge of when one is impending is oftentimes very limited. These circumstances pave the way for opportunistic terrorists to “strike [government targets] while the iron is hot”, and for aggrieved nationals to “become” terrorists over time.

My second hypothesis seeks to determine the relationship - if any - between endogenous natural disasters and terrorism. As famines are the sole type of endogenous natural disaster that I identify, the terms “famine” and “endogenous natural disaster” can be used interchangeably within this study. Based on my literature, theory, and intuitions, I hypothesize that:
**H₂**: The occurrence of an endogenous natural disaster (famine) in a given nation will decrease the incidence of subsequent terrorism within that nation in the short-term and, to an even greater extent, in the long-term.

It is my educated assumption that endogenous natural disasters (i.e., famine) within a country will impede terrorism within that country. Endogenous natural disasters, hence their name, come from within a nation and its leadership; famines are most often government-induced with a deliberate objective to cripple its subjects for politically strategic reasons, such as to eliminate opposition and/or to suppress foreseeable insurgent rebellion(s).

Unlike the majority of exogenous natural disaster shocks, famines are a protracted type of disaster event. They have neither formal nor defined start and end dates and/or times, as, for instance, a cyclone would. Quite the contrary, a famine can last as long as the leadership that induces it so chooses; this can easily be a matter of years, as was the case in Ethiopia from 1983-1985. With this being the case, my aforementioned hypothesis takes the following into consideration: in the short-term - i.e., within the six months following the onset of a famine - the effects of mass hunger will indeed be pronounced, though likely less so in the two months following the famine’s onset as opposed to the following four. In the long-term, conversely - i.e., within the latter seven (7) to twelve (12) months of the year - the effects of mass hunger will be calamitous; people will be physically unable to survive with such extreme starvation, and fatalities will be widespread. Accounting for the two-month “grace period” following the famine’s onset within which humans can, in technical terms, survive without food, I expect the negative relationship that I hypothesize between famines and terrorism to be somewhat more stark
in the long run than in the short run. I, nonetheless, predict that this negative relationship will prevail, whatever the strength of correlation, in both the short and long-term.

My third and final hypothesis contains two parts, and seeks to determine the effect - if any - of polities/political institutions on the prevalence of terrorism following an exogenous natural disaster. Based on the literature consulted, theory, and intuitions, I hypothesize that:

\( H_{3A} \): In a democratic nation, the risk of terrorism following an exogenous natural disaster shock is relatively low in both the short and long-term.

Additionally, I hypothesize that the converse holds true:

\( H_{3B} \): In an autocratic nation, the risk of terrorism following an exogenous natural disaster shock is relatively high in both the short and long-term.

It is my educated presumption that countries governed by democratic/democratic-leaning institutions will be less prone to disaster-related terrorism than will countries governed by autocratic/autocratic-leaning institutions. The literature has made a point in that democratic administrations will be much quicker to be at the disposal of their citizens following a natural disaster than an autocratic administration. I propose that this same pattern will hold true in my study; it seems axiomatic that democrats are dependent on the satisfaction of their constituency to remain in office, whereas the political survival of autocrats depends on how well they please their small nucleus of adherents, most of whom are chosen nepotistically. The post-disaster assistance with which a democracy furnishes its citizens will contribute to the citizens’ level of content and satisfaction with the government, which will give them a marginal motive, if any, to terrorize their
government out of anger. The lack of post-disaster assistance provided and action taken by an autocracy will contribute to the citizens’ level of infuriation and disgruntlement with the government, thereby heightening the grounds for hostility-provoked terrorism.
V. DATA, METHODOLOGY, & EMPIRICAL DESIGN

As a mechanism of validation for my intuitions and hypotheses, I have undertaken a comprehensive statistical analysis project using STATA® statistical software. My first step towards the success of this analysis was the collection of raw data. The datasets I have obtained are extracted from four distinct databases which, collectively, comprise a series of economic and political variables along with variables pertinent to natural disasters and to terrorism. I have tailored these respective datasets - which I present in more detail below - to meet the specific needs of my project, ultimately leaving me with empirical data covering nearly 200 nations of the world and spanning over a half-century in time.

I referred to the World Bank Open Data database to collect data on economic variables. Of the database’s hundreds of variables, I downloaded a select number that I felt would be most relevant to my research; among them include, *inter alia*, gross domestic product (GDP), population, economic growth, the Gini coefficient, and consumer price index (CPI). I came to the determination that the three former would be best included in my regressions. World Bank Open Data dates as far back as 1960, though this varies from variable to variable. World Bank Open Data covers all of the organization’s 189 member nations. I should note that, as none of my hypotheses sought to directly measure any economic variable per se, nearly all of the World Bank data variables included in my regressions served as control variables; I specify my control variables later in this section.
I referred to the Polity V Database (Annual Time-Series Data) to obtain data on political variables. The variables that interested me in this dataset were those measuring how democratic or autocratic a given national government is - variables such as democracy index, autocracy index, and polity score. Polity V Annual Time-Series Data covers the time period spanning 1800 up through the present, though under no circumstances did I take into account any observations prior to 1960 in this project. Polity V Annual Time-Series Data provides data for 167 nations.

As a purely pragmatic matter, the polity score variable would prove most useful and pertinent in running my regressions. The variable measures a nation’s ruling political regime on a scale ranging from -10 to +10, with a score of -10 denoting a pure autocracy, a score of +10 denoting a pure democracy, and a score of 0 denoting a perfectly hybrid regime; for the purposes of my regressions, I made some modifications to this scale to facilitate interpretation, which I will discuss in more detail in the following section. I employ the polity score variable as both a control variable and, in certain regressions, as an interactive variable, also to be discussed further.

I referred to the Emergency Events Database (EM-DAT) - International Disaster Database to collect data on natural disasters. Of the many variables it has to offer, the ones that proved germane to my analyses were primarily those measuring disaster type (e.g., earthquake, famine), number of disasters, and disaster-related fatalities. EM-DAT data extends back as far as 1970, and covers all nations of the world in which a significant natural disaster has been recorded. Nearly all of the independent variables in my regressions come from EM-DAT.
Lastly, I referred to the National Consortium for the Study of Terrorism and Responses to Terrorism (START) - Global Terrorism Database to collect data on terrorism. Of the many variables it has to offer, the ones that were significant factors in my regressions were those measuring number of terrorism-related events and terrorism-related fatalities. Like EM-DAT, START data goes back to 1970, and covers all nations of the world in which a significant terrorist attack has been recorded. All of my dependent variables in my regressions come from START, as well as an interactive variable in a specific regression, to be specified in the subsequent section.

Much of the existing research literature on natural disasters and terrorism examines trends at the nation-year level, such as that of Berrebi and Ostwald. To make observations at such a macro level, however, I feel neglects to heed attention to the phenomenon of opportunistic terrorism, which - per my theoretical definition - occurs within a matter of weeks to six months following an exogenous natural disaster. Accordingly, if I am to maintain consistency with my theory, opportunism is not observable at a yearly level. Given that the differentiation between opportunistic terrorism and grievance-based terrorism is a paramount objective of my research, I resolved that it would do my project more justice if I were to make more micro-level observations. To this end, I determined the most appropriate unit of observation/analysis for my research to be at the nation-month level. This is to say, I am interested in making observations about the relationship between the incidence of natural disasters and the prevalence of terrorist activity in a given nation, within a period of successive months. As such, all of my data is
organized and aggregated in such a way that I have one unique row of data for each nation for each month of each year in my dataset. It was not until I arranged my data in this exact way, as well as standardized all nation abbreviations using the Correlates of War (COW) country codes, that I was able to merge the four aforementioned datasets into one. At this point, my data was ripe for regression analysis.

When organizing my data, the most pronounced obstacle around which I was forced to work was an unforeseen sparsity in the data. This is particularly the case when dealing with my EM-DAT (natural disaster) and START (terrorism) data. There are countless months and even years in which a particular nation may not have experienced a natural disaster, an incident of terrorism, or even both. In addition to objectively not having had any natural disaster(s) or terrorism in a given period of time, this sparsity can be due to numerous different factors, not the least of which are differing views as to what exactly constitutes terrorism. As mentioned in my introduction, no genuine consensus has yet been reached on the definition of terrorism on account of different political views, nationalities, ethnicities, and personal values. One man’s terrorist is most certainly another man’s liberation fighter or martyr. This automatically incorporates an implicit bias in the documentation of terrorist incidents/attacks. As for natural disasters, a disaster must meet certain criteria to be entered into the EM-DAT database, including having caused at least ten (10) fatalities or having affected at least one hundred (100) people.\textsuperscript{65} However, in more exceptional circumstances, there may be an adverse weather event whose damage manifests itself in ways other than directly affecting people. I thus needed

\textsuperscript{65} EM-DAT International Disaster Database, under “Criteria”.
to make quite a few adjustments along the way to overcome data gaps/missing data to ensure that each of my regressions contained a sufficient amount of observations to make them reliable, which included replacing missing natural disaster data and missing terrorism data with zeroes. Fortunately, after doing so, I was able to verify the reliability of my regressions by looking at the number of observations themselves, my $F$, $t$, and $p$-statistics, and the $R^2$ values, all of which were indicative of highly robust and significant regressions once I was able to circumvent this issue. I present all of these regressions in the next section.

Following this initial data management initiative, the next step in my methodology entailed constructing a series of econometric models/regression equations in order to test my predictions/hypotheses empirically (i.e., using the data I had collected). With the help of STATA®, I ran ordinary least squares (OLS) regressions as a means to estimate any unknown parameters within my regression models. For each of these regressions, I ultimately employed a longitudinal/panel model of cross-sectional time-series data with a single time variable - entitled “YEARMONTH” - to obtain the most robust model possible for the hypothesis being tested.

Each of my regression analyses follows its own specific model. I will identify each specific model to the regression to which it corresponds in the following analysis and interpretations section. What of this should be known for the time being, however, is that each individual regression equation portrayed in the subsequent section is partially derived from a more generalized econometric model which I propose - along with its specifications - here. I measure terrorism in nation $i$, month $t$ (my two units of
observation) as a function of a series of vectors and beta coefficients, and I employ a number of lagged variables to predict what will occur in the future from what has already occurred in the past.

\[
\hat{Y}_{i,t} = \beta_0 + \beta_1(ND_{i,t}) + \beta_2(ND_{i,t-1}) + \beta_3(ND_{i,t-2}) + \ldots + \beta_\alpha(ND_{i,t-\alpha(t-1)}) + \beta_4(\log(GDP_{i,t})) \\
+ \beta_5(Poverty_{i,t}) + \beta_6(Income Inequality_{i,t}) + \beta_7(Welfare_{i,t}) + \beta_8(Polity_{i,t}) \\
+ \beta_9(Economic Growth_{i,t}) + \beta_{10}(\log(Population_{i,t})) + \beta_{11}((ND_{i,t}) \cdot (y_{i,t-1})) + \varepsilon
\]

where:

\(\hat{Y}_{i,t}\): Terrorist attacks or fatalities from terrorist attacks in nation \(i\), month \(t\).

\(\beta_0\): The y-intercept of the regression line.

\(ND_{i,t}\): Natural disaster incidence or fatalities from natural disasters in nation \(i\), month \(t\).

\(ND_{i,t-1}\): Natural disaster incidence or fatalities from natural disasters in nation \(i\), in the previous month \((t-1)\).

\(ND_{i,t-2}\): Natural disaster incidence or fatalities from natural disasters in nation \(i\), two months prior \((t-2)\).

\(ND_{i,t-\alpha(t-1)}\): Natural disaster incidence or fatalities from natural disasters in nation \(i\), \(\alpha\)-\(t\) months prior.

\(\log(GDP_{i,t})\): Log gross domestic product (GDP, in 2010 U.S. Dollars) in nation \(i\), month \(t\).

\(Poverty_{i,t}\): Level of poverty, based on amount of per capita income falling below the international poverty threshold, in nation \(i\), month \(t\).

\(Income Inequality_{i,t}\): Amount of income inequality, as measured by the nation’s Gini
coefficient, in nation \(i\), month \(t\).

\(Welfare_{i,t}\) : Education level (by number of people who have finished secondary school), life expectancy (in years), and health expenditure (as a percentage of national GDP) in nation \(i\), month \(t\).

\(Polity_{i,t}\) : Regime type - autocratic/hybrid/democratic - in nation \(i\), month \(t\).

\(Economic\ Growth_{i,t}\) : Level of economic growth (in terms of percent GDP growth) in nation \(i\), month \(t\).

\(\log (Population_{i,t})\) : Log population in nation \(i\), month \(t\).

\((ND_{i,t}) \cdot (y_{i,t-1})\) : Interactive term between natural disaster incidence in nation \(i\), month \(t\) and level of terrorist attacks in nation \(i\), in the previous month \((t-1)\). If there is an existing terrorist organization, then suddenly they have an enhanced opportunity to act against the government.

\(\varepsilon\) : Any error that has not yet been accounted for.

As indicated by this general model, terrorism is my dependent \((y)\) variable. It can measure (1) the number of actual terrorism events themselves, or (2) the number of fatalities resulting from terrorism events. With this said, I have obtained considerably more reliable regression models when using the number of terrorism-induced fatalities as my dependent variable. This is likely due to the fact that fatality levels give some sort of a scaling of the severity of the terrorist attack(s) - more fatalities indicate more severe attacks and vice-versa - whereas the terrorism events alone do not give a good sense of the enormous variation in seriousness among different events/attacks. What is more, terrorism tends to be highly politicized, and there is thus - as I have mentioned previously
- a great deal of debate and disagreement as to what should be counted as a terrorism event. For this reason, in all regressions I consider for analysis in the subsequent section, I use the number of people killed in terrorism events as a proxy measure for the number of terrorism incidents/events themselves. While I do physically run regressions using terrorism events alone, I do not consider them for any substantive analysis for the aforementioned reasons. The regressions using terrorism events as the dependent variable can be found in the appendix, but not for any formal results or interpretations.

As is also indicated by the general model, natural disasters are my independent (x) variable. This independent variable comes in two forms, both of which appear in all regressions: (1) the number of actual natural disaster events themselves, and (2) the number of fatalities resulting from natural disaster events.

My project considers six forms of exogenous natural disasters, under four different categorical groupings specified by EM-DAT:

I. **Geophysical** ➞ (1) Earthquakes & (2) Volcanic Activity

II. **Meteorological** ➞ (1) Storms

III. **Hydrological** ➞ (1) Floods & (2) Landslides

IV. **Climatological** ➞ (1) Wildfires

For efficiency purposes, I consolidate all of these six forms of exogenous natural disasters into one general disaster variable in my dataset. I also generate a disaster death variable, which simply measures the number of fatalities resulting from these six forms of exogenous natural disasters combined. I then subdivide my disaster variable into (1) a
variable designating disasters taking place within the past six (6) months \( \left( \sum_{\alpha=0}^{6} ND_{i,t-\alpha} \right) \) and

(2) a variable designating disasters taking place between the last seven (7) through twelve (12) months \( \left( \sum_{\delta=7}^{12} ND_{i,t-\delta} \right) \) as a means to differentiate between short-term effects and long-term effects, respectively. I subdivide my disaster death variable in the exact same way, and for the exact same purpose \( \left( \sum_{\gamma=0}^{6} ND \text{ DEATHS}_{i,t-\gamma} \right) \& \left( \sum_{\zeta=7}^{12} ND \text{ DEATHS}_{i,t-\zeta} \right) \), respectively).

My project considers one form of endogenous natural disaster, which is famine. I have one famine variable in my dataset. I also generate a famine death variable, which measures the number of fatalities resulting from famines. As I do with my general disaster variable, I subdivide my famine variable into (1) a variable designating famines taking place within the past six (6) months and (2) a variable designating famines taking place between the last seven (7) through twelve (12) months as a means to differentiate between short-term effects and long-term effects, respectively. I subdivide my famine death variable in the exact same way, and for the exact same purpose. My famine and famine death variables, being endogenous in nature, are always run separately from my (exogenous) general disaster and disaster death variables.

I have four (4) control variables for which I believe it was imperative that I took into account in order to guarantee robust and reliable regression models. The first of these control variables is log GDP; dramatic differences in national GDP between different countries of the world had the potential to skew my data in erroneous directions, a
possibility I wished to avoid. The second of my control variables is log population; as
nations with larger populations are more prone to, for instance, higher natural disaster
fatality levels and more terrorism, population should be held constant to ensure optimal
accuracy of the model. The third of my control variables is Polity Score, since, as
described in the literature and in my theory earlier on, nations with certain political
institutions are more prone to terrorism, terrorism-related casualties, etc. The fourth and
final of my control variables is economic (GDP) growth, as growth is a meaningful
measure of a country’s economic status; stark differences in economic growth/status from
nation to nation can yield remarkably different responses to a natural disaster between
two or more nations, and whether a state’s prevention and/or response to a disaster is
sufficient has a prodigious impact on both disaster survival rate and terrorism.
Additionally, the presence of or lack of economic growth can be a cause of happiness or
unhappiness, respectively. To maintain as much consistency as possible across all models,
I will be controlling for the same four variables in each of my regressions.

I place all of my independent and dependent variables on a logarithmic scale, which I do
in order to curb the effects of observations that are outliers. Depending on the extremity
of an outlier, the residual of a said outlier can be astronomically large, which can be
enormously influential on the general distribution of natural disasters/natural disaster
deaths and/or terrorism/terrorism deaths. For instance, if I am to predict on average that
there will be approximately three (3) terrorism-inflicted fatalities in a given nation-month
(which is what my average prediction should be, given that it is the approximate modal
value ($e^1$) for terrorism deaths), then in the exceptionally rare case that there is an
observation of three thousand (3,000) terrorism-inflicted fatalities (or more) in a nation-month, the utter magnitude of the residual of this outlier will skew the distribution of terrorism-inflicted fatalities positively - a right skew by virtue of the elongated right tail that the distribution exhibits. To give an empirical conception of just how extreme this right skew would be, of the nearly 200,000 observations of terrorist attacks in the entire START dataset since it began recording in 1970, only two (2) of these attacks have resulted in three thousand (3,000) or more fatalities in a given nation-month: (1) the Northern Iraq offensive in June 2014 and (2) the attacks of September 11, 2001, in the United States of America. I intend to avoid, inasmuch as possible, any such skew in my data; using a logarithmic scale is an efficient means of minimizing skew.

The general distribution of terrorism-inflicted fatalities in a nation-month - on a logarithmic scale - is portrayed in the kernel density plot below:
An example in the case of natural disasters - if I am to predict on average that there will be approximately twenty (20) exogenous natural disaster-induced fatalities in a given nation-month (which is what my average prediction should be, given that it is the approximate modal value ($e^3$) for exogenous natural disaster deaths), then in the exceptionally rare case that there is an observation of one hundred thousand (100,000) exogenous natural disaster-induced fatalities (or more) in a nation-month, the massive size of the residual of this outlier will - similar to the effect on the terrorism events distribution - skew the distribution of exogenous natural disaster-induced fatalities.

**Figure 4.1 : General Distribution via Kernel Density Estimate of Terrorism-Inflicted Fatalities in One (1) Nation-Month, Logarithmic Scale**
positively. Like the terrorism deaths distribution, the general distribution of exogenous natural disaster-induced fatalities would have an elongated right tail (right skew); I thus use a logarithmic scale to minimize this skew as much as possible.

The general distribution of exogenous natural disaster-induced fatalities in a nation-month - on a logarithmic scale - is portrayed in the kernel density plot below:

![Exogenous Natural Disaster-Induced Fatalities in a Nation-Month (Logarithmic Scale)](image)

**Figure 4.2 : General Distribution via Kernel Density Estimate of Exogenous Natural Disaster-Induced Fatalities in One (1) Nation-Month, Logarithmic Scale**

Henceforth, in order to account for the order of magnitude of events (be they terrorism or disaster-related), as well as to make the general distributions of my independent and
dependent variables more symmetric, and thus, more normalized, I take the log of my independent and dependent variables when regressing.

Lastly, I run fixed effects regressions for each and every one of my hypotheses. I do so in order to account for temporal heterogeneity and variation globally in terms of natural disasters and terrorism - i.e., the fact that there are time periods where, around the world, there are lots of natural disasters and lots of terrorism, and others where there are few natural disasters and little terrorism - or any combination of the two. I use my aforementioned “YEARMONTH” variable as a time fixed effect in order to correct for any possible reporting bias that may have increased or decreased reporting of disaster and/or terrorism events towards a certain time period (for example, reporting of terrorism has tended to increase substantially following major “rude awakening” terrorist events such as 9/11). I also used fixed effects to account for the fact that certain nations are more prone to natural disasters and/or terrorism, and other nations are less prone to natural disasters and/or terrorism. When I account for these fixed effects, I tend to find that independent variables such as poverty, income inequality, and welfare tend to drop out in terms of having any effect, as these variables change very little over a period of years, let alone months; they generally vary over decades. Any such variables are hereafter omitted from any and all regression analyses that I will present.
VI. **REGRESSIONS, RESULTS, & INTERPRETATIONS**

Each of the regressions I have performed on STATA® has yielded highly sensible, quality models, the reliability of which allow me to draw meaningful conclusions. Each of my regressions contains over 85,000 observations with *F*-statistics of .0000, and has *R*-squared values indicating that my models account for - depending on the specific model - anywhere between 35 percent and 55 percent of the observations.

**(I) REGRESSION 1 — HYPOTHESIS 1**

I begin with the first of four regression analyses that I will present - an empirical examination of my first hypothesis which postulates that the occurrence of an exogenous natural disaster shock in a nation increases that nation’s subsequent level(s) of terrorism on all timescales both near and distant (see also p. 30).

To obtain the most practical model possible, I establish the following econometric equation specification to represent this regression:

\[
\hat{Y}_{i,t} = \beta_0 + \beta_1 \left( \sum_{\alpha=0}^{6} \log (ND_{i,t,\alpha}) \right) + \beta_2 \left( \sum_{\gamma=0}^{6} \log (ND \ DEATHS_{i,t,\gamma}) \right)
+ \beta_3 \left( \sum_{\delta=7}^{12} \log (ND_{i,t,\delta}) \right) + \beta_4 \left( \sum_{\zeta=7}^{12} \log (ND \ DEATHS_{i,t,\zeta}) \right) + \beta_5 \left( \log (GDP_{i,t}) \right)
+ \beta_6 \left( \log \ (Population_{i,t}) \right) + \beta_7 \left( Polity_{i,t} \right) + \beta_8 \left( Economic \ Growth_{i,t} \right) + \varepsilon
\]

The corresponding regression table is as appears on the following page:
### Figure 5: Fixed Effects Regression Analysis of the Impact of Exogenous Natural Disaster Occurrence and Deaths on the Level of Terror Activity

**Model No. 1**

<table>
<thead>
<tr>
<th></th>
<th>( \log(\text{Terrorism Deaths}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \log(\text{Natural Disaster}_{t, t-1, \ldots t-6}) )</td>
<td>0.0288*** (0.00727)</td>
</tr>
<tr>
<td>( \log(\text{Natural Disaster Deaths}_{t-1, \ldots t-6}) )</td>
<td>0.0216*** (0.00192)</td>
</tr>
<tr>
<td>( \log(\text{Natural Disaster}_{t-7, \ldots t-12}) )</td>
<td>0.0671*** (0.00759)</td>
</tr>
<tr>
<td>( \log(\text{Natural Disaster Deaths}_{t-7, \ldots t-12}) )</td>
<td>0.0183*** (0.00199)</td>
</tr>
<tr>
<td>( \log(\text{GDP}) )</td>
<td>0.0398*** (0.00922)</td>
</tr>
<tr>
<td>( \log(\text{Population}) )</td>
<td>0.526*** (0.0169)</td>
</tr>
<tr>
<td>( \text{Polity Score} )</td>
<td>0.00433*** (0.000703)</td>
</tr>
<tr>
<td>( \text{Economic Growth} )</td>
<td>-0.00404*** (0.000434)</td>
</tr>
</tbody>
</table>

**Observations:** 86,592  
**\( R^2 \):** 0.340

*Standard Errors in Parentheses*

\* \( p < 0.05 \), \*\* \( p < 0.01 \), \*\*\* \( p < 0.001 \)

*Note: This Model Uses Fixed Effects for Nation, Month, and Year (Unit of Analysis: Nation-Month)*
The principal finding I have gathered from this analysis is that exogenous natural disaster shocks have an unmistakably robust positive effect on the number of terrorist attacks within a nation-month. Stated otherwise, an exogenous natural disaster taking place within a given nation is, indeed, associated with a greater amount of subsequent terrorist activity in that nation in both the short-term and long-term. This finding lends considerable support to my first hypothesis, which holds up by just about all estimates.

This positive correlation can be observed in the regression table above; all observations are statistically significant at the 0.1 percent level. Additionally, as can be seen in the table, the coefficients on the control variables included in the regression model indicate that the observed relationship tends to take place in large, rich, democratic countries with low levels of economic growth.

To give a better understanding of the substantive scaling of my observations, if one were to assume ten (10) exogenous natural disaster shocks in a given nation-month - an exceptionally high number - this would imply an increase of roughly fifteen (15) percent in terrorist attacks. The substantive effect of exogenous natural disaster-induced fatalities on terrorism is even more pronounced; assuming ten thousand (10,000) exogenous natural disaster deaths in a nation-month - yet another exceptionally high statistic - the resulting increase in terrorist activity within the nation in question would be approximately twenty (20) percent.
None of these results are to suggest, however, that the magnitude of what is a clear positive correlation existing between exogenous natural disaster shocks and terrorism is similar in the six (6)-month short-term as opposed to the seven (7) through twelve (12)-month long-term. In fact, if I am to heed attention to the magnitudinal discrepancy between the coefficients, such a statement would be a faulty proposition. Despite the fact that the coefficient of [.067] corresponding to my long-term disaster variable is over twice as large as that of my short-term disaster variable [.029], the pattern is inverted when comparing the coefficients corresponding to my respective disaster death variables.

No mistake should be made. The regression analysis above leaves little to no doubt whatsoever; exogenous natural disaster shocks do precipitate terrorism. However, because of this coefficient magnitude pattern inconsistency between natural disasters themselves and natural disaster fatalities, it is difficult to come to a valid/lucid conclusion as to whether opportunism or grievance is the most substantial driving mechanism of terrorism that results from exogenous natural disaster shocks. I thus thought it sensible to devise another regression model, to assist me in arriving at a more disambiguated conclusion as to which of these two mechanisms exogenous natural disaster-induced terrorism can be mainly attributed. I analyze this model in the following subsection.

(II) REGRESSION 2 — HYPOTHESIS 1

With strong evidence to buttress my initial hypothesis that exogenous natural disaster shocks lead to an escalation in terrorism, my focus now turns to the mechanisms through
which this said terrorism tends to evolve, the latter of which was nebulous in the outputs of my initial regression analysis. Such will be the focus of the regression analysis discussed in this subsection, which should be treated as an extension of the findings pertaining to my first hypothesis. I turn to this regression model to assess the important question of which mechanisms of terrorism evolution - opportunism or grievance - are primarily responsible for the increased terrorist attacks that result from the effects of exogenous natural disaster shocks - a relationship made very clear by my first model.

For this model, I incorporate a new variable into my dataset that facilitates making this distinction. This variable takes the logarithm of terrorism-inflicted fatalities in the year prior (i.e., within the past thirteen (13) through twenty-four (24) months) to the occurrence of an exogenous natural disaster shock - \[ \sum_{\kappa=13}^{24} \log(TDPY_{i,t-\kappa}) \], where “TDPY_{i,t-\kappa}” denotes terrorism deaths in the previous year in nation \( i \), \( \kappa \) months prior. Just as I do with my dependent variable, I use the total killed in terrorism in the prior year variable as a proxy measure for the amount of actual terrorism (i.e., events) that took place. This new variable seeks to distinguish between the mechanisms of opportunistic and grievance-based terrorism, which most logically would be indicated by a high presence and low presence of terrorism in the previous year, respectively. If there were already active terrorist networks in the previous year, one would intuitively expect that the exogenous natural disaster might provide them with a window of opportunity to attack. Conversely, if there were no active terrorist organizations in the previous year,
then the exogenous natural shock might be more likely to be creating the grievance that leads to a terrorist attack in the long run.

As I am inspecting the relationship among three variables in this regression analysis, I employ an interactive model, interacting the newly-created past year terrorism fatalities variable with my existing exogenous natural disaster shock variables. This permits me to measure the effect that this interaction casts on present terrorism levels - my dependent variable.

The proposed model specification for this regression is:

\[
\hat{Y}_{i,t} = \beta_0 + \beta_1(\sum_{\alpha=0}^{6} \log (ND_{i,t-\alpha})) + \beta_2(\sum_{\gamma=0}^{6} \log (ND DEATHS_{i,t-\gamma})) + \beta_3(\sum_{\delta=7}^{12} \log (ND_{i,t-\delta})) + \beta_4(\sum_{\zeta=7}^{12} \log (ND DEATHS_{i,t-\zeta})) + \beta_5(\sum_{k=13}^{24} \log (TDPY_{i,t-k}) \cdot \sum_{\alpha=0}^{6} \log (ND_{i,t-\alpha})) + \beta_6(\sum_{k=13}^{24} \log (TDPY_{i,t-k}) \cdot \sum_{\gamma=0}^{6} \log (ND DEATHS_{i,t-\gamma})) + \beta_7(\sum_{k=13}^{24} \log (TDPY_{i,t-k}) \cdot \sum_{\delta=7}^{12} \log (ND_{i,t-\delta})) + \beta_8(\sum_{k=13}^{24} \log (TDPY_{i,t-k}) \cdot \sum_{\zeta=7}^{12} \log (ND DEATHS_{i,t-\zeta})) + \beta_9(\log (GDP_{i,t})) + \beta_{10}(\log (Population_{i,t})) + \beta_{11}(Polity_{i,t}) + \beta_{12}(Economic Growth_{i,t}) + \varepsilon
\]

The corresponding regression table is as appears on the following page:

(Figure 6: Fixed Effects, Interactive Regression Analysis of the Impact of (1) Exogenous Natural Disaster Occurrence and Deaths, and (2) Terrorism-Inflicted Deaths in the Previous Year on the Level of Terror Activity)
## MODEL N°2
Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Prior Terrorism Deaths

<table>
<thead>
<tr>
<th></th>
<th>Log (Terrorism Deaths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log (Terrorism Deaths&lt;sub&gt;t-13, ..., t-24&lt;/sub&gt;)</td>
<td>0.275*** (0.00220)</td>
</tr>
<tr>
<td>Log (Natural Disaster&lt;sub&gt;t, t-1, ..., t-6&lt;/sub&gt;)</td>
<td>0.0150* (0.00743)</td>
</tr>
<tr>
<td>Log (Natural Disaster Deaths&lt;sub&gt;t, t-1, ..., t-6&lt;/sub&gt;)</td>
<td>-0.0102*** (0.00195)</td>
</tr>
<tr>
<td>Log (Natural Disaster&lt;sub&gt;t-7, ..., t-12&lt;/sub&gt;)</td>
<td>0.0198* (0.00781)</td>
</tr>
<tr>
<td>Log (Natural Disaster Deaths&lt;sub&gt;t-7, ..., t-12&lt;/sub&gt;)</td>
<td>-0.0103*** (0.00205)</td>
</tr>
</tbody>
</table>

(Log (Terrorism Deaths<sub>t-13, ..., t-24</sub>)) * (Log (Natural Disaster<sub>t, t-1, ..., t-6</sub>)) | -0.0198*** (0.00282) |

(Log (Terrorism Deaths<sub>t-13, ..., t-24</sub>)) * (Log (Natural Disaster Deaths<sub>t, t-1, ..., t-6</sub>)) | 0.0138*** (0.000765) |

(Log (Terrorism Deaths<sub>t-13, ..., t-24</sub>)) * (Log (Natural Disaster<sub>t-7, ..., t-12</sub>)) | 0.000560 (0.00297) |

(Log (Terrorism Deaths<sub>t-13, ..., t-24</sub>)) * (Log (Natural Disaster Deaths<sub>t-7, ..., t-12</sub>)) | 0.0103*** (0.000791) |

Log (GDP) | 0.0449*** (0.00795) |

Log (Population) | 0.213*** (0.0146) |

Polity Score | 0.000929 (0.000601) |

Economic Growth | -0.00391*** (0.000370) |

Observations | 85,776 |

\( R^2 \) | 0.530 |

Standard Errors in Parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Note: This Model Uses Fixed Effects for Nation, Month, and Year (Unit of Analysis: Nation-Month)
The most prominent findings obtained from this regression analysis are twofold. Firstly, in the presence of terrorism in the prior year, opportunity-based terrorism is the predominant driving mechanism of terrorist activity resulting from exogenous natural disaster-related fatalities in the present. Secondly, in the absence of terrorism in the prior year, grievance-based terrorism is the predominant driving mechanism of terrorist activity resulting from exogenous natural disaster shocks in the present. These findings speak considerably to my theoretical intuitions (see also pp. 24-26), in which I note that terrorist networks with pre-existing grievances (i.e., unrelated to the exogenous natural shock) are a prerequisite for opportunistic terrorism, whereas grievance-based terrorism takes time to foment on the basis of how satisfactorily a government protects and palliates its citizenry from the adverse effects of an exogenous disaster event.

The accompanying regression table lends support to these findings. All but two of the observations in the table exhibit statistical significance at the five (5) percent level or less, and, as was the case in the initial model, the coefficients on the control variables indicate that the observed relationships tend to take place in large, rich, democratic countries with low levels of economic growth.

Substantively, absent terrorist activity in the year prior, having an extraordinarily high ten (10) exogenous natural disaster events in a given nation-month would engender a roughly five (5) percent increase in terrorism. Present terrorist activity in the year prior, having one thousand (1,000) terrorism-inflicted mortalities in the previous year interacted with ten thousand (10,000) exogenous natural shock-induced mortalities would entail a
shocking substantive increase in terrorist attacks of about one hundred twenty (120) percent within the nation-month in which the shock took place - a truly astonishing effect that could potentially pose an existential threat to a nation. Judging from these interpretations, it seems to be the case that, of the two mechanisms of terrorism evolution, opportunity-based terrorism tends to arouse the most pronounced detrimental impact in terms of promoting attacks.

To recapitulate the most noteworthy outputs of my first two regressions: my first hypothesis that “[t]he occurrence of an exogenous natural disaster shock in a given nation will increase the incidence of subsequent terrorism within that nation in both the short and long-term” is irrefutably substantiated by my first regression. There is a clear, direct, statistically significant positive correlation between exogenous natural disaster shocks and terrorism.

Whether this terrorism is predominantly a product of opportunism or grievance, however, rests on the question of whether terrorism was present or absent in the year prior to the observations in question. If terrorism was present/high in the year prior, current terrorism attributed to exogenous natural disaster-related deaths is most likely to be opportunity-based, whereas if terrorism was absent/low in the year prior, current terrorism attributed to exogenous natural disasters (alone) is most likely to be grievance-based; this is documented and substantiated well by my second regression analysis.
(III) REGRESSION 3 — HYPOTHESIS 2

I now transition to my third regression analysis, which seeks to assess the soundness of my second hypothesis. My second hypothesis diverts somewhat from the rest in that it probes the effects of *endogenous* natural disasters - namely, famines - on the incidence of terrorism (see also p. 31). Specifically, this hypothesis posits that the occurrence of an *endogenous* natural disaster (famine) in a given country decreases that country’s subsequent levels of terrorism in the short-term, and, to an even greater extent, in the long-term.

I specify the following econometric model representation in order to obtain a most sensible model:

\[
\hat{Y}_{i,t} = \beta_0 + \beta_1 \left( \sum_{\alpha=0}^{6} \log (\text{FAMINE}_{i,t-\alpha}) \right) + \beta_2 \left( \sum_{\gamma=0}^{6} \log (\text{FAMINE DEATHS}_{i,t-\gamma}) \right) \\
+ \beta_3 \left( \sum_{\delta=7}^{12} \log (\text{FAMINE}_{i,t-\delta}) \right) + \beta_4 \left( \sum_{\zeta=7}^{12} \log (\text{FAMINE DEATHS}_{i,t-\zeta}) \right) + \beta_5 \left( \log (\text{GDP}_{i,t}) \right) \\
+ \beta_6 \left( \log (\text{Population}_{i,t}) \right) + \beta_7 (\text{Polity}_{i,t}) + \beta_8 (\text{Economic Growth}_{i,t}) + \epsilon
\]

The corresponding regression analyses/results are as appears on the following page:
### MODEL №3

Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Endogenous Natural Disasters (Famines)

<table>
<thead>
<tr>
<th>Log (Terrorism Deaths)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Log (Famine_{t-1, t-6})</td>
<td>0.682***</td>
</tr>
<tr>
<td></td>
<td>(0.143)</td>
</tr>
<tr>
<td>Log (Famine Deaths_{t, t-1, ..., t-6})</td>
<td>-0.0948**</td>
</tr>
<tr>
<td></td>
<td>(0.0335)</td>
</tr>
<tr>
<td>Log (Famine_{t-7, ..., t-12})</td>
<td>0.771***</td>
</tr>
<tr>
<td></td>
<td>(0.154)</td>
</tr>
<tr>
<td>Log (Famine Deaths_{t-7, ..., t-12})</td>
<td>-0.149***</td>
</tr>
<tr>
<td></td>
<td>(0.0362)</td>
</tr>
<tr>
<td>Log (GDP)</td>
<td>0.0482***</td>
</tr>
<tr>
<td></td>
<td>(0.00919)</td>
</tr>
<tr>
<td>Log (Population)</td>
<td>0.552***</td>
</tr>
<tr>
<td></td>
<td>(0.0169)</td>
</tr>
<tr>
<td>Polity Score</td>
<td>0.00554***</td>
</tr>
<tr>
<td></td>
<td>(0.000703)</td>
</tr>
<tr>
<td>Economic Growth</td>
<td>-0.00364***</td>
</tr>
<tr>
<td></td>
<td>(0.000435)</td>
</tr>
<tr>
<td>Observations</td>
<td>86,592</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.335</td>
</tr>
</tbody>
</table>

Standard Errors in Parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: This Model Uses Fixed Effects for Nation, Month, and Year (Unit of Analysis: Nation-Month)

---

**Figure 7**: Fixed Effects Regression Analysis of the Impact of Endogenous Natural Disaster (Famine) Occurrence and Deaths on the Level of Terror Activity
The findings generated by this analysis are clear: the occurrence of an endogenous natural disaster/famine in and of itself gives rise to terrorism, yet the resulting fatalities suppress terrorism. The former finding runs directly counter to what I put forth in my second hypothesis, while the latter is consistent with my second hypothesis. As deaths tend to be an authentic metric by which to scale the severity of a natural disaster, my interpretation of these findings is that mild famines tend to increase levels of terrorism whereas severe famines tend to decrease levels of terrorism; this interpretation seems to intuitively make sense, and I discuss the line of logic at greater length below.

Furthermore, the long-term famine fatality coefficient of [-.149] as compared to the short-term famine fatality coefficient of [-.095] gives credence to the condition of my hypothesis which predicts a sharper decline in terrorism in the long-term than in the short-term.

The positive correlations corresponding to famines alone and the negative correlations corresponding to famine-inflicted fatalities are readily observable in the regression analysis table above. Nearly all observations are statistically significant at the 0.1 percent level. The coefficients on the control variables included in the regression model indicate that these observed relationships tend to take place in large, rich, democratic countries with low levels of economic growth.

In substantive terms, if one were to assume a staggering ten thousand (10,000) famine-inflicted fatalities over an extended period of time, this would bring about a nearly sixty (60) percent decrease in terrorism in the short-term and a seventy-five (75)
percent decrease in terrorism in the long-term. I note that, in the case of a famine, measuring substantive relationships at a nation-month level of analysis is an exceptionally difficult - if not impossible - endeavor, as famines tend to be a protracted form of disaster event that unfolds over an extended and indeterminate length of time.

In summary, when considering the occurrence of endogenous natural disasters (famines) per se, the observed trend based on the statistical data is that terrorism levels increase as a result. By contrast, when considering deaths related to the occurrence of endogenous natural disasters (famines), the observed trend is that terrorism levels decrease. My second hypothesis holds up in the latter mode of observation, but does not in the former. However, since it has been my standard practice to value event-related fatalities much more than the events in and of themselves, as fatalities tend to provide for some sort of a conception of the seriousness of a disaster event that events alone do not, I am more confident that my second hypothesis is valid than I am it is not.

What I also ultimately conclude from my results, on a more substantive level, is that if a government has any intention of deliberately inducing a famine for political purposes, that government ought to ensure that the famine it inflicts is a massive, catastrophic famine that debilitates and starves its citizenry to death in order that they are unable to spearhead and/or support any anti-government insurrection. If the induced famine is going to be anything smaller, then the government is better off not inducing any famine at all. In other words, the worst-case scenario for a government is a small famine, since famines induce terrorism and - if the famine is mild - it yields less incapacitation and
fewer deaths. If citizens observe that their government is depriving them of nutrition, they will become aggrieved, which incites grievance-based terrorist violence against the government. A mild famine is not sufficient for a large enough sector of the population to become incapacitated and/or die to the point that citizens no longer have the wherewithal to vent grievances towards the government through terrorism. To achieve this, a much larger-scale famine is necessary, at which point citizens’ grievances will no longer be of any threat or concern to the government since the citizens all will have perished. Hence, a government either wants to aim for a severe famine or for no famine.

(IV) REGRESSION 4 — HYPOTHESIS 3

I terminate the section with my fourth and final regression analysis, which scrutinizes my third and final hypothesis. This third hypothesis propounds that, in the aftermath of an exogenous natural disaster shock, autocratic nations/regimes are more prone to terrorism than are democratic nations/regimes (see also p. 32).

I thought it most practical to construct an interactive model for this analysis, as I am working with three variables. Namely, I am interested in interacting the polity score variable with each of my exogenous natural disaster shock variables, to determine where regime type figures in terms of having an effect on terrorism levels in the presence of an exogenous natural shock. For ease of interpretation of the interactive effects, I make a modification to the traditional polity score variable, rescaling its values to between “0” and “1” (as opposed to the customary “-10” to “10” scale). I entitle this rescaled polity
score variable “demaut”. A score of “0” on the “demaut” scale indicates a perfect autocratic regime, and a score of “1” indicates a perfect democratic regime. I propose the following econometric model specification for this analysis so as to yield a dependable representation of my findings:

\[
\hat{Y}_{i,t} = \beta_0 + \beta_1 \left( \sum_{\alpha=0}^{6} \log(ND_{i,t-\alpha}) \right) + \beta_2 \left( \sum_{\gamma=0}^{6} \log(ND\ DEATHS_{i,t-\gamma}) \right) \\
+ \beta_3 \left( \sum_{\delta=7}^{12} \log(ND_{i,t-\delta}) \right) + \beta_4 \left( \sum_{\gamma=0}^{6} \log(ND\ DEATHS_{i,t-\gamma}) \right) \\
+ \beta_5 ((demaut_{i,t}) \cdot \sum_{\alpha=0}^{6} \log(ND_{i,t-\alpha})) + \beta_6 ((demaut_{i,t}) \cdot \sum_{\gamma=0}^{6} \log(ND\ DEATHS_{i,t-\gamma})) \\
+ \beta_7 ((demaut_{i,t}) \cdot \sum_{\delta=7}^{12} \log(ND_{i,t-\delta})) + \beta_8 ((demaut_{i,t}) \cdot \sum_{\gamma=0}^{6} \log(ND\ DEATHS_{i,t-\gamma})) \\
+ \beta_9 (\log(GDP_{i,t})) + \beta_{10} (\log(Population_{i,t})) + \beta_{11} (Polity_{i,t}) \\
+ \beta_{12} (Economic\ Growth_{i,t}) + \varepsilon
\]

The accompanying regression table is depicted on the following page:

(Figure 8: Fixed Effects, Interactive Regression Analysis of the Impact of (1) Exogenous Natural Disaster Occurrence and Deaths, and (2) Polity/Regime Type on the Level of Terror Activity)
### Model No. 4

**Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Polity**

<table>
<thead>
<tr>
<th></th>
<th>Log (Terrorism Deaths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demaut</td>
<td>0.00799</td>
</tr>
<tr>
<td></td>
<td>(0.0153)</td>
</tr>
<tr>
<td>Log (Natural Disaster(t, t-1, \ldots, t-6))</td>
<td>0.0614***</td>
</tr>
<tr>
<td></td>
<td>(0.0172)</td>
</tr>
<tr>
<td>Log (Natural Disaster Deaths(t, t-1, \ldots, t-6))</td>
<td>-0.0127**</td>
</tr>
<tr>
<td></td>
<td>(0.00395)</td>
</tr>
<tr>
<td>Log (Natural Disaster(t, t-7, \ldots, t-12))</td>
<td>0.115***</td>
</tr>
<tr>
<td></td>
<td>(0.0184)</td>
</tr>
<tr>
<td>Log (Natural Disaster Deaths(t, t-7, \ldots, t-12))</td>
<td>-0.0126**</td>
</tr>
<tr>
<td></td>
<td>(0.00418)</td>
</tr>
<tr>
<td>Demaut * Log (Natural Disaster(t, t-1, \ldots, t-6))</td>
<td>-0.0608**</td>
</tr>
<tr>
<td></td>
<td>(0.0220)</td>
</tr>
<tr>
<td>Demaut * Log (Natural Disaster Deaths(t, t-1, \ldots, t-6))</td>
<td>0.0591***</td>
</tr>
<tr>
<td></td>
<td>(0.00572)</td>
</tr>
<tr>
<td>Demaut * Log (Natural Disaster(t, t-7, \ldots, t-12))</td>
<td>-0.0808***</td>
</tr>
<tr>
<td></td>
<td>(0.0234)</td>
</tr>
<tr>
<td>Demaut * Log (Natural Disaster Deaths(t, t-7, \ldots, t-12))</td>
<td>0.0525***</td>
</tr>
<tr>
<td></td>
<td>(0.00603)</td>
</tr>
<tr>
<td>Log (GDP)</td>
<td>0.0369***</td>
</tr>
<tr>
<td></td>
<td>(0.00925)</td>
</tr>
<tr>
<td>Log (Population)</td>
<td>0.533***</td>
</tr>
<tr>
<td></td>
<td>(0.0170)</td>
</tr>
<tr>
<td>Polity Score</td>
<td>—</td>
</tr>
<tr>
<td>Economic Growth</td>
<td>-0.00401***</td>
</tr>
<tr>
<td></td>
<td>(0.000433)</td>
</tr>
<tr>
<td>Observations</td>
<td>86,592</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.342</td>
</tr>
</tbody>
</table>

*Standard Errors in Parentheses*

\* \(p < 0.05\), ** \(p < 0.01\), *** \(p < 0.001\)

*Note: This Model Uses Fixed Effects for Nation, Month, and Year (Unit of Analysis: Nation-Month)*
This regression analysis yields a myriad of fascinating results. My results suggest that - in a
democratic regime - the occurrence of an exogenous natural disaster shock has no effect
on levels of terrorism in the near aftermath,\textsuperscript{66} and decreases levels of terrorism in the
distant aftermath. Yet - once again assuming a democratic regime - exogenous natural
shock-related \textit{fatalities} tend to \textit{increase} levels of terrorism.

My findings evince that the converse is true in an autocratic regime; the occurrence of an
exogenous natural disaster shock tends to increase levels of terrorism, yet exogenous
natural shock-related \textit{fatalities} tend to \textit{decrease} terrorist attacks.

Alas, by virtue of the intricacies that arose during this empirical testing, my third
hypothesis cannot be simply labeled as acceptable or rejectable. An evaluation of the
validity of this third hypothesis can only be undertaken in the context of the statistical
and substantive findings that I glean from this regression analysis.

The regression model portrayed on the preceding page buttresses these results. All but
one observation in the table exhibit statistical significance at the one (1) percent level or
less. The coefficients on the control variables indicate that the observed relationships tend
to take place in large, rich countries with low levels of economic growth; polity score
exhibited no effect.

Substantively speaking, in a democracy, having ten (10) exogenous natural disaster
events in a given nation-month would have virtually no effect on terrorism within that

\textsuperscript{66} The coefficient corresponding to the short-term exogenous natural disaster variable \texttt{[.061]} is
statistically indistinguishable from the coefficient corresponding to the short-term
“demaut” * exogenous natural disaster interactive variable \texttt{[-.061]}.\textsuperscript{66}
nation-month. However, having an unusually high ten thousand (10,000) exogenous natural shock-induced mortalities in a democracy would entail a substantive increase in terrorist attacks of roughly one-third (~ 33 percent) within the nation-month in which the shock took place.

In an autocracy, having an exceptional ten (10) exogenous natural disaster events in a given nation-month would propagate terrorist attacks by anywhere from fifteen (15) to thirty (30) percent within the nation-month period. That said, having ten thousand (10,000) exogenous natural shock-induced deaths in an autocracy would bring about a substantive decrease in terrorism just exceeding ten (10) percent.

To recapitulate, from the perspective of a democratic regime/government, the occurrence of an exogenous natural disaster shock either has no impact on (in the short-term) or decreases (in the long-term) subsequent levels of terrorism. However, when people perish at the hands of a natural disaster, this leads to significantly more terrorism in a democracy. A democratic leader should thus not be overly concerned with the effects of having a natural disaster in and of itself, but should focus on mobilizing pre and post-disaster organizations and resources for preparative and palliative purposes to minimize the number of fatalities resulting from the disaster in question, as well as to stop the masses from suffering. For it is the fatalities that greatly come back to bite a democratic society terrorism-wise, not the actual disaster event itself.

From the perspective of an autocratic regime/government, the occurrence of an exogenous natural disaster shock precipitates subsequent terrorism, but fatalities resulting from such a shock suppresses the subsequent terrorist threat. This is a diametrically
opposite case to the situation in a democratic regime. In fact, it is politically favorable for the autocrat to allocate resources towards buying political support from their cronies than to use them towards post-disaster humanitarian assistance. To put it bluntly, the autocrat reaps a greater reward the more his citizens suffer and die in natural disasters. To the autocrat, the welfare of the masses is of secondary to no importance; his power-retention strategy is, which involves re-allocating any prospective humanitarian budget to buy his cadre of ultra-faithful and steadfast political supporters. For the autocrat, having an exogenous natural disaster shock is bad news, but having people die is not a problem.

These findings are visualized in the figure below:

![Table](Table-9.png)

*Figure 9: Interactive Effects of Exogenous Natural Disasters and Regime Type on Terrorism*
My findings in this subsection replicate those of Alejandro Quiroz and Alastair Smith in their 2012 “Leader Survival and Natural Disasters” research article in the *British Journal of Political Science*. 67

“[I]n large coalition systems, such as democracies, their occurrence has little effect on protest or leader survival. However, if large numbers of people die in these disasters, more protests occur and leader survival diminishes. In contrast, for leaders in small coalition systems, the occurrence of disasters increases protests and reduces tenure, but the level of fatalities has little effect. The anticipation of these potential political effects accounts for why many more people die in disasters in small coalition systems than in large coalition systems [...] political motivations, not humanitarian concerns, drive governments’ responses to disasters.” 68

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68 Ibid - pp. 1, 23.
VII. CONCLUSION

The existing literature on what is a well-explored topic of study within the field of international relations presents results that overwhelmingly evince a direct correlation between exogenous natural disaster shocks and the incidence of civil conflict/terrorism. My findings in this study demonstrate strong consistency with this trend. Unlike the majority of the literature, however, I add an additional element to this trend in my experimentation: differentiating between the mechanisms of opportunity-based terrorism and grievance-based terrorism as a result of natural disasters. Which of these two mechanisms of terrorism takes effect is highly dependent on the presence or absence of terror campaigns in the preceding year. Present terrorism in the preceding year, opportunity-based terrorism tends to be the predominant mechanism of current terrorism; absent terrorism in the preceding year, opportunism tends to slip into the background in favor of grievance-based terrorism, since opportunity cannot be exploited without existing terrorists harboring pre-disaster grievances.

My theoretical framework intuits that endogenous natural disasters - namely, famines - logically demonstrate a negative correlation with the incidence of terrorism, since a starving population - though they may be irate with their government - is incapacitated and/or killed by the effects of the famine. This renders it impossible for the populace to channel their grievances through terroristic means. My findings suggest that light famines in fact increase terrorism (to a greater degree in the long run as opposed to the short run), as an aggrieved, food-deprived populace will still have the minimal requisite resources to
stay alive and capacitated to vent their grievances towards their leadership. However, my other - and more significant - finding is that heavy, large-scale famines decrease terrorism substantially, as the starving population is out of commission and even dies off from lack of nutrition, thereby rendering the terrorist threat dissolved from the government’s point of view. As I hypothesized, this large-scale famine-induced decrease in terrorism is more pronounced in the long-term as opposed to the short-term.

The literature also suggests that autocratic (small coalition) regimes are considerably more likely to experience terrorism in the wake of an exogenous natural disaster shock than a democratic (large coalition) regime. This trend owes itself to the fact that democratic rulers are at their constituency’s mercy to retain their seat in office, and will thus be much more concerned about ensuring the welfare of and pleasing their constituents by implementing pre and post-disaster relief measures and humanitarian assistance to assuage the deleterious effects that the natural disaster inflicts. For an autocratic ruler, providing disaster relief is a poor political strategy as it is not conducive to his survival; what an autocratic ruler benefits from is reallocating and redistributing relief and humanitarian resources towards his cronies, and allowing his population to suffer immensely and/or perish. My findings at least somewhat parallel these notions, for they are reflective of two different situations contingent upon the regime in question. I find that, in an autocratic regime, the occurrence of exogenous natural disaster shocks in and of themselves increases the incidence of terrorism, whereas natural disaster-induced fatalities decrease terrorism. In a democratic regime, on the contrary, I find that the occurrence of exogenous natural disaster shocks in and of themselves either has no effect
upon (in the six (6)-month short-term), or decreases (in the seven (7) through twelve (12)-month long-term), the incidence of terrorism, whereas natural disaster-induced fatalities increase terrorism.

While I am quite satisfied with my research and the results I have been able to obtain therein, I feel that the research that I have conducted in this paper, and the findings that this research has yielded, are, in many respects, at a merely rudimentary level. Indubitably, there is a great deal of additional research that this domain of study warrants and demands before more definite conclusions and/or axioms can be reached with full appreciation. It is my hope that my piece of research will serve as a springboard for further, more comprehensive and profound research on this topic.

Future studies bearing premises along the same lines as mine, but which are able to one-up my assessments, findings, and conclusions through more sophisticated research design and data analysis, would go a long way in the advancement of this strand of research. For instance, I believe a study that incorporates geolocation of terrorist attacks - and of the specific terrorist network(s) that perpetrate them - with respect to where a natural disaster has geographically taken place would be extremely captivating research that would bring about highly fascinating results, and would reveal new phenomena concerning the nexus of natural disasters/shocks and terrorism that, for the time being, are unbeknownst even to scholars within the field. All too often, the impact of physical and human geography on the incidence of terrorism is overlooked. While I had hoped to incorporate an element of geographical consideration and geolocation in this study, I
determined that such an undertaking would have extended well beyond the realm of what was appropriate for a relatively simple study such as mine.

Furthermore, I believe that - while outside the scope of this study - the consequential line of distinction between domestic and international terrorism cannot be overemphasized. With varying definitions of the term “terrorism” itself, let alone those of two disparate mechanisms through which terrorism comes to fruition, transnational and domestic terrorism are not always as readily differentiable from one another as it may seem. Nonetheless, their differentiability has far-reaching implications on the contemporary political arena; whether ultra right-wing extremists storming the United States Capitol in violent protest of election results is as “terroristic” as an Islamic State (ISIL) member/sympathizer blowing himself up in a crowd is a complicated question that is very much up for debate. The separation of domestic and transnational terrorism is the subject of a paper (discussed in the literature review) by Claude Berrebi and Jordan Ostwald, and they make an excellent point in that natural disasters may induce “spillover terrorism” across national borders; this form of metastasis of terrorism into neighboring nations can very quickly render - depending on one’s definition of the two - what was previously domestic terrorism into an international campaign of terror.69

Finally, the *cum hoc ergo propter hoc* fallacy prevents me from drawing any conclusions within this paper beyond a correlative relationship between natural disasters and terrorism. Future supplemental research that may be more substantial in such a way that it

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can point not only towards a correlation between the occurrence of natural disasters and the incidence of terrorism as I have done, but, in addition, towards some proof of a relationship of causality between the two, would indeed make results/findings such as mine all the more compelling.

As I stated in my introduction, both natural disasters and terrorism can pose some of the largest threats to mankind. In fact, either of the two considered alone are sufficient to leave indelible scars; the intersection of the two can prove many orders of magnitude more devastating. A more comprehensive and thorough understanding and appreciation of how the phenomena of natural disasters and terrorism interact with one another not only makes for more interesting research, but when findings from such research are applied practically in the field, they can often make the difference between life and death. Hence, it is why it is ever so indispensable that further, more advanced research be conducted on such a critical couple of dangers that persist in perpetuity around the world in which we live.
Bibliography


“Female Suicide Bomber Stops UN Aid to Pakistan Flood Victims.” *Asia News*, December 27, 2010.


https://www.terrorismtracker.com/index.php/

“Terrorist Attacks in the U.S Between 1970 and 2013: Data from the Global Terrorism Database (GTD).” START National Consortium for the Study of Terrorism and Responses to Terrorism, November 2014, pp. 1–2.


https://data.worldbank.org/
Appendix I: Model N°1 for Hypothesis N°1 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks
// Regression 2, H1 //

. reghdfe LogTerrorismTotalKilled c.LogTerrorismTotalKilledPast13_24##c.(LogDisasterPast6 LogDisasterTotalDeathsPast6 > LogDisasterPast7_12 LogDisasterTotalDeathsPast7_12) loggdp logtotalpop PolityScore GDPgrowth_annpct, a(ccode YEARMON > TH)

(MMFE estimator converged in 6 iterations)

Absorbing 2 HDFE groups

| LogTerrorismTotalKilled | Coef.    | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|-------------------------|----------|-----------|-------|------|----------------------|
| LogTerrorismTotalKilledPast13_24 | 0.274928 | 0.023006  | 119.50| 0.000| 0.2704189 - 0.2794371 |
| LogDisasterPast6        | 0.0149628 | 0.0074278 | 2.01  | 0.044| 0.0004044 - 0.0295213 |
| LogDisasterTotalDeathsPast6 | -0.0102401 | 0.01951 | -5.25 | 0.000| -0.0148641 - 0.0084161 |
| LogDisasterPast7_12     | 0.0197544 | 0.0078127 | 2.53  | 0.011| 0.0044415 - 0.0350673 |
| LogDisasterTotalDeathsPast7_12 | -0.0102553 | 0.020463 | -5.01 | 0.000| -0.0142659 - 0.0062446 |
| c.LogTerrorismTotalKilledPast13_24# | 0.190234 | 0.028215 | -7.03 | 0.000| -0.025353 - -0.142933 |
| c.LogDisasterPast6      | 0.0138019 | 0.007653 | 18.04 | 0.000| 0.0123019 - 0.0153018 |
| c.LogDisasterTotalDeathsPast6 | 0.0056801 | 0.029708 | 0.19  | 0.050| -0.0052627 - 0.0063829 |
| c.LogTerrorismTotalKilledPast13_24# | 0.0130295 | 0.007909 | 13.06 | 0.000| 0.0087794 - 0.017895 |
| loggdp                 | 0.0448862 | 0.0079457 | 5.65  | 0.000| 0.0391288 - 0.0504597 |
| logtotalpop            | 0.2129266 | 0.014935 | 14.59 | 0.000| 0.1843234 - 0.2415298 |
| PolityScore            | 0.0002924 | 0.0006012 | 1.55  | 0.122| -0.0002489 - 0.0002108 |
| GDPgrowth_annpct       | -0.0039071 | 0.003696 | -10.57| 0.000| -0.0046315 - 0.0031827 |
| _cons                  | -3.76069  | 0.2612514 | -14.39| 0.000| -4.272741 - -3.24864 |

Absorbed degrees of freedom:

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Appendix II : Model Nº2 for Hypothesis Nº1 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Prior Terror Deaths
Appendix III : Model Nº3 for Hypothesis Nº2 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Endogenous Natural Disasters (Famines)
Appendix IV: Model N°4 for Hypothesis N°3 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Polity
### Appendix V: Model Nº1 for Hypothesis Nº1 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks, with (Log) Terrorism Events as Dependent Variable (NOT INCLUDED IN ANY REGRESSION ANALYSIS)

```
. reghdfe LogTerrorEvents LogDisasterPast6 LogDisasterTotalDeathsPast6 LogDisasterPast7_12 LogDisasterTotalDeathsPast7_12 loggdp logtotalpop PolityScore GDPgrowth_annpct cyear cmonth, a(ccode YEARMONTH)
(NumFE estimator converged in 6 iterations)

|                      | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|----------------------|--------|-----------|-------|------|----------------------|
| LogTerrorEvents      |        |           |       |      |                      |
| LogDisasterPast6     | .0427235 | .0068312  | 7.08  | 0.000 | .0309023 - .0545446  |
| LogDisasterTotalDeathsPast6 | .0181579 | .0015925  | 11.40 | 0.000 | .0150836 - .0212791  |
| LogDisasterPast7_12  | .0750793 | .0062899  | 12.06 | 0.000 | .0636335 - .0863351  |
| LogDisasterTotalDeathsPast7_12 | .0146885 | .0016537  | 8.87  | 0.000 | .0114274 - .0179097  |
| loggdp               | .0992973 | .007646   | 12.99 | 0.000 | .0843112 - .1142834  |
| logtotalpop          | .3872858 | .014259   | 27.61 | 0.000 | .3597951 - .4147765  |
| PolityScore          | .0082577 | .0008528  | 14.17 | 0.000 | .0071154 - .0094006  |
| GDPgrowth_annpct     | -.0029703 | .0003599  | -8.25 | 0.000 | -.0036757 - -.0022648 |
| _cons                | -6.778577 | .2515158  | -26.95 | 0.000 | -7.271546 - -6.265608 |

Absorbed degrees of freedom:

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### Regression Results

**Model: Appendix VI for Hypothesis N°1 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Prior Terror Deaths, with (Log) Terrorism Events as Dependent Variable**

*(NOT INCLUDED IN ANY REGRESSION ANALYSIS)*

| LogTerrorEvents | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|-----------------|-------|-----------|---|------|----------------------|
| LogTerrorEventsPast13_24c_LogDisasterPast6 | .312587 | .0021256 | 147.06 | 0.000 | .3084209 | .3167532 |
| LogDisasterPast6 | -.0258573 | .0063747 | -4.06 | 0.000 | -.0380317 | -.013683 |
| LogDisasterTotalDeathsPast6 | -.0079905 | .0016272 | -4.91 | 0.000 | -.0111848 | -.0048063 |
| LogDisasterPast7_12 | -.0284247 | .0067374 | -4.22 | 0.000 | -.04163 | -.0152194 |
| LogDisasterTotalDeathsPast7_12 | -.0071968 | .0017111 | -4.15 | 0.000 | -.0104606 | -.0038753 |
| c.LogTerrorEventsPast13_24c_LogDisasterPast6 | -.0029768 | .0026044 | -1.14 | 0.253 | -.0080814 | .0021279 |
| c.LogTerrorEventsPast13_24c_LogDisasterTotalDeathsPast6 | .0118686 | .0007877 | 16.79 | 0.000 | .010483 | .0132542 |
| c.LogTerrorEventsPast13_24c_LogDisasterPast7_12 | .0194656 | .002743 | 7.11 | 0.000 | .0181194 | .0208178 |
| c.LogTerrorEventsPast13_24c_LogDisasterTotalDeathsPast7_12 | .0077515 | .0007377 | 10.51 | 0.000 | .0063856 | .0091974 |
| loggdp | .0434383 | .0061665 | 7.04 | 0.000 | .0313519 | .0555247 |
| logtotalpop | .196530 | .0112991 | 17.39 | 0.000 | .1743929 | .218665 |
| PolityScore | .0016149 | .0004684 | 3.45 | 0.001 | .0007686 | .0025533 |
| GDPgrowth_annpct | -.0026957 | .0002874 | -9.38 | 0.000 | -.0033291 | -.0020624 |
| _cons | -3.517567 | .2024851 | -17.38 | 0.000 | -3.914276 | -3.120859 |

**Absorbed degrees of freedom:**

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Appendix VII: Model No. 3 for Hypothesis No. 2 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Endogenous Natural Disasters (Famines), with (Log) Terrorism Events as Dependent Variable

(Not Included in Any Regression Analysis)
Appendix VIII: Model No. 4 for Hypothesis No. 3 - Terrorism-Inflicted Fatalities Per Nation-Month as a Function of Exogenous Natural Disaster Shocks & Polity, with (Log) Terrorism Events as Dependent Variable

*(NOT INCLUDED IN ANY REGRESSION ANALYSIS)*
### Appendix IX: Exogenous Natural Disaster Summary Statistics (Per Nation-Month)

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<th>Variable</th>
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### Appendix X: Endogenous Natural Disaster (Famine) Summary Statistics (Per Nation-Month)

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### Appendix XI: Terrorism Events Summary Statistics (Per Nation-Month)

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<td>1.293221</td>
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### Appendix XII: Exogenous Natural Disaster Fatalities Summary Statistics (Per Nation-Month)

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Appendix XIII : Endogenous Natural Disaster (Famine) Fatalities Summary Statistics (Per Nation-Month)

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Appendix XIV : Terrorism Fatalities Summary Statistics (Per Nation-Month)

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Appendix XV : Nation-Year-Months in Which Exogenous Natural Disaster Fatalities Exceeded One Hundred Thousand (100,000) Persons

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Appendix XVI: Nation-Year-Months in Which Terrorism Fatalities Exceeded Three Thousand (3,000) Persons

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Appendix XVII: General Distribution via Kernel Density Estimate of Endogenous Natural Disaster (Famine)-Induced Fatalities in One (1) Nation-Month, Logarithmic Scale
Appendix XVIII: General Distribution via Kernel Density Estimate of Exogenous Natural Disasters One (1) Nation-Month, Logarithmic Scale
Appendix XIX: General Distribution via Kernel Density Estimate of Terrorist Attacks in One (1) Nation-Month, Logarithmic Scale

(Trend Chart)

*kernel = epanechnikov, bandwidth = 0.1328
*x-values are approximate*